Research Brief

Investment Case for Reducing Noncommunicable Disease Risk Factors in Adolescents

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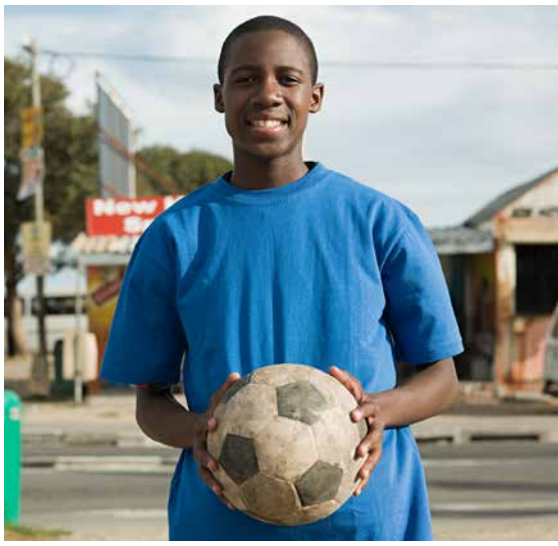

Noncommunicable diseases (NCDs)—including cardiovascular and respiratory diseases, cancers, mental disorders, and injuries—are a major global health concern. More people (almost 40 million deaths in 2016) die from NCDs than from malaria, tuberculosis, and HIV/AIDS combined.[1] Most NCDs are caused by a handful of important risk factors and behaviors. NCD risk often starts during the adolescent years (defined in this study as 10–19 years old) and develops slowly into adulthood. Two-thirds of premature NCD deaths in adults are associated with behaviors initiated during youth and early adulthood, underscoring the importance of NCD prevention during adolescence.[2]

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Key messages

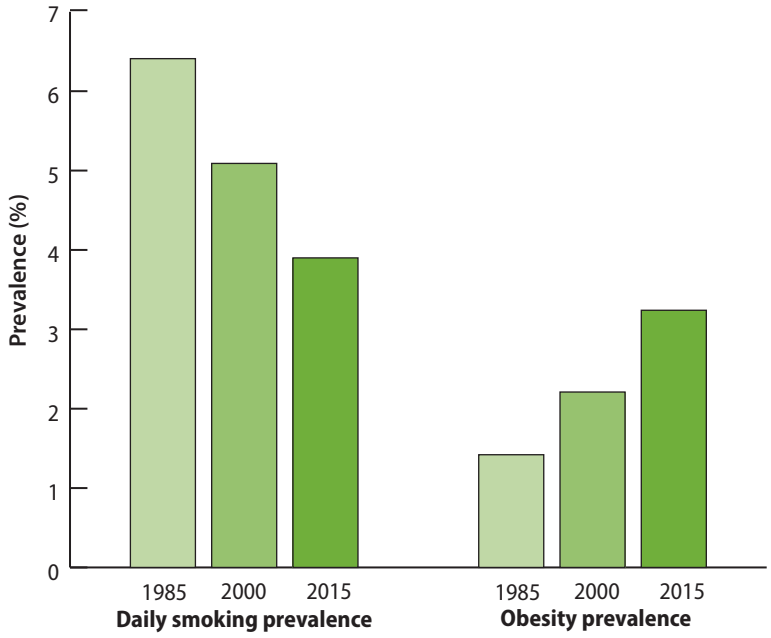
- Adolescent obesity is rapidly increasing around the world. The response to adolescent tobacco use has been inadequate. Both cause significant risk of NCDs in adulthood. Prevention of NCDs must start in adolescence.
- Successful implementation of evidence-based interventions targeted at adolescents could—on average—save 500,000 adult lives per year globally over the next 50 years and provide annual economic benefits averaging US $6 billion.
- Well-designed excise taxes are an effective way to reduce consumption of tobacco and sugary beverages among adolescents. These taxes should be a health policy priority for all countries. Tobacco advertising bans and school-based obesity prevention programs can complement taxes to reduce NCD risk even further.

Many NCDs emerge because of social pressures to engage in unhealthy behaviors. For neurodevelopmental reasons, adolescents are especially susceptible to these external cues. At the same time, adolescents also respond well to external cues to change behavior for the better. The impact of adolescent behavior on long-term well-being is significant.[2] For example, 90% of adult smokers[3] initiated smoking by the time they turned 18, and 50% of adolescent smokers continue to smoke for another 16 to 20 years.[4]

Intervening to reduce NCD risk during the adolescent period provides great benefits. Youth who can quit smoking for at least 1 year have a 67% chance of never smoking again.[5] Overweight adolescents are 50% more likely to die compared to adolescents of normal weight.[6] Seventy percent of obese adolescents continue to be obese as adults,[7] whereas people who are fit in their 20s are more likely to sustain their fitness throughout adulthood, use fewer health services as they age, and have lower rates of cardiovascular disease later in life.[8]

According to World Health Organization (WHO) estimates, the annual death toll from tobacco use is expected to reach 8 million by 2030, an increase from 2014 of 2 million deaths annually.[9] Some progress has been made on smoking over the past few decades because tobacco has long been recognized as a public health threat. On the other hand, child and adolescent obesity have increased from 11 million in 1975 to 124 million in 2016, with the most rapid rise in low- and middle-income countries.[10] Prevalence of adolescent obesity and adolescent smoking were nearly the same in 2015 (Figure 1). Lack of action on obesity is due to several factors, including the fact that the evidence for determinants of obesity has emerged more recently and requires more nuanced and complex

Figure 1. Global adolescent smoking and obesity prevalence, 1985–2015



Source: Global Burden of Disease Study 2015 (GBD 2015) Smoking Prevalence 1980–2015 [dataset] and Obesity and Overweight Prevalence 1980–2015 [dataset]. 2017 Accessed 2018 Mar 26.

changes in behavior. Public health action has not kept pace with the increase in unhealthy diet and physical inactivity.

Global trends for both adolescent tobacco use and obesity are alarming, and policy makers must now focus seriously on adolescent NCD prevention to prevent a deluge of premature mortality, disability, high medical costs, and reduced economic growth in future decades. ***From a life course perspective, targeting the major risk factors that younger persons are exposed to is an efficient way to reduce the incidence of NCDs later in life.***

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Overview of study

The following sections summarize an analysis conducted by RTI International to estimate the health and economic gains that could be realized through maximum implementation of four evidence-based interventions targeted at tobacco use and obesity risk among adolescents. We looked at the current implementation levels for these interventions worldwide and assessed how closing the gap between current and maximum implementation could affect the risk of premature death among today's adolescents. We then quantified the economic consequences of not fully implementing these tobacco use and obesity interventions—the global "cost of inaction."

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Selection of interventions

We conducted structured literature reviews and consulted topic experts to arrive at a list of interventions targeted at tobacco use and obesity reduction among adolescents; these interventions have demonstrated good value for money and feasibility in diverse country settings. We drew heavily on the recommendations of *Disease Control Priorities, 3rd Edition,* and the Updated WHO Global NCD Action Plan 2013—2020 ("Appendix 3").[11,12] Our review of evidence suggested that intersectoral and fiscal policies were likely to have a high degree of feasibility and effectiveness in low- and middle-income countries. Taxes are viewed especially favorably, due to their effectiveness at curbing consumption of unhealthy products and generating revenue.[13] Although we identified community-based interventions, we deemed the evidence to be insufficiently strong to include in this analysis. We did not identify any cost-effective clinical interventions to address tobacco use and obesity among adolescents in diverse country settings. Table 1 summarizes these interventions and the estimates of their effectiveness used in our analysis.

Tobacco use

We identified excise tax hikes and point-of-sale (POS) advertising bans as having the highest likelihood of impact on tobacco use among adolescents. Tobacco taxes are often called a "win-win" because they not only improve health but also contribute to government revenue—which can be used to further tobacco control or other public health programs.[14] Although many countries have a tobacco excise tax, the taxes remain low relative to WHO's recommendation that 75% of the final sale price of tobacco products be taxes. POS advertising bans reduce youth exposure to tobacco industry messages, and thereby

reduce smoking initiation and prevalence among youth. POS advertising bans are often missing from country tobacco control efforts.[14]

We defined maximum implementation of the two tobacco policies as (1) rapid achievement of an excise tax hike and (2) full implementation and enforcement of the POS ban in all countries. For tobacco taxes, we estimated the price increase required for each country to reach WHO-recommended tax levels;[15] then we used effectiveness studies[16] to calculate the reduction in adolescent smoking prevalence that would result from the tax hike. For the POS advertising ban, we assessed the presence of bans and overall levels of compliance (as currently legislated) by country,[15] then we used literature estimates of effectiveness[17] to calculate the reduction in smoking prevalence that would result from scaling up the ban to full compliance.

Obesity

We identified excise taxes on sugar-sweetened beverages (SSBs) and school-based physical and nutrition education programs as having the highest likelihood of reducing obesity among adolescents. The evidence in support of SSBs taxes is growing.[18] Several countries are experimenting with SSB taxes and are beginning to find favorable effects on reducing consumption. School-based programs that encourage physical activity and teach children about nutrition have also shown promise. In most countries, schools are a logical entry point for engaging children and adolescents, and embedding healthy diet and lifestyle habits.[19]

We defined maximum implementation of the two obesity interventions as (1) uniform execution of an SSB tax and (2) scale-up of the nutrition and physical activity programs to every adolescent currently attending school. For SSB taxes, we collected SSB consumption data by country,[20] estimates of tax effectiveness,[18] and information on the relationship between SSB consumption and body-mass index (BMI)[21] to calculate reductions in population mean BMI. For the school-based education intervention, we drew on a large trial that quantified the impact of such programs on mean BMI in Chinese schools,[22] factoring in that some adolescents do not attend school and that this number varies by country.

Table 1. Interventions modeled in this analysis

Risk factor	Intervention	Literature estimates of effectiveness
Tobacco use	Increase in excise tax to 75% of final retail price of tobacco products	10% increase in price leads to a 5.6% decline in smoking prevalence
	Point-of-sale (POS) advertising bans	27% reduction in chance of smoking
	Outcome: reduction in monthly smoking prevalence among adolescents (varies by country)	
Obesity	Addition of a 20% excise tax on sugar-sweetened beverages (SSB)	10% increase in price leads to a 10% decrease in SSB consumption (and body-mass index [BMI] downstream)
	School-based physical activity and nutrition programs	0.29 kg/m^2 reduction in mean BMI
	Outcome: reduction in mean BMI among adolescents (varies by country)	

Other analytic methods

We presumed that intervention effects would remain constant throughout the life course of today's adolescents. Our modeling accounted for the fact that specific interventions have overlapping effects on mortality. We estimated the economic benefits of reduced mortality using previously published methods.[23] We conducted our analyses on 70 countries for which we had the required epidemiological inputs, representing about 88% of the world's population. Our analyses were conducted on a country-by-country basis, then extrapolated to the global population.

Results

As today's adolescents grow older, we estimate that 20 million avoidable premature deaths could occur during the next 50 years if current trends around POS bans, school-based obesity programs, and tobacco and SSB taxes continue. The net economic benefit would be $300 billion. Implementing these interventions would save—on average—500,000 lives each year and provide US $6 billion in annual economic benefits.

Table 2 illustrates how implementing the tobacco and obesity policies can avert deaths and economic losses in the next 50 years. The benefits of enacting these policies accumulate throughout adulthood, even though the benefits are relatively low in early adulthood.

Reducing tobacco use and obesity to lower levels than assumed here may be plausible with a broader package of interventions, although the evidence base for other interventions is currently weaker. However, our counterfactual scenarios (very low levels of smoking; significant reductions in obesity) require a level of enactment that may be implausible in certain contexts; they are intended to provide a sense of what is possible with maximum effort. In addition, these figures account only for health and economic losses prior to about age 70. Losses would continue to accrue exponentially over time as this cohort passes 70.

Consequences of not addressing tobacco use and obesity among today's adolescents would be an average of

500,000

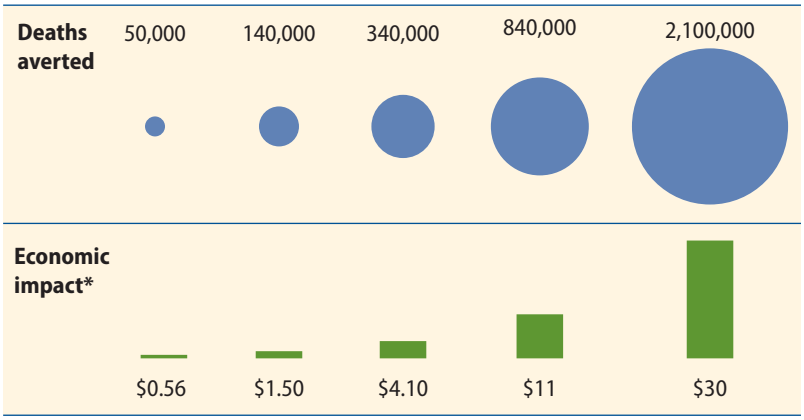
avoidable premature deaths annually, with an economic loss averaging

US $6

billion annually.

Table 2: Global benefits of tobacco and obesity policy implementation among adolescents

	2028	2038	2048	2058	2068
Deaths averted	50,000	140,000	340,000	840,000	2,100,000
Economic impact*	$0.56	$1.50	$4.10	$11	$30



* Estimates provided in billions of 2016 US dollars.

Policy implications of this analysis

The critical period of adolescence has been neglected by the global health and NCD agenda. We studied the impact of maintaining status quo levels of tobacco and obesity interventions during the adolescent years, as compared to taking aggressive action to reduce these NCD risk factors using evidence-based interventions.

The health effects of these risk factors threaten to reduce life expectancy among today's adolescents and hinder progress on Sustainable Development Goal 3, which calls for ensuring healthy lives and promoting wellbeing for all at all ages.

Global action

Although these interventions will be implemented at the country level, global advocacy should continue to help countries prioritize NCD prevention during the adolescent years. Global health institutions, civil society organizations, and industry partnerships need to be strengthened to reduce barriers to implementation at the country level, particularly in the case of taxes. The WHO tobacco reports and Noncommunicable Disease Progress Monitor reports present country profiles and annual updates on the status of policy implementation. This type of work needs to be expanded to include all major NCD risk factors and their interventions, with a focus on policies that target the adolescent population. Keeping countries accountable for their endorsement of the Sustainable Development Goal 3 NCD targets will be crucial to curbing the NCD epidemic and preventing premature deaths.

Domestic action and adaptation

Tobacco and SSB taxes are most likely to generate the highest returns on investment across diverse country settings. POS advertising bans are also highly effective but may require additional resources to enforce fully. School-based programs, although effective, can be resource-intensive; in countries with low school attendance rates, their population impact will be lessened. Therefore, these programs should be implemented where conditions and resources indicate success is likely.

Still, we argue that these four interventions provide a short menu of options for countries to consider as next steps in their NCD action plans. Tobacco and SSB taxes should be a top priority in nearly all countries. Eventually, this package could be expanded to include other population- and community-based interventions; however, we deemed the current evidence base (particularly on economic benefits) for these sorts of interventions to be insufficient to justify their scale-up.

Notably, tobacco and SSB consumption vary significantly by country and pose different risks to the population. For example, the average SSB consumption in countries of East Asia is 0.2 serving/day, whereas the Caribbean countries consume almost 10 times that amount on average, at 1.9 servings/day.[20] Daily smoking prevalence also varies from 6.8% in Sub-Saharan Africa to 21.9% in Central Europe, Eastern Europe, and Central Asia.[24] When choosing among promising interventions, countries with limited resources should consider their population's

behavior patterns. For instance, if SSB consumption is relatively low, the country should consider putting more resources towards school-based obesity prevention programs and tobacco interventions to obtain more value for money spent. On the other hand, considering the high cost of school-based programs, lower-income countries could consider starting with taxes and POS advertising bans, then adding school-based programs as resources permit.

Limitations

Our analysis had several important limitations. Our estimates of intervention effectiveness were based mostly on studies conducted in high- and upper-middle-income countries, limiting generalizability to diverse populations at different stages of development. Our assessment of lives saved relies on existing projections of population size and structure during the next several decades, and the presumption that current death rates will remain stable in the future.

Future iterations of this analysis will incorporate a broader range of outcomes in our model to provide a fuller and more precise set of estimates—including estimates of effects by intervention.

This is an ongoing research project with a full global report and country analyses forthcoming.

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