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Original Investigation

Economic Costs of Diseases and Deaths Attributable to Tobacco Use in India, 2017–2018

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Abstract

Introduction: About 28.6% of Indian adults use tobacco. This study estimates the economic burden of deaths and diseases attributable to smoking and smokeless tobacco (SLT) use for persons aged ≥35 years.

Methods: The National Sample Survey data on healthcare expenditures, the Global Adult Tobacco Survey data on tobacco use prevalence, and relative risks of all-cause mortality from tobacco use were used to estimate the economic burden of diseases and deaths attributable to tobacco use in India, using a prevalence-based attributable-risk approach. Costs are estimated under the following heads: (1) direct medical and nonmedical expenditures; (2) indirect morbidity costs; and (3) indirect mortality costs of premature deaths.

Results: Total economic costs attributable to tobacco use from all diseases and deaths in India in the year 2017–2018 for persons 35 years or older amount to INR 1773.4 billion (US $27.5 billion), of which 22% is direct and 78% is indirect cost. Men bear 91% of the total costs. Smoking contributed 74% and SLT use contributed 26% of the costs.

Conclusions: The economic costs of tobacco use amount to approximately 1.04% of India's gross domestic product (GDP), while the excise tax revenue from tobacco in the previous year was only 12.2% of its economic costs. The direct medical costs alone amount to 5.3% of total health expenditure. The enormous costs imposed on the nation's health care system due to tobacco use could potentially stress the public health care system and strain the economy and it warrants massive scaling up of tobacco control efforts in India.

Implications: The study finds that the economic burden from tobacco constitutes more than 1% of India's GDP, and the direct health expenditures on treating tobacco-related diseases alone accounts for 5.3% of the total private and public health expenditures in India in a year. It shows that, for every INR 100 that is received as excise taxes from tobacco products, INR 816 of costs is imposed on society through its consumption. It establishes that tobacco consumption is a major resource drain on the national exchequer, and its effective regulation through comprehensive fiscal and non-fiscal policies is highly warranted.

Introduction

It has been well established that tobacco, in all forms, has a causal role in various noncommunicable diseases and that the overall mortality rate for smokers is 60% to 80% higher than that for nonsmokers.[1,2] According to the World Health Organization (WHO),[3] worldwide, 12% of all adult deaths (>30 years of age and older) are attributed

to tobacco (16% among men, 7% among women). The number of deaths attributed to smokeless tobacco (SLT) use globally due to all causes was estimated to be more than 650 000 among adults constituting about 10% of all deaths that could be attributed to all forms of tobacco use.[4] The total economic costs of smoking-attributable diseases and deaths in 152 countries, representing 97% of the world's smokers was estimated to be US $1436 billion in 2012, accounting for 1.8% of the world's annual gross domestic product (GDP) according to a study by WHO.[5] Nearly 40% of these costs occurred in developing countries. Several studies from individual countries have also estimated that the economic cost of smoking expressed as a percentage of GDP ranged from 0.1% to 7.2%.[6]

In India, the second-largest producer of tobacco in the world,[7] tobacco use takes a variety of forms such as smoking and chewing. According to the second round of the Global Adult Tobacco Survey in 2016–2017 (GATS 2),[8] about 28.6% of adults (267 million) aged 15 or above used tobacco in some form in India in 2017. Out of this, about 100 million smoked, 199 million used SLT, and 32 million used both. In addition, about 38.7% and 30.2% of adults were exposed to secondhand smoke (SHS) at home and work places, respectively.[8] Noncommunicable diseases accounted for 63% of all deaths in India in the year 2018, up from only 37.9% in the year 1990.[9] Available estimates in India show that smoking-attributable annual deaths[10] were about 930 000, while the SLT attributable annual deaths[11] were about 350 000, together accounting for about 1 280 000 deaths per year or approximately 3500 deaths every day. The potential economic cost resulting from premature deaths and productivity loss can be gigantic.

Although there have been some studies[12–14] on economic cost of tobacco use in India, these studies were either not fully representative of the country or did not consider different types of costs. A comprehensive study of economic costs from all tobacco-related diseases combined, as well as for four major diseases separately, was undertaken for the year 2011 by the Ministry of Health and Family Welfare, Government of India, in collaboration with the WHO.[15] It estimated the total economic costs attributable to tobacco use from all diseases and deaths in the year 2011 for persons aged 35–69 to be INR 1044.8 billion (US $16.18 billion, using 2017–2018 exchange rate of 1 US $ = 64.56 INR), of which 16% was direct cost and 84% was indirect cost. The study found that economic cost was 1.16% of the GDP and 12% more than the combined state and central government expenditures on health in 2011–2012. A more recent study[16] estimated the economic costs of bidi (*hand-rolled tobacco*) smoking in India and found that the total economic costs of diseases and deaths attributable to bidi smoking among persons 30–69 were INR 805.5 billion or 0.5% of India's GDP in 2017.

Given the enormous public policy implications of economic burden estimates of tobacco use in the past, it is imperative to provide more up-to-date estimates as and when possible. With the release of new GATS data in 2018 by the Ministry of Health and Family Welfare as well as the new nationally representative health expenditure data and periodic labor force surveys in 2019, by the National Statistical Office, this paper updates the economic cost estimates of tobacco use for the year 2017–2018.

Methods

This study used a number of different data sources. The 75th round of the National Sample Survey during 2017–2018—social consumption in India: (Health)[17]—was used to estimate healthcare expenditures. This survey collected data from a representative sample of 64 552 rural and 49 271 urban households consisting of 555 115 persons on utilization and expenditures with respect to private and public health care services. It included data on inpatient hospitalization during the 365 days and outpatient visits during the 15 days prior to the date of interview. Different items of expenditures incurred during every spell of ailments were recorded, as explained below. Smoking and SLT use prevalence were estimated using GATS 2,[8] which is a nationally representative household survey of persons 15 years of age or older across 30 states of India and two Union Territories during 2016–2017. The periodic labor force survey[18] during 2017–2018, on employment and unemployment was used to estimate the labor force participation rate and average wages. Besides these, other data from Sample Registration System,[19] Census of India,[20] Reserve Bank of India,[21] WHO life tables for India,[22] and published literature on relative risks of mortality (RR) for smoking and SLT by gender and age group[23] were also used for estimating different cost components.

Three major types of costs were considered: (1) direct costs which included direct medical expenditure of treating diseases, including the cost of medicine, surgeon fees, bed charges and costs of diagnostic tests and patient transportation and direct nonmedical expenditures which included transportation and lodging charges for caregivers; (2) indirect morbidity costs which included loss of household income during hospitalization or outpatient visits; and (3) indirect mortality costs of premature deaths attributable to tobacco use.

A prevalence-based attributable-risk approach was used for estimating the direct medical and nonmedical costs[24,25] while the human capital approach[26,27] was used to estimate the costs of morbidity and premature mortality. Costs were estimated separately for smoking and SLT use and for males and females ages 35–69 and ≥70, because the RR for smoking and SLT was available for this age group only. The detailed methodology is described below.

Estimation of Tobacco Use-Attributable Fraction

The tobacco use-attributable fraction (SAF) is the proportion of expenditure on health care, morbidity and mortality attributable to tobacco use, estimated using an epidemiological formula[25]:

$$SAF_{tga} = \frac{PE_{tga}\left(RR_{tga} - 1\right)}{PN_{tga} + \sum_t PE_{tga}\left(RR_{tga}\right)} \quad (1)$$

Subscripts *t*, *g*, and *a* indicate type of tobacco use (smoking and SLT), gender and age group (35–69 and 70 or above). *PE* and *PN* denote the prevalence of ever and never smoking/SLT use, respectively and RR denotes the RR of all-cause mortality for smoking/SLT compared to never users. It is to be noted that the cost estimates are for all diseases combined, using the RRs of all-cause mortality from tobacco use and not separately for individual diseases. The all-cause RR used in this study captured the RR of dying from any disease for those who ever used tobacco compared to those who never used. Accordingly, costs were estimated for all diseases combined, multiplying the average costs with the respective SAF for each expenditure components and categories. The RR for mortality here is used as a proxy for the RR of morbidity due to the absence of data on RR of morbidity. The estimated SAF is applied to all cost components, including direct expenditures, indirect morbidity, and indirect mortality costs. Ever use prevalence is defined as current use prevalence + former use prevalence. The ever use prevalence of both smoking and SLT are defined to be mutually exclusive with dual use added to

smoking. The prevalence was defined as such to be consistent with the way the RRs used here are estimated. For estimating indirect mortality costs, the SAFs were estimated only by tobacco use type, gender, and 5-year age groupings using an all-cause mortality risk. Whereas, to estimate the direct medical and nonmedical expenditures and indirect morbidity costs, SAFs were estimated by tobacco use type, gender, and age groups (35–69 and 70 or more). The RRs of all-cause mortality, the tobacco use prevalence, and the estimated attributable fractions using these as in equation 1 are given in Table 1.

Direct Costs

Approximately 45.7% and 35.3% of inpatient hospitalization and 32.5% and 26.2% of outpatient visits in rural and urban areas, respectively, were serviced by public sector providers according to the National Sample Survey data. The ailment-specific average expenditure for each of the ailments from private providers was computed and imputed to those receiving treatment from public providers. This is because the public health care services are subsidized by the state and, as result, several expenses are not adequately reflected in expenditures incurred by patients seeking treatment from public service providers. Before such imputation was made, however, the private expenditure data itself was adjusted using the expenditures of only private health care seekers who made payments fully out of pocket. Sampling weights were used while estimating average expenditures. Pregnancy-related expenditures incurred, if any, were not counted while estimating the average healthcare expenditures.

Direct Medical Costs

Direct medical expenditures from inpatient hospitalization and outpatient visits include expenditures on medicine, doctor's fees, bed charges, attendant charges, medical appliances, diagnostic tests, and patient transportation, which includes only the cost of ambulance for transporting patients. Any other costs of transportation are included under direct nonmedical expenditures. Tobacco use-attributable direct medical expenditures (TDME) for each subgroup stratified by state and gender for the age groups 35–69 and ≥70 were estimated by multiplying the SAF with the corresponding direct medical expenditures (DME):

Table 1. All-Cause Relative Risks, Prevalence, and Attributable Fraction Used for Cost Estimates

	35–69 age group		≥70 age group	
	Male	Female	Male	Female
Relative risks				
Smoked tobacco	1.67	1.53	1.30	1.75
Smokeless tobacco	1.16	1.30	1.23	1.28
Attributable fraction (%)				
Smoked tobacco	18.15	1.95	10.78	5.37
Smokeless tobacco	3.71	5.30	5.61	7.19
Ever use prevalence (%)				
Smoked tobacco	34.73	3.96	42.63	8.16
Smokeless tobacco	29.71	19.05	29.44	29.78

SLT = smokeless tobacco. Tobacco use-attributable fraction (SAF) calculated based on the formula in equation 1. Ever use prevalence for smoking = prevalence of current smoking + former smoking + dual use of smoking and smokeless; ever use prevalence for smokeless = prevalence of current SLT use – current dual use + former SLT use – former dual use.

$$TDME_{tga} = DME_{ga} \times SAF_{tga} \quad = \begin{bmatrix} EIP_{ga} \times NIP_{ga} + \\ (EOP_{ga} \times NOP_{ga} \times 24.33) \end{bmatrix} \times N_{ga} \times SAF_{tga} \tag{2}$$

where subscripts *t*, *g*, and *a* indicate type of tobacco used (smoked or smokeless), gender, and age group, respectively. *EIP* is the average expenditure per inpatient hospitalization, *NIP* is the average number of inpatient hospitalizations per person (averaged over the full subgroup) in 365 days, *EOP* is the average expenditure per outpatient visit, and *NOP* is the average number of outpatient visits per persons for 15 days prior to the date of interview. The 15 days average values for outpatient expenditures were multiplied with 24.33 to convert them to 1-year values. *N* is the estimated population in 2017–2018 for the respective subgroups.

Direct Nonmedical Costs

Direct nonmedical expenditures include (1) expenditures incurred for transportation other than ambulance and (2) lodging charges of caregivers during inpatient hospitalization and outpatient visits. Tobacco use-attributable direct nonmedical expenditure for each subgroup stratified by gender for the age groups 35–69 and ≥70 were estimated by multiplying the SAF with the corresponding indirect morbidity costs using a similar formula as in equation 2.

Indirect Morbidity Costs

Tobacco use-attributable indirect morbidity costs consist of the loss of household income from work due to inpatient hospitalization or outpatient visits. Tobacco use-attributable indirect morbidity costs (TIM) for each subgroup stratified by state and gender for the age groups 35–69 and ≥70 were estimated by multiplying the SAF with the corresponding indirect morbidity costs (IM):

$$TIM_{tga} = IM_{ga} \times SAF_{tga} \quad = \begin{bmatrix} YIP_{ga} \times NIP_{ga} + \\ YOP_{ga} \times NOP_{ga} \times 24.33 \end{bmatrix} \times N_{ga} \times SAF_{tga} \tag{3}$$

YIP and *YOP* are the income loss from work due to inpatient hospitalization and outpatient visits, respectively.

Indirect Mortality Costs

A third and important component of the economic cost of tobacco is the cost of premature deaths from tobacco use. Tobacco use-attributable costs of premature mortality were estimated using the human capital approach, as the present expected value of lost future productivity caused by tobacco use-attributable premature deaths for the year 2017. It involved two steps: (1) Estimating the total number of premature deaths attributable to smoking and SLT use: number of deaths in each age group by gender obtained from the Sample Registration System[19] was multiplied with the corresponding SAF for this purpose; and (2) Estimating the expected present value of future productivity lost for each of those deaths: for this, the present value of foregone lifetime earnings for each person at the age of death was estimated. Estimation of present value of foregone lifetime earnings used an approach,[27] which took into account life expectancy by gender and 5-year age groupings, labor force participation rate, current pattern of earnings at successive ages by gender, and a discount rate to convert a stream of future earnings into its present value. An empirically estimated social discount rate of 3%, as recommended in the reference manual for the Health Technology Assessment (HTA) in India,[28] was used to convert the stream of future earnings into its present value. In order to account for potential growth in future earnings, an annual average productivity growth rate of 7.3% was

assumed, which is the geometric mean of the 10 years of annual GDP growth rates from 2007 to 2008 to 2016–2017 in India.[29] Tobacco use-attributable costs of premature deaths were estimated separately for smoking and SLT use by multiplying the corresponding attributable deaths by the present value of foregone lifetime earnings for each subgroup stratified by 5-year age group and gender. These were estimated by 5-year age group and gender using all-cause mortality. The unit costs for all the cost components, as well as the number of hospitalization and visits along with the 95% confidence interval are available in Table 2.

Results

As shown in Table 3, the total economic costs attributable to tobacco use from all diseases in India in the year 2017–2018 for persons aged ≥35 years amounted to INR 1773.4 billion (US $27.5 billion) or INR 3, 772.5 per adult per year. Out of this, INR 387.1 billion (22%) was direct costs and INR 1386.3 billion (78%) was indirect costs. The costs of premature mortality alone were 75% of the total economic costs.

The analysis by tobacco use type reveals that the smoking-attributable costs were much higher than SLT attributable costs, as shown in Table 4. While the smoking-attributable costs amounted to INR 1309.2 billion (74%) the SLT attributable costs amounted to INR 464.2 billion (26%). Similarly, the share of males in the total tobacco attributable costs is substantially higher (91%) compared to females (9%). However, the relative share of females in the total attributable burden is much larger in case of SLT (23%) than in case of smoking (4%). Further, female's relative contribution was much larger (56%) towards direct medical costs attributable to SLT than smoking (13%). Only 3% of the cost of premature mortality, however, is borne by females. This could be on account of lower annual average earnings and the lower present value of lifetime earnings for females in India compared to their male counterparts.

Out of the total economic burden attributable to tobacco-related diseases, 93.3% of the costs were borne by those in the age group 35–69, while those 70 and above shared the remaining 6.7%. However, if we examine these shares by tobacco use type, we can see that the relative share of ≥70 age group is higher (10.6%) for SLT compared to smoked tobacco, where the contribution by the ≥70 is limited to only about 5.3%.

Tobacco use-attributable premature mortality cost estimates the present expected value of lost future productivity due to premature death. The total cost of premature mortality due to tobacco use across all age groups was INR 1324.5 billion, as shown in Table 5. Costs from smoking accounted for 76% (INR 1006.6 billion) of the cost of premature mortality attributed to tobacco use, while SLT accounted for the rest (INR 317.9 billion). Men in the age group 35–39 shared the highest (29.2%) burden from premature mortality, while women from 40 to 44 age group shared the maximum burden of 34.9% of the respective cost of premature mortality attributable to tobacco use.

Table 6 compares the estimated economic costs with certain outcome indicators. The estimated total economic costs attributable to tobacco use is about 1.04% of the GDP in the year 2017–2018, while the total excise tax collected on tobacco products in the previous year amounted to only about 12.2% of this cost. In other words, for every INR 100 that is received as excise taxes from tobacco products, INR 816 of costs is imposed on society through the consumption of tobacco. The tobacco attributable direct medical

Table 2. Average Costs (INR) per Inpatient Hospitalization and Outpatient Visits and Average Number of Visits

	In patient hospitalization			Out patient visits		
	Mean	SE	95% CI	Mean	SE	95% CI
Direct medical expenditures						
Male	44 006.5	1016.4	(42 014.1, 45 998.8)	1189.0	50.5	(1090.0, 1288.0)
Female	32 096.4	614.1	(30 892.7, 33 300.1)	956.4	29.1	(899.4, 1013.4)
Direct nonmedical expenditures						
Male	1940.8	136.0	(1674.3, 2207.3)	36.3	2.2	(32.1, 40.5)
Female	1422.8	48.1	(1328.6, 1517.1)	37.6	2.6	(32.4, 42.7)
Morbidity costs (lost household income)						
Male	2759.1	190.4	(2386.0, 3132.3)	313.6	19.2	(276.0, 351.2)
Female	1478.3	49.5	(1381.4, 1575.3)	129.9	9.3	(111.7, 148.1)
Average number of visits[a]						
Male	0.042	0.001	(0.040, 0.044)	0.118	0.003	(0.113, 0.123)
Female	0.047	0.001	(0.045, 0.049)	0.155	0.003	(0.149, 0.162)

CI = confidence interval; SE = standard error. Costs and visits for inpatient are for 1 year whereas the same for outpatient are for the past 15 days. Both outpatient expenses and visits were multiplied with 24.33 to convert them to 1-year values.

[a]Average number of visits are computed using the total sample population as denominator.

Table 3. Annual Economic Burden of All Diseases Attributable to Tobacco Use, 2017–2018

	Cost (INR million)	% Distribution	Cost per capita (INR)	Costs (US $ million)
1) Direct costs	387 084.5	21.8%	823.4	5995.7
A. Medical expenditures	373 440.8	21.1%	794.4	5784.4
B. Nonmedical expenditures	13 643.6	0.8%	29.0	211.3
2) Indirect costs	1 386 329.8	78.2%	2949.0	21 473.5
A. Indirect morbidity costs	61 812.7	3.5%	131.4	957.4
B. Indirect Mortality costs	1 324 517.1	74.7%	2817.5	20 516.0
Grant total (1 + 2)	1 773 414.3	100.0%	3772.5	27 469.2

The calculated costs are for all diseases together using all-cause mortality and tobacco use-attributable fraction (SAF). 1 US $ = INR 64.56 (average reference rate for 2017–2018 as per the Reserve Bank of India).

Table 4. Annual Economic Burden by Tobacco Use and Gender (INR Million)

		Direct costs			Indirect costs			
		Medical	Nonmedical	Subtotal	Morbidity	Mortality	Subtotal	Total costs
Age	Gender	Smoked tobacco						
35–69	Male	183 016	6405	189 420	37 964	974 473	1 012 437	1 201 857
	Female	18 682	785	19 467	2155	15 698	17 853	37 320
≥70	Male	32 852	1230	34 083	3687	16 090	19 777	53 860
	Female	14 309	486	14 795	1048	340	1388	16 183
≥35	Male	215 868	7635	223 503	41 651	990 563	1 032 214	1 255 717
	Female	32 991	1270	34 262	3203	16 038	19 242	53 503
Subtotal		248 859	8905	257 765	44 854	1 006 601	1 051 455	1 309 220
Age	Gender	Smokeless tobacco						
35–69	Male	37 439	1310	38 749	7766	284 064	291 830	330 579
	Female	50 882	2137	53 019	5870	25 380	31 251	84 270
≥70	Male	17 083	640	17 723	1917	8011	9928	27 651
	Female	19 178	651	19 829	1405	460	1865	21 694
≥35	Male	54 522	1950	56 472	9683	292 075	301 759	358 230
	Female	70 060	2788	72 848	7275	25 841	33 116	105 964
Subtotal		124 582	4738	129 320	16 958	317 916	334 874	464 194
Age	Gender	All tobacco						
35–69	Male	220 454	7715	228 169	45 730	1 258 537	1 304 267	1 532 436
	Female	69 564	2922	72 486	8026	41 078	49 104	121 590
≥70	Male	49 935	1870	51 805	5604	24 101	29 705	81 511
	Female	33 487	1136	34 624	2453	801	3254	37 878
≥35	Male	270 390	9585	279 975	51 334	1 282 638	1 333 972	1 613 947
	Female	103 051	4059	107 110	10 478	41 879	52 358	159 467
Grand total		373 441	13 644	387 084	61 813	1 324 517	1 386 330	1 773 414

Table 5. Annual Tobacco Attributable Cost of Premature Mortality (INR Million)

Age group	Smoked tobacco			Smokeless tobacco			All tobacco		
	Male	Female	Subtotal	Male	Female	Subtotal	Male	Female	Total
35–39	260 211	0	260 211	114 012	3530	117 542	374 223	3530	377 753
40–44	245 233	7881	253 114	52 633	6742	59 375	297 866	14 623	312 489
45–49	183 924	0	183 924	44 343	4328	48 671	228 267	4328	232 595
50–54	123 892	5982	129 874	44 845	2819	47 664	168 737	8800	177 538
55–59	75 107	863	75 970	3250	4090	7340	78 357	4953	83 310
60–64	55 234	121	55 355	15 235	2610	17 844	70 469	2731	73 200
65–69	30 872	851	31 723	9746	1263	11 009	40 618	2114	42 732
Subtotal	974 473	15 698	990 171	284 064	25 380	309 445	1 258 537	41 078	1 299 615
70–74	9461	186	9646	4959	249	5208	14 420	435	14 855
75–79	4201	87	4288	1934	119	2053	6135	205	6341
80–84	1721	48	1769	792	66	858	2514	114	2628
≥85	707	20	727	325	27	352	1032	47	1079
Subtotal	16 090	340	16 430	8011	460	8471	24 101	801	24 902
Total	990 563	16 038	1 006 601	292 075	25 841	317 916	1 282 638	41 879	1 324 517

Table 6. Comparison of Tobacco Attributable Economic Costs With Select Outcome Indicators

Outcome indicators	Unit	Value
Economic costs attributable to tobacco use (2017–2018)	INR billion	1773.4
Direct medical costs attributable to tobacco (2017–2018)	INR billion	373.4
Excise tax from tobacco (2016–2017)[a]	INR billion	217.2
Total private and public expenditure on health[b]	INR billion	6984.3
GDP at current Prices (2017–2018)[c]	INR billion	17 095 005
Costs of tobacco as percentage of GDP	%	1.04%
Tobacco excise revenue as % of tobacco attributable costs	%	12.20%
Tobacco attributable direct medical costs as % of total health care expenditures	%	5.3%

GDP = gross domestic product.

Data sources: [a]Ministry of Finance, Government of India; [b]National Health Accounts, Government of India; [c]First Revised estimates of GDP for 2017–2018 from National Statistical Office.

expenditure alone amounts to about 5.3% of the total private and public expenditures on health in the same year.

Discussion

This study estimates the total economic costs attributable to tobacco use from all diseases and deaths in India in the year 2017–2018 for persons aged ≥35 years to be INR 1773.4 billion (US $27.5 billion) or INR 3773 per adult. The costs in 2011 according to a previous study by the Ministry of Health and Family Welfare[15] was only INR 1044.8 billion in comparison. If we were to inflation adjust the 2011 costs for 2017–2018 with consumer price index to make the estimates comparable, we see that the 2011 total cost amounts to INR 1459.2 billion (US $22.6 billion). Hence, the estimated economic costs for the year 2017–2018 is 21.5% higher, in real terms, compared to 2011 despite a fall in relative prevalence of tobacco use in India during the same period. Unlike the previous study, the present study included population above 70 years whose contribution in the total economic costs was about 6.7%. Even after excluding this age group, the increase in estimated costs is still about 13.4% higher in real terms. Increased average costs of treatment, increased average wages, and a lower discount rate used in the present study are possible factors that led to a relatively higher economic cost estimate.

The huge healthcare burden attributable to tobacco use in India has several implications. More than 63 million people are pushed into poverty every year in India due to healthcare costs.[30] It is also known that tobacco spending crowds out expenditure on food and education in India, especially among the poor.[31] Direct spending on tobacco and tobacco attributable health care spending together impoverish about 15 million people in India annually.[32] Given that out-of-pocket payments constitute nearly 70% of the total health care expenditures[33] in India, increased economic cost due to tobacco use can aggravate poverty and economic hardships. As tobacco use in India is more prevalent among lower socioeconomic status groups, it

is likely that much of the related illness and associated economic cost would also be higher among the poor, exacerbating their poverty. The economic cost of tobacco also reflects an important gender dimension, with 91% costs accounted for by males. Yet, the consequent toll on household income is shared by all the household members.

Despite the huge economic cost of tobacco use, however, the total tax burden—tax as percentage of retail price—on tobacco products was approximately 53%, 22%, and 60% for cigarettes, bidis, and SLT, respectively, after the introduction of the Goods and Services Tax (GST) in 2017,[34] far below the levels recommended by the WHO.[35] Moreover, there have been no revisions on tobacco taxes under the GST for more than 2 years, which has made tobacco products even more affordable, as shown by a recent study.[36] There has been a small increase in the National Calamity Contingent Duty on tobacco products in the central government budget for FY 2020–2021; however, this alone may not help reduce the affordability. Also, this was not applied on bidis despite it being one of the most heavily used tobacco product in India and causing severe economic burden in the country.[16] It is important for the GST council to take heed of this and find ways to regularly increase taxes on tobacco products.

Although the study uses updated nationally representative data and robust methods to arrive at the results, it still suffers from few limitations. First, it used RR of mortality to estimate all attributable costs. To the extent, the RR of mortality differs from the RR of morbidity the estimates may be biased. Second, this study used RR from a Mumbai cohort study, which was based on the population of Mumbai and hence it may not be representative. However, in the absence of RRs information representative of all of India for the different subgroups used in the study, the Mumbai cohort results had to be relied upon. Moreover, the RRs of tobacco use are not likely to be very different from the rest of the country. Third, there may be underestimation of indirect morbidity cost due to underreporting of income lost by the households for the unemployed and casual laborers. Fourth, the study does not estimate the costs attributable to secondhand smoking, which is known to cause several diseases and premature deaths.[2] This will also have the effect of underestimating the total economic costs presented in this report. Fifth, the estimates of unit costs per inpatient hospitalization and outpatient visits, as well as the number of hospitalization and outpatient visits, are based on household survey data, which may be subject to recall bias. To the extent such bias exist, it will affect the estimated total costs too. Sixth, the average unit costs for inpatient hospitalization and outpatient visits were imputed for those availing treatment from public hospitals using the corresponding costs in private hospitals. This was done as many of the public hospitals in India are subsidized, and the out-of-pocket expenditures by households incurred in public hospitals would not capture the true unit costs. Notwithstanding these limitations, this study presents the most up-to-date and comprehensive estimates of the direct and indirect economic burden arising from diseases and deaths attributable to tobacco use, separately for smoking and SLT, in India.

It is clear that tobacco use is a major threat to the national exchequer given the enormous costs it imposes on individuals and society. The National Health Policy,[37] 2017 envisages increasing the share of public spending in health to 2.5% of GDP by 2025 from its then level of 1.15%. However, the enormous costs imposed on the nation's health care system due to tobacco use could potentially stress the public health care system and deprive the nation of necessary resources required to reach these targets. There is overwhelming evidence on the effectiveness of taxing tobacco products,[6] and India should take steps to increase taxes on tobacco products, including bidis, under the GST either by raising the compensation cess (a temporary additional duty on tobacco products under the GST) or by increasing the re-introduced excise taxes substantially so that all tobacco products continue to be less and less affordable. Simultaneously, the government should also ramp up investment in National Tobacco Control Program for the effective implementation of tobacco control and broad-based MPOWER policies.

Supplementary Material

A Contributorship Form detailing each author's specific involvement with this content, as well as any supplementary data, are available online at https://academic.oup.com/ntr.

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Declaration of Interests

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