

# The Economic Cost of Tobacco Use in Bangladesh: A Health Cost Approach

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Programme for Research, Advocacy and Capacity Building on Tobacco Taxation (PROACTT), a collaboration between the Cancer Research United Kingdom and the American Cancer Society, USA



# EXECUTIVE SUMMARY

**TOBACCO USE IS THE SINGLE MOST PREVENTABLE CAUSE OF DEATH GLOBALLY. IT IS ONE OF THE GREATEST RISK FACTORS FOR NONCOMMUNICABLE DISEASES INCLUDING CANCERS, CARDIOVASCULAR AND RESPIRATORY DISEASES. GLOBALLY SMOKING, CHEWING TOBACCO AND EXPOSURE TO SECONDHAND SMOKE TOGETHER WERE RESPONSIBLE FOR THE LOSS OF MORE THAN 8 MILLION LIVES AND 213 MILLION DISABILITY-ADJUSTED LIFE YEARS (DALYS) IN 2017. BETWEEN 2007 AND 2017, THE NUMBER OF TOBACCO-ATTRIBUTABLE DEATHS INCREASED BY 0.8 MILLION AND DALYS INCREASED BY 13 MILLION. IN THE 20TH CENTURY, TOBACCO IS KNOWN TO HAVE KILLED ABOUT 100 MILLION PEOPLE, AND IT IS PROJECTED TO KILL 1 BILLION PEOPLE IN THE 21ST CENTURY. THERE IS URGENT NEED TO REVERSE THIS TREND BEFORE MORE LIVES AND HEALTHY LIFE YEARS ARE LOST.**

The global economic cost of diseases attributable to smoking, including health expenditures and productivity losses, was estimated at \$1,436 billion in 2012, roughly equivalent to 1.8 percent of the world's annual Gross Domestic Product. Globally there are 1.1 billion tobacco smokers aged 15 years or older, around 80 percent of whom live in low- and middle-income countries (LMICs). As a result, the enormous global health and economic burden of tobacco use will be increasingly borne by these LMICs. The present study finds that Bangladesh, a lower-middle income country, incurs substantial and increasing tobacco-attributable economic costs consistent with the global evidence.

According to the Global Adult Tobacco Survey (GATS), the prevalence of tobacco use (including smoking and smokeless tobacco) among adults 15 and older decreased from 43.3 percent in 2009 to 35.3 percent in 2017 overall. In males, there was a reduction from 58.0 to 46.0 percent; among females, a drop from 28.7 to 25.2 percent. The youth (13-15) prevalence of tobacco use was 6.9 percent overall (9.2 percent among boys; 2.8 percent among girls) in 2013. That represented no significant change in the prevalence overall and among boys, and a decrease among girls from 5.1 percent since 2007.

Despite some positive changes in tobacco use prevalence among adult men and women and girls in the recent past, tobacco use remains one of the major risk factors for noncommunicable diseases in Bangladesh, one that can be modified to prevent a substantial number of deaths and disabilities.

The primary objective of the present study was to estimate the direct and indirect health costs attributable to tobacco use and harm from exposure to secondhand smoke. It also aimed at providing a comparison between the current estimates and those obtained from a 2004 WHO study on the impact of tobacco related illnesses in Bangladesh. The ultimate objective was to compare the costs of tobacco use with tobacco's so-called economic benefit, with a view to shaping national tobacco control policy.

Tobacco control has been an explicit government priority, but adoption and application of a fully functional and effective measure have been constrained by the powerful lobby of the financially strong tobacco companies. The estimates of the economic burden of tobacco use in this study provide the basis for a comprehensive assessment of the social and economic impact of tobacco use in Bangladesh and compelling evidence to support a strong public health policy intervention. This would also help raise people's awareness about the hard reality tobacco users face and build public opinion in support of tobacco control nationwide.

This study estimated that tobacco use caused nearly 126,000 deaths accounting for 13.5 percent of deaths from any cause in Bangladesh in 2018. In addition, the study revealed that approximately 1.5 million adults were suffering from diseases attributable to tobacco use and nearly 61,000 children were suffering from diseases due to exposure to secondhand smoke. Tobacco-induced deaths and diseases alone cost the economy of Bangladesh around BDT 305.6 billion (\$3.61 billion) a year, which was equivalent to 1.4 percent of its national GDP in the year 2017-18.

The total economic contribution of the tobacco sector (in terms of household final consumption expenditure, private and public domestic investment and net export) to the GDP in Bangladesh was estimated at BDT 229.1 in 2016-17 fiscal year in 2018 prices. This is BDT 76.5 billion short of the estimated total cost of tobacco, BDT 305.6 billion. Tobacco thus appears to be causing net loss to the economy of Bangladesh.

These findings establish that tobacco use imposes a significant financial burden on tobacco users, their families, and on the nation. The breakdown of the total cost estimate of BDT 305.6 billion shows that the direct healthcare costs attributable to tobacco use amounted to BDT 83.9 billion annually, 76 percent of which was paid by tobacco users' households. The remaining 24 percent was financed through public health sector budget representing nearly 9 percent of total government health expenditure in fiscal year 2018-19. The indirect cost given by the annual productivity loss, due to morbidity and premature mortality from tobacco-related diseases, was estimated to be BDT 221.7 billion.

Generally, studies that measure the economic cost of tobacco use apply diverse methods, and the estimates are not readily comparable across populations, time and studies. The present study shows that the annual estimate of total economic cost of tobacco in Bangladesh more than doubled since 2004. By maintaining the cost-of-illness approach followed in the 2004 WHO study in Bangladesh, this study provided a consistent evidence base for comparison of the economic costs of tobacco over time, measurement of progress in curbing the tobacco epidemic and timely intervention to accelerate the progress in tobacco control.

Though this study is comprehensive insofar as including direct medical costs and indirect productivity costs, it still misses a significant number of additional costs, and therefore remains an underestimate of the total costs of the tobacco burden. We recognize that this study has not accounted for the substantial costs of the environmental and health damages from tobacco cultivation, loss of food security caused by the use of scarce land resources for tobacco growing, smoking-related fire hazards, environmental pollution from littering of cigarette butts, and so on. Had these costs been estimated, the net loss from tobacco would have even larger. These costs can be measured in future research endeavors. Perhaps more importantly from a human perspective, we will never be able to gauge the pain and suffering of tobacco victims and their families.

Moreover, the spending on tobacco and on health care attributable to tobacco diverts resources away from necessities. The crowding-out effect of tobacco consumption can lead to displacement of basic needs among lower-income households and contribute to impoverishment and overall economic and health inequity.

The need to reverse the adverse socioeconomic, environmental and health consequences of tobacco use on individuals and on society is urgent. The vision of Tobacco-Free Bangladesh by 2040 underscores this need. The path to a tobacco-free state is, however, arduous and can be reached only with aggressive and effective tobacco control measures that:

- Raise tobacco taxes and prices
- Monitor tobacco use and prevention policies
- Protect people from tobacco smoke with smoke-free laws
- Offer help for tobacco use cessation
- Warn about the dangers with graphic warning labels on tobacco packages
- Enforce bans on tobacco advertising, promotion and sponsorship
- Tax tobacco farming land as industrial land to discourage tobacco cultivation
- Provide incentive to tobacco farmers to shift to alternative and more viable livelihoods
- Enforce ban of tobacco sales to minors.

At present, 35.3 percent of Bangladeshis 15 and older (an estimated 37.7 million adults) smoke and/or use smokeless tobacco. If we start the clock now, 1.8 million tobacco users will have to quit tobacco use every year to make the country tobacco-free by 2040. A comprehensive tobacco tax reform with simplification of tax structure, plus increases in tobacco taxes and prices can make this target feasible. Yet there will be new tobacco users, unless we can stop initiation of tobacco use among the youth completely. Global evidence shows that tax and price increases are particularly effective in deterring youth from starting to smoke. A tobacco tax increase also

can reduce tobacco consumption faster among the poor, who are usually more price sensitive. The effect of tax and price increases in reducing tobacco consumption can be stronger, if tax policy can be aligned and combined with other measures.

Estimates of the tobacco-attributable health care costs and productivity loss at the population level help to understand the economic impact of tobacco use and provide the evidence base for policymakers to implement comprehensive tobacco control policies to curb the epidemic. The progress in tobacco control policies in Bangladesh since the ratification of the WHO Framework Convention on Tobacco Control (WHO FCTC) in 2004, followed by the passage of the Tobacco Control Act in 2005 and the amendment to the Tobacco Control Act in 2013, has been limited. Despite the reduction of tobacco use, Bangladesh will not meet the target of a Tobacco-Free Bangladesh by 2040 envisioned by the prime minister. It will take much stronger tobacco control measures fortified with “best practices” and stricter compliance with the guidelines of the articles under the WHO FCTC, especially targeted at youth, who constitute the generation of potential future smokers.

**THE GOALS OF TOBACCO CONTROL ARE INTERTWINED WITH THE UNITED NATIONS 2030 SUSTAINABLE DEVELOPMENT GOALS TO ERADICATE EXTREME INCOME POVERTY, REDUCE DEATHS FROM NONCOMMUNICABLE DISEASES BY ONE-THIRD, AND ACHIEVE UNIVERSAL HEALTH COVERAGE TO HELP PROTECT AGAINST IMPOVERISHMENT CAUSED BY ILLNESSES. ELIMINATION OF TOBACCO USE CAN PREVENT THE DEATHS AND DISEASES ATTRIBUTABLE TO TOBACCO USE AND SECONDHAND SMOKE EXPOSURE ALTOGETHER, THEREBY CONTRIBUTING SIGNIFICANTLY TO THE SUSTAINABLE DEVELOPMENT GOALS IN BANGLADESH BY 2030.**

# THE STUDY TEAM

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***Additionally, 38 field officers were trained and sent to selected locations throughout the country to conduct the primary survey component.***

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Dr. Tara M Kessaram, Medical Officer, Noncommunicable Diseases

Dr. M Mostafa Zaman, Advisor, Research and Publication

Dr. Syed Mahfuzul Huq, National Professional Officer, Noncommunicable Diseases

# FROM THE TEAM LEADER



The **PROACTT Bangladesh Project** has been a great journey for all of us. Our study team, medical team and our field research officers visited every district in the country to make this project a success. I appreciate all their efforts and the difficulties that they faced in the important work of collecting evidence on the human and socioeconomic costs of tobacco use in Bangladesh.

The study grew out of a workshop in July 2017 at the University of Dhaka, followed by a formal agreement between the Bangladesh Cancer Society and the American Cancer Society (ACS). The study was jointly supported by American Cancer Society (ACS) and Cancer Research United Kingdom (CRUK) under the Programme for Research, Advocacy and Capacity Building on Tobacco Taxation (PROACTT). A multi-stage clustered survey was designed for a nationally representative sample of 10,000 households. After developing survey questionnaires for disease profile and health costs, 38 interviewers collected data from the sample households. The field work for the 18-month-long study was conducted from January to April 2018. After data collection, processing and analysis, we released the key findings of the study on 23 February 2019 in the presence of the State Minister of Health and the Secretary of Health of the Government of Bangladesh, distinguished health professionals, civil society organizations, tobacco control advocates and representatives of ACS and CRUK.

I am delighted to submit the full report. It is my sincerest hope that this study will contribute to the advancement of the tobacco control movement in Bangladesh.

Cordially,

A handwritten signature in black ink, appearing to be 'Golam Mohiuddin Faruque', written over a horizontal line.

**Professor Dr. Golam Mohiuddin Faruque**

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# TABLE OF CONTENTS

Executive Summary	1
The Study Team	3
From the Team Leader	4
Acknowledgements	4
List of Tables	5
List of Figures	8
SECTION 1: INTRODUCTION	9
SECTION 2: METHODS AND ANALYTICAL FRAMEWORK	
2.1. Cost of Illness (COI) Approach	10
2.2. Data Sources	11
2.2.1 Household Survey	11
2.2.2 Secondary Data	16
2.3. Measures	16
Study Population	16
Status of tobacco use	16
Exposure to secondhand smoke	16
Prevalence of Tobacco-related Diseases	17
Mortality from Tobacco-related Diseases	17
Risk Ratio (RR)	17
Population-attributable Risk (PAR)	17
Private Health Expenditures	18
Public Health Expenditures	18
Costs of Morbidity	19
Costs of Mortality	19
Costs of Secondhand Smoke Exposure	20

## SECTION 3: FINDINGS

3.1. Prevalence of tobacco-related diseases	21
3.2. Prevalence of tobacco use (adults aged 30 and older)	23
3.3. Excess risk of tobacco-related diseases attributable to tobacco use and household exposure to secondhand smoke	24
3.4. National level estimates of the number of patients suffering from tobacco-attributable illnesses	26
3.5. National level estimates of tobacco-attributable mortality	27
3.6 Direct costs of tobacco-attributable illnesses	28
3.6.1 Private health expenditures	28
3.6.2 Public health expenditures	30
3.6.3 Total health expenditure	31
3.7. Indirect costs of tobacco-attributable illnesses	32
3.7.1 Costs of morbidity	32
3.7.2 Costs of mortality	35
3.8. Comparison of the economic costs and benefits of tobacco	37
3.9. Tobacco-attributable costs: 2004 and 2018	38

## SECTION 4: DISCUSSION AND CONCLUSION

References	42
Glossary	44
List of Abbreviations	45
Appendices	46
Appendix 1. Household Disease Profile Questionnaire	47
Appendix 2. Household Health Cost Questionnaire	59
Appendix 3. Map of Bangladesh with All 64 Districts	88



# LIST OF TABLES

<b>Table 2.1</b> Geographic Distribution of Sample Households	12
<b>Table 2.2</b> Sample characteristics of patients (30 and older) with proven medical records of tobacco-related diseases	12
<b>Table 3.2.1</b> Prevalence of tobacco use among adults 30 and older	23
<b>Table 3.2.2</b> Prevalence of current tobacco use by product type among adults 30 and older	23
<b>Table 3.3.1</b> Risk Ratio (RR) and Population Attributable Risk (PAR) due to tobacco use among adults 30 and older	24
<b>Table 3.3.2</b> Risk Ratio (RR) and Population Attributable Risk (PAR) due to household exposure to secondhand smoke among children younger than 15	25
<b>Table 3.4.1</b> Total number of patients suffering from tobacco-related illnesses in Bangladesh, 2018.	26
<b>Table 3.4.2</b> Total number of patients suffering from tobacco-related illnesses by disease category for age group 30 and older in Bangladesh, 2018	26
<b>Table 3.6.1</b> Tobacco-attributable out-of-pocket health expenditure for inpatient care for patients 30 and older	28
<b>Table 3.6.2</b> Tobacco-attributable out-of-pocket health expenditure for outpatient care for patients 30 and older	29
<b>Table 3.6.3</b> Direct costs of tobacco-related illnesses in Bangladesh, 2018	31
<b>Table 3.7.1</b> Value of time of patients 30 and older for attending health care services	32
<b>Table 3.7.2</b> Household productivity loss of non-employed patients 30 and older	34
<b>Table 3.7.3</b> Productivity loss due to premature mortality attributable to tobacco use for the age group 30 and older	35
<b>Table 3.7.4</b> Productivity loss due to premature mortality attributable to secondhand smoke exposure	36
<b>Table 3.8.1</b> The costs (in billion BDT) of tobacco-attributable illnesses in Bangladesh, 2018	37
<b>Table 3.9.1</b> Comparison of the tobacco-attributable cost estimates for Bangladesh between 2004 and 2018 (in 2018 prices)	38

# LIST OF FIGURES

<b>Figure 3.1.1</b> Prevalence of tobacco-related diseases among adults 30 and older	21
<b>Figure 3.1.2</b> Prevalence of tobacco-related diseases among children younger than 15	22
<b>Figure 3.3.1</b> Prevalence of tobacco-related diseases by tobacco use status of adults 30 and older	24

# 1. INTRODUCTION

Tobacco use is the single most preventable cause of death globally. It is one of the greatest risk factors for noncommunicable diseases (NCDs) including cancers, cardiovascular and respiratory diseases. Globally smoking, chewing tobacco and exposure to secondhand smoke together were responsible for the loss of more than 8 million lives and 213 million disability-adjusted life years (DALYs) in 2017 (Global Burden of Disease, Injuries, and Risk Factors Study, 2017). Further, the deaths and disabilities attributable to tobacco are rising — between 2007 and 2017, the number of tobacco-attributable deaths increased by 0.8 million and DALYs increased by 13 million (Global Burden of Disease, Injuries, and Risk Factors Study, 2017). In the 20th century, tobacco is known to have killed about 100 million people. It is projected to kill 1 billion people in the 21st century (World Health Organization, 2008) (World Health Organization, 2017). There is urgent need to reverse this trend before more lives and healthy life years are lost.

The global economic cost of smoking-attributable diseases from health expenditures and productivity losses was estimated at \$ 1,436 billion in 2012, roughly equivalent to 1.8 percent of the world's annual Gross Domestic Product (Goodchild et al., 2018). Globally there are 1.1 billion tobacco smokers 15 years or older, around 80 percent of whom live in low and middle-income countries (LMICs) (U.S. National Cancer Institute; World Health Organization, 2016). As a result, the enormous global health and economic burden of tobacco use will be increasingly borne by these LMICs. The findings from the present study reveal that Bangladesh, a lower-middle income country, incurs substantial and increasing tobacco-attributable economic costs consistent with the global evidence.

According to the Global Adult Tobacco Survey (GATS), the prevalence of tobacco use (including smoking and smokeless tobacco) among adults 15 and older decreased from 43.3 percent in 2009 to 35.3 percent in 2017 overall (from 58.0 to 46.0 percent among males; from 28.7 to 25.2 percent among females (Bangladesh Bureau of Statistics, 2018)). The youth (13-15) prevalence of tobacco use was 6.9 percent overall (9.2 percent among boys; 2.8 percent among girls) in 2013. That represented no significant change in the prevalence overall and among boys, and a decrease among girls from 5.1 percent since 2007 (World Health Organization, Regional Office for South-East Asia, 2015). Despite some positive changes in tobacco use prevalence among adult men and women and young girls in the recent past, tobacco use remains one of the major risk factors for NCDs in Bangladesh, one that can be modified to prevent a substantial number of deaths and disabilities.

The primary objective of the present study was to estimate the direct and indirect health costs attributable to tobacco use and harm from exposure to secondhand smoke. It also aimed at providing a comparison between the current estimates and those obtained from 2004 WHO study on the impact of tobacco related illnesses in

Bangladesh (World Health Organization, Regional Office for South-East Asia, 2007). The ultimate objective was to compare the costs with the so-called economic benefit of tobacco, with a goal of setting out policy implications for national tobacco control.

Tobacco control has been an explicit government priority, but adoption and application of a fully functional and effective measure from the part of the government have been systematically constrained by the powerful lobby from the financially strong tobacco companies. The estimates of the economic burden of tobacco use made available by this study provide the basis for a comprehensive assessment of the overall social and economic impact of tobacco use in Bangladesh and compelling evidence for strong public health policy intervention by the government to curb the tobacco epidemic despite these influential lobbyists. This would also help raise people's awareness about the hard reality tobacco users face and build public opinion in support of tobacco control nationwide.

SECTION 2

# METHODS AND ANALYTICAL FRAMEWORK

## 2.1 COST OF ILLNESS (COI) APPROACH

This study followed the cost-of-illness approach to estimate the economic cost of the adverse health effects of tobacco use (Rice, Hodgson, Sinsheimer, Browner, & Kopstein, 1986). In this study, we estimated the economic cost for seven tobacco-related diseases, namely, ischemic heart disease, stroke, chronic obstructive pulmonary disease (COPD), pulmonary tuberculosis, lung cancer, laryngeal cancer, and oral cancer. There is significant association between tobacco use and the prevalence of or the risk of mortality caused by these diseases. In addition, for capturing the effects of exposure to secondhand smoke, the study considered additional health conditions such as asthma, autism, lower respiratory infection, low birth weight of the newborn, and sudden infant death syndrome among the nonsmoker residents in the smokers' households.

We used a prevalence-based, disease-specific approach to measure the annual cost of tobacco-related illnesses and deaths caused by both current and past tobacco use, both smoking and smokeless tobacco. The economic cost of tobacco-related illnesses includes the following components:

- 1. Private expenditure (out-of-pocket or insurance covered) of patients on medical care for treating tobacco-related diseases of the tobacco users and those exposed to secondhand smoke:** It includes household expenses on inpatient hospitalizations, outpatient visits, hospital admission costs, doctor fees, medicines and nutritious food costs, diagnostic tests, accommodation costs, transportation to health centers and hired caregivers' costs;
- 2. Cost of the public health care system:** It includes direct government expenditure on health care services offered to patients suffering from tobacco-attributable diseases in public health care facilities, covering outpatient and inpatient care, medical rehabilitation, publicly procured pharmaceuticals, medical aids, emergency medical services, nursing, medical diagnosis and procedures; and
- 3. Loss of productivity and income:** It includes the effect of disability and premature mortality on individual and household level productivity and income due to tobacco-related illnesses.

The first two components compose the "direct costs" to the patients and the health care system. The third component captures the "indirect costs" that the patients and their families incur because of illnesses caused by tobacco use.

The cost-of-illness approach entails the determination of excess cost that can be attributed to tobacco use. In the first step, we determined the relative risks (RR) based on the excess risk of the prevalence of or mortality from these diseases among the tobacco users and the nonsmokers exposed to secondhand smoke. More formally, RR is the ratio of the probability of the outcome (prevalence of disease or mortality from the disease) in the exposed group (tobacco users or those exposed to secondhand smoke) to the probability of the outcome in the unexposed group (non-tobacco users or those not exposed to secondhand smoke).

The RR is required to identify the fraction of the total cost-of-illness that can be attributed to tobacco use known as the population attributable risk (PAR), as multiple factors including tobacco can contribute to the disease prevalence and mortality. PAR is given by the formula:

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

where P is the tobacco use prevalence in the population.

## 2.2 DATA SOURCES

### 2.2.1 Household Survey

#### SAMPLING DESIGN

The primary data on diseases of all household members were collected during January-April 2018 from a nationally representative survey of 10,000 households selected using a multi-step clustered sampling design. The sample size of households was pre-determined to ensure the availability of enough patients suffering from tobacco-related diseases to successfully apply the prevalence-based disease-specific cost-of-illness approach. Based on previous information on average household size and age distribution from the fifth Population and Housing Census of Bangladesh 2011, and the prevalence of tobacco-related diseases observed in the WHO study in 2004, it was estimated that to obtain a sample of 2,500 patients with a tobacco-related disease, a representative sample of at least 10,000 households would be required.

The sampling frame used for the household survey was based on the Population and Housing Census of Bangladesh 2011 and was obtained from the Bangladesh Bureau of Statistics. At the time of the census, there were six divisions (Barisal, Chittagong, Dhaka, Khulna, Rajshahi, and Sylhet), which are the largest administrative units in Bangladesh. By 2018, when the survey for the present study was carried out, two more divisions had been created by dividing Dhaka division into Dhaka and Mymensingh and Rajshahi division into Rajshahi and Rangpur. For the purpose of this study, we isolated the population statistics for the two new divisions based on the population data from the districts (Zilla) covered within the new divisions.

The sampling of households was done in three successive stages:

1. In line with the latest Global Adult Tobacco Survey conducted in Bangladesh in 2017, which is a global surveillance system for systematically monitoring adult tobacco use, a total of 496 Primary Sampling Units (PSUs), Mauza in rural and Mohalla in urban areas, were selected at the first stage with probability proportional to population size. The population size was measured by the total number of households in each PSU in the 2011 Census. The 496 PSUs were allocated evenly across the eight divisions, with 62 PSUs per division. Within each division, 62 PSUs were distributed among all districts (Zilla) with probability proportional to the population size of each district.
2. At the second stage, one Secondary Sampling Unit (SSU), village in rural areas and para in urban areas, was selected randomly from each PSU.
3. At the third stage, households were selected randomly (every 6th or 7th household based on the conditional probability of selecting one household) from each SSU. To represent all 64 districts in the country, the pre-determined sample size of 10,000 households was distributed among all districts proportionate to the number of households in each district. To avoid losing this pre-determined sample size due to nonresponse or missing information, 119 additional households were interviewed resulting in 10,119 total number of households in the survey. The sample size determined for each district was then distributed among the selected SSUs proportionate to the population size of each SSU. From each household, the head of the household or other responsible adult responded to the survey questions to provide household-specific information as well as individual-specific information on all residents of the household. In case of non-response, a replacement household was selected randomly to meet the target of pre-specified sample size.

Table 2.1 reports the geographic distribution of 10,119 sample households. Information on the symptoms and diagnosed cases of tobacco-related illnesses were collected for all individuals 30 years and older and children below age 15 from these households. The tobacco use status of all adults were collected at this stage as well. Based on the disease profile of 10,119 sample households, 2,600 households were identified with at least one member diagnosed with one of the selected major tobacco related diseases. Among these 2,600 households, 998 households had confirmed cases of the said diseases, with supporting medical records. The distribution of these households by division is shown in the final column of Table 2.1.

The 998 households with confirmed cases received a health cost questionnaire to collect detailed information on the use of health care services and related expenses, employment status and earnings of the patients, along with basic sociodemographic and economic characteristics of households. In this round of survey, age cohorts included adults 30 and older for diseases attributable to tobacco use and children younger than 15 for diseases attributable to exposure to secondhand smoke. There were 39 valid cases of tobacco-related diseases among children younger than 15 in the sample households. The sample characteristics of the individuals aged 30 and older are presented in Table 2.2.

**Table 2.1** Geographic Distribution of Sample Households

Division	District (Zilla)	Primary Sampling Unit (PSU) (Mauza/Mohalla)	Secondary Sampling Unit (SSU) (village/para)	Number of sample households	Number of sample households with confirmed cases of tobacco-related diseases
Barisal	6	62	62	1,238	90
Chittagong	11	62	62	1,343	88
Dhaka	13	62	62	1,392	124
Khulna	10	62	62	1,191	142
Mymensingh	4	62	62	1,220	159
Rajshahi	8	62	62	1,273	128
Rangpur	8	62	62	1,242	150
Sylhet	4	62	62	1,220	116
<b>Total</b>	<b>64</b>	<b>496</b>	<b>496</b>	<b>10,119</b>	<b>998</b>

The 998 households with confirmed cases received a health cost questionnaire to collect detailed information on the use of health care services and related expenses, employment status and earnings of the patients, along with basic sociodemographic and economic characteristics of households. In this round of survey, age cohorts included adults 30 and older for diseases attributable to tobacco use and children younger than 15 for diseases attributable to exposure to secondhand smoke. There were 39 valid cases of tobacco-related diseases among children younger than 15 in the sample households. The sample characteristics of the individuals aged 30 and older are presented in Table 2.2.

**Table 2.2** Sample characteristics of patients (30 and older) with proven medical records of tobacco-related diseases

	Urban	Rural	Total
<b>Number of patients by disease category</b>			
Ischemic heart disease	144	220	364
Stroke	130	194	324
COPD	70	91	161
Pulmonary tuberculosis	23	28	51
Lung cancer	17	14	31
Laryngeal cancer	10	11	21
Oral cancer	3	5	8
Total	397	563	960
<b>Gender (%)</b>			
Men	66.7	76.2	72.3
Women	33.3	23.8	27.7
<b>Age group (%)</b>			
30-39 years	14.9	11.9	13.1
40-49 years	27.0	22.2	24.2
50-59 years	26.4	25.8	26.0

	Urban	Rural	Total
60-69 years	20.4	24.9	23.0
70 years and older	11.3	15.3	13.6
<b>Marital status (%)</b>			
Married	85.0	90.4	88.3
Single/widowed/separated	15.0	9.6	11.7
<b>Relationship to household head (%)</b>			
Head	90.2	91.8	91.1
Other members	9.8	8.2	8.9
<b>Education (%)</b>			
No formal education	30.0	35.6	33.4
Less than primary	9.8	14.0	12.3
Primary	14.6	19.0	17.2
Less than secondary	38.3	28.2	32.4
Secondary and above	7.3	2.8	4.7
<b>Employment status (%)</b>			
Not Employed	39.1	31.3	34.5
Employed	60.9	68.7	65.5
<b>Primary occupation (%)</b>			
Self-employed in non-farm businesses	24.6	17.7	20.6
Laborer	10.1	10.2	10.1
Farmers	10.4	26.8	20.0
Professional	11.1	6.3	8.3
Retired, students, others	4.4	6.8	5.8
Homemaker	26.7	22.5	24.3
Unemployed	12.7	9.6	10.9
<b>Annual per capita household income</b>			
1st Quartile (less than BDT 28,800)	17.4	29.0	24.5
2nd Quartile (BDT 28,801 to 45,000)	25.1	24.2	24.6
3rd Quartile (BDT 45,001 to 88,000)	31.0	21.8	25.4
4th Quartile (above BDT 88,000)	26.5	24.9	25.5

## SAMPLING WEIGHT

To ensure the representativeness of the sample measures at the national level, sample weight was derived considering the multi-stage probability sampling design. It was given by the inverse of the unconditional probability of selection for each household, which is the product of the probabilities of selection at each stage of the sample design.

At the first stage, the probability of the  $i$ -th PSU (Mauza in rural and Mohalla in urban areas) being selected,  $p_i$ , was:

$$p_i = \frac{N_{PSU} * N_i}{\sum_i N_i}$$

where

$N_{PSU}$  = number of PSUs chosen from each district (Zilla),

$N_i$  = number of households in the  $i$ -th PSU as of the census of 2011, and

$\sum_i N_i$  = total number of households in all PSUs in a district as of the census of 2011.

At the second stage, the probability of the  $j$ -th SSU (village in rural areas and para in urban areas) within the  $i$ -th PSU being selected,  $p_{j(i)}$ , was:

$$p_{j(i)} = \frac{N_{j(i)}}{\sum_{j(i)} N_{j(i)}}$$

where

$N_{j(i)}$  = number of SSUs selected by simple random sampling (without replacement), and

$\sum_{j(i)} N_{j(i)}$  = total number of SSUs in the  $i$ -th PSU.

$N_{j(i)}=1$  for all PSUs in the sample.

The unconditional joint probability of selecting the  $i$ -th PSU and the  $j$ -th SSU from the  $i$ -th PSU is,

$$p_{ij} = p_i * p_{j(i)} = \left[ \frac{N_{PSU} * N_i}{\sum_i N_i} \right] * \left[ \frac{N_{j(i)}}{\sum_{j(i)} N_{j(i)}} \right]$$

At the third stage, the conditional probability of the  $h$ -th household from the  $j$ -th SSU in the  $i$ -th PSU being selected,  $p_{h(i(j))}$ , was:

$$p_{h(i(j))} = \frac{N_{h(i(j))}}{H_{i(j)}}$$

where

$N_{h(i(j))}$  = number of households selected by simple random sampling from the  $j$ -th SSU in the  $i$ -th PSU, and

$H_{i(j)}$  = total number of households in the  $j$ -th SSU in the  $i$ -th PSU as of the census of 2011.

Finally, the unconditional joint probability of selecting the  $h$ -th household from the  $j$ -th SSU in the  $i$ -th PSU into the sample was:

$$p_{hij} = p_{ij} * p_{h(i(j))}$$

Thus, the associated sampling design weight for a respondent household was:

$$w_{hij} = \frac{1}{p_{hij}} = \frac{1}{p_{ij} * p_{h(i(j))}}$$

The total sample of 10,000 households was allocated to a selected SSU in a selected PSU, given by  $N_{h(i(j))}$  above, according to the population proportion of the total number of households in a selected SSU in a selected PSU within each district in each division. Thus,

$$N_{h(i(j))} = 10,000 * \frac{N(Division)}{N(National)} * \frac{N(District)}{N(Division)} * \frac{N_i(PSU)}{\sum_i(PSU)} * \frac{N_j(SSU)}{\sum_{j(i)}(SSU)}$$

where

$N(National)$  = total number of households at the national level in the census of 2011,

$N(Division)$  = total number of households in each division in the census of 2011,

$N(District)$  = total number of households in each district in the census of 2011,

$N_i(PSU)$  = total number of households in a selected PSU in the census of 2011,

$\sum_i(PSU)$  = total number of households in all the selected PSUs in a district in the census of 2011,

$N_j(SSU)$  = total number of households in a selected SSU in the census of 2011,

$\sum_j(SSU)$  = total number of households in all the selected SSUs in a PSU in the census of 2011,

The ratio  $\frac{N_j(SSU)}{\sum_{j(i)}(SSU)} = 1$ , because only one SSU was selected per PSU.



## SURVEY TOOLS

**Household Disease Profile Questionnaire:** First, an in-depth survey named “Disease Profile” was carried out over 10,000 randomly selected households throughout Bangladesh to identify the selected tobacco-related illnesses. The respondents were screened initially with a questionnaire regarding specific symptoms related to the selected tobacco-related diseases, and tobacco-use status of the members within the respondent households. This questionnaire was developed by members of the study team, and it was finalized on the basis of pre-testing and opinions of experts (including a number of physicians) (see Appendix 1).

**Household Health Cost Questionnaire:** The household “Health Cost” questionnaire was administered to 998 households that were confirmed to have the selected tobacco-related diseases out of 10,000 disease-profile interviewed households. It collected extensive information on health-seeking behavior and a variety of costs of treatment incurred in last one year before the survey. More specifically, household expenditures on outpatient care included primary care, specialist consultations, health services provided in hospital emergency departments, outpatient surgeries, etc. Household expenditures on inpatient care included costs of treatment during hospital stays. Distinct sections in the questionnaire were devoted to collecting information only on morbidity, mortality, health insurance, purchase pattern and use of tobacco products, etc. (see Appendix 2). In addition, it obtained information on household characteristics, e.g. household yearly/monthly income-expenditure, assets, tobacco use by each member, occupation and the educational achievement of each member, etc. The draft questionnaires were reviewed by the technical advisors and pretested before they were finalized.

**Diagnosis of Diseases:** The Disease Profile questionnaire provided the scope for screening of those who were found to have tobacco-related illnesses. Only those who had valid documents (e.g., prescription from a qualified doctor (at least MBBS), hospital records) concerning any of the selected diseases, as checked by the survey enumerators, were considered diagnosed or confirmed cases, and subsequently they were surveyed with the Health Cost questionnaire. The in-depth medical questionnaire named “Disease Profile” in the first stage was originally designed to identify probable cases of tobacco-related diseases. Those detected as probable cases (per self-reported) but who did not have valid supporting documents were excluded from the survey.

## SURVEY MANAGEMENT AND QUALITY CONTROL

The primary data collection for this study through a nationwide household level survey involved efficient planning and management of the fieldwork including placement of field enumerators at their respective positions, movement from one survey location to another, provision of food and lodging facilities to the enumerators, supervision at different tiers, and coordination with the headquarters.

For eight divisions, 19 survey teams (16 for outside the Dhaka city and 3 for the Dhaka city) were formed. Each team consisted of two enumerators (both male and each at least a university graduate). Though 38 enumerators were employed throughout the survey,

the preparatory training was provided to a total of 58 prospective enumerators. All had to attend a comprehensive compulsory training session for two long official days before they were sent to the field. During the training session, the prospective enumerators were sent to the nearby clusters within the Dhaka city for one day to assess the respondents’ ability to understand the questionnaire in different situations. Finally, the enumerators were recruited on the basis of sincerity and aptitudes to fill out the questionnaires in varying circumstances, taking into consideration their participation in the training sessions and performance on the field day.

The trainers who were involved in developing the questionnaire conducted the training of the enumerators. Every question was clarified. Field-like condition was simulated in the classroom and mock interviews were conducted to make the questionnaire clear to the enumerators. After every mock interview, various challenges arose, and the trainers clarified every issue for every question. Many of the suggestions from the trainee enumerators to make the questionnaire clearer were also incorporated in the final printed version. One day field practice was organized in the urban area of Dhaka before the beginning of the actual survey.

For field administration, a temporary office was set up in Dhaka city (the Head Office was in the University of Dhaka, Arts Building; one other office was at the Bangladesh Cancer Society Headquarters, Mirpur, Dhaka). A number of trained personnel were involved in coordination of the field, in different capacities, some with personnel management responsibilities and some with data management duties. The designated field manager administered and coordinated the activities of enumerators through a hierarchy of supervisors.

Enumerators were expected to fill out all information sought in the household questionnaire, and they identified probable cases of tobacco-related illnesses. They also marked suspected cases (households that claimed to have at least one member who had any of the selected diseases but failed to show necessary documents or households that reported a number of symptoms of the diseases) and passed on the to the physician working in the Dhaka Office. The confirmation of these cases required expensive diagnostic tests which were beyond the purview of the timeline and budget of the study.

In the evening, each enumerator would produce a list of information that was lacking from the households surveyed. Each pair of enumerators would exchange their surveyed questionnaires to some other pair of enumerators for cross-examination and then send it to the Dhaka Office. Three people (each of them recent graduates from the Department of Economics, University of Dhaka) were appointed full time to check entry errors by the enumerators and logical flaws (if any) in the completed questionnaire. Each of them re-checked 10 questions from each pair of enumerators at the household level for consistency. One additional full day was allotted for the base work in each cluster to re-check the whole questionnaire and collect the missing information. If any information from the respondent household or an individual household member was incomplete or confusing, the three research team members would contact the households immediately to collect accurate and complete information.

## DATA MANAGEMENT

Before handing over the questionnaires for coding, each team checked the questionnaire again in the presence of the supervisor (student) working at the Head Office. Coders then worked on the questionnaire under the guidance of the data management supervisor and coordinator of the household survey. The data entry supervisor was present as the data were entered. A trained pool of data entry personnel did the work under one supervisor. The data entry supervisor and the investigators did consistency checks.

## DATA STORAGE

Data were preserved in secure locations, in secure computers. Using software packages (e.g. EXCEL, STATA and SPSS), descriptive analysis was carried out to guide data checks and cleaning. The identification codes were separated from the database for maintaining anonymity and privacy of the respondents and strict confidentiality of data.

## 2.2.2 Secondary Data

The prevalence rates of current, former and non-tobacco users came from the Global Adult Tobacco Survey Bangladesh 2009 (World Health Organization, Country Office for Bangladesh, 2009). Data on government expenditures and health care utilization rate on inpatient and outpatient care provided in public health care facilities came from the national health sector budget, available in the Ministry of Finance's Budget Brief and the national Health Bulletin 2017 published by the Management Information System of the Directorate General of Health Services, Ministry of Health and Family Welfare (Ministry of Health and Family Welfare, Government of Bangladesh, 2017). Average annual salary per employed person and the employment rate of working age individuals were drawn from the Labor Force Survey 2016-17 published by the Bangladesh Bureau of Statistics.

Supplementary national level data on cause-specific mortality, age-specific mortality rates attributable to tobacco, and probability of survival between successive age groups were obtained from Bangladesh Sample Vital Statistics 2016, Global Burden of Disease Study 2017 and WHO Life Table for Bangladesh. Data on annual tobacco tax revenue was obtained from the National Board of Revenue, Ministry of Finance.

## 2.3 Measures

### Study Population

Because the average age at initiation of daily smoking is below 20 and the health effects of tobacco use result from many years of exposure, studies evaluating the burden of tobacco use generally focus on adults 30 years and older. Exposure to secondhand smoke can, however, affect nonsmokers of any age, particularly children. The study population in the present case included adults 30 and older for estimating the health burden of tobacco use and children below age 15 for estimating the health burden of secondhand smoke exposure.

### Status of tobacco use

If adult household members age 15 and older responded that they currently smoked cigarette, biri and/or hukka, and/or used smokeless tobacco products such as jarda, gul and sadapata, they were identified as current tobacco users. Those who were not using any tobacco product at the time of the survey were asked about their past tobacco use and were identified as former tobacco users if they answered yes. Current and former tobacco users were identified as "ever" tobacco users in subsequent analysis. The rest of the individuals were identified as never tobacco users.

### Exposure to secondhand smoke

Nonsmokers, specifically children younger than 15 and pregnant women, living with current smokers in the same household where smoking was allowed indoors were identified as regularly exposed to secondhand smoke. Otherwise, they were considered as not exposed to secondhand smoke. This criterion excluded occasional exposure of children and pregnant women to secondhand smoke in public or workplaces, which can be further restricted by smoke-free laws. However, smoke-free laws do not protect children or pregnant women who share common airspace with smokers residing in the same household. The health consequences of such exposure go unaccounted for in the existing literature. The present study aimed to measure the health impact of this unrestricted exposure to indoor secondhand smoke on children and pregnant women in particular.

### Prevalence of Tobacco-related Diseases

The population-level prevalence of tobacco-related diseases was estimated using the weighted sample proportion of individuals who reported currently suffering from at least one tobacco-related disease. The prevalence was estimated by:

Age groups: 30 years and older, below 15 years

Gender: Male, female

Disease categories:

- Adults 30 and older: Ischemic heart disease, stroke, COPD, pulmonary tuberculosis, lung cancer, laryngeal cancer, and oral cancer
- Children younger than 15: Autism, asthma and lower respiratory infection for children younger than 15, in addition to the seven diseases mentioned above for adults 30 and older
- Newborn: Low birth weight, sudden infant death syndrome (SIDS)
- Tobacco use status among adults: Ever tobacco user, never tobacco user
- Exposure to secondhand smoke: Residents in households with smokers, residents in households without smokers

The prevalence of disease in each population sub-group was multiplied with corresponding population size to obtain the total number of patients suffering from these diseases at the national level.

## Mortality from Tobacco-related Diseases

Households reported on the premature deaths of family members retrospectively for the five years before the survey. The causes of death were classified as natural death due to aging, accident, injuries and illnesses. The tobacco-use status of the deceased was also reported to help identify the mortality rates among ever and never tobacco users. The mortality of children and nonsmoking adults was differentiated by the status of households with smokers and without smokers, to identify deaths attributable to secondhand smoke exposure. The mortality rates obtained from the health cost survey were calibrated against the corresponding national level death rates reported in the latest issue of Bangladesh Sample Vital Statistics 2016. The mortality rates, thus determined from this study, were applied to national population size of corresponding age groups to calculate the number of deaths attributable to tobacco-related diseases both from tobacco use and secondhand smoke exposure.

## Risk Ratio (RR)

Disease-specific RRs for tobacco use were estimated using the following ratio:

$$RR = \frac{\text{Prevalence of tobacco – related disease among ever tobacco users age } \geq 30}{\text{Prevalence of tobacco – related disease among never tobacco users age } \geq 30}$$

When RR is statistically significantly greater than 1, it indicates excess risk of morbidity associated with tobacco use, either current or former.

For estimating the excess risk of premature mortality from tobacco-related diseases, a separate RR was calculated as:

$$RR = \frac{\text{Mortality rate from tobacco – related disease among ever tobacco users age } \geq 30}{\text{Mortality rate from tobacco – related disease among never tobacco users age } \geq 30}$$

In addition, separate RRs were calculated for measuring the excess risk from secondhand smoke exposure based on disease prevalence and cause-specific mortality among children younger than 15 reported by sample households as below:

$$RR = \frac{\text{Prevalence of tobacco – related disease among children in smokers' households}}{\text{Prevalence of tobacco – related disease among children in nonsmokers' households}}$$

$$RR = \frac{\text{Mortality rate from tobacco – related disease among children in smokers' households}}{\text{Mortality rate from tobacco – related disease among children in nonsmokers' households}}$$

The RR for exposure to secondhand smoke among adult nonsmokers age 15 and older was found statistically not significant and hence this age group was not covered in subsequent analysis.

## Population-attributable Risk (PAR)

Based on the RRs measured from household survey data gathered in 2018 and the estimates of national prevalence of tobacco use and exposure to indoor secondhand smoke obtained from the Global Adult Tobacco Survey conducted in 2009, separate PARs were calculated for relative morbidity and mortality risks of tobacco use and exposure to secondhand smoke at the aggregate level using equation (1). We were thus able to maintain a nine-year lag to relate the health outcomes reported in 2018 to the rate of tobacco consumption observed in 2009. Gender- or age group-specific PARs were not used in subsequent analysis because of inadequate information on the breakdown of health care costs, morbidity and premature mortality by these population sub-groups.

## Private Health Expenditures

Private health expenditure for each of the tobacco-related diseases was collected from the health cost survey based on self-reported out-of-pocket health spending under three headings:

**1. Inpatient care:** Disease-specific average out-of-pocket inpatient health expenditure was obtained by multiplying the average out-of-pocket expenditure per day in inpatient hospitalization, average number of days per hospitalization and average number of hospitalizations per patient in last 12 months. The disease-specific average out-of-pocket inpatient health expenditure was multiplied with corresponding total number of patients at the national level who sought medical care and PAR to obtain the total out-of-pocket inpatient health expenditure for each disease. According to the survey, only 55% of the patients who identified themselves as suffering from one of the tobacco-related diseases sought medical care from health care facilities (private or public) in the last 12 months. The disease-specific total out-of-pocket inpatient health expenditures were added together to calculate the total tobacco-attributable inpatient private health care expenditure.

**2. Outpatient care:** Disease-specific average out-of-pocket outpatient health expenditure was found by multiplying the average out-of-pocket expenditure per outpatient visit and average number of outpatient visits per patient last 12 months. The disease-specific average out-of-pocket outpatient health expenditure was multiplied with corresponding total number of patients at the national level who sought medical care and PAR to obtain the total out-of-pocket outpatient health expenditure for each disease. The disease-specific total out-of-pocket outpatient health expenditures were added together to calculate the total tobacco-attributable outpatient private health care expenditure.

**3. Treatment received abroad:** The total tobacco-attributable cost of treatment received abroad was reached by multiplying average out-of-pocket expenditure per visit for treatment received abroad, average number of visits per patient for treatment received abroad in last 12 months, total number of patients at the national level who sought medical care and the PAR for all diseases combined. Because of the very small number of observations by disease categories, it was not feasible to obtain disease-specific cost for treatment received abroad.

The above three components constituted the total tobacco-attributable private health care expenditure (PRHCE). There were no reported health expenditures covered by health insurance, either private or public, in the household survey. More formally,

$$PRHE = [PRINP * INPDAY * NINP + PROUTP * NOUTP + TABR * NTABR] * POP * PAR \quad (2)$$

where

PRINP = average private expenditure per day in inpatient care;  
 INPDAY = average number of days per hospitalization;  
 NINP = average number of hospitalizations per person;  
 PROUTP = average private expenditure per outpatient visit;  
 NOUTP = average number of outpatient visits per person;  
 TABR = average private expenditure per visit for treatment received abroad;  
 NTABR = average number of visits per patient for treatment received abroad;  
 POP = total number of patients who sought medical care.

## Public Health Expenditures

The government health sector budget for the 2018-19 fiscal year was BDT 233.38 billion, which includes operating and development expenses for inpatient, outpatient and emergency medical services in public health care facilities (e.g., Upazila Health Complex, District Hospitals, Medical College Hospitals, Specialized Institutes). The total public health expenditure budget was allocated into inpatient and outpatient (including emergency) services based on the information provided by household survey respondents. The total public health expenditure for each type of service was then divided by the annual national health care utilization rate (number of attendees) of inpatient, outpatient and emergency services in public health care facilities to estimate the average public expenditure per day in inpatient services and average cost per patient in outpatient and emergency departments.

The average public expenditure per day in inpatient services was multiplied with the average number of hospitalizations per patient, average number of days per hospitalization, total number of patients suffering from tobacco-related diseases who sought medical care, and the PAR for all diseases combined (as obtained from household survey data) to find the aggregate tobacco-attributable public health expenditure for inpatient care. Similarly, the average public health expenditure per outpatient visit was multiplied with the average number of outpatient visits per patient, total number of patients suffering from tobacco-related diseases who sought medical care, and the PAR for all diseases combined (as obtained from household survey data) to obtain the aggregate tobacco-attributable public health expenditure for outpatient care. The sum of the public health

expenditure estimated for inpatient and outpatient care provided the total tobacco-attributable public health care expenditure (PUHCE). More formally,

$$PUHE = [PUINP * INPDAY * NINP + PUOUTP * NOUTP] * POP * PAR \quad (3)$$

where PUINP = average public expenditure per day in inpatient care;  
 PUOUTP = average public expenditure per outpatient visit;  
 and the rest of the notations follow the interpretation in equation (2).

## Costs of Morbidity

The costs of morbidity (COSTMORB) attributable to tobacco use include the following four components that were estimated from household survey data:

### 1. Value of lost time of patients 30 and older attending health care services

The value of lost work days of employed patients who sought health care services was reached by adding the product of the average number of work days lost for attending health care services, average daily income per employed patient, proportion of patients employed, total number of patients getting health care in last 12 months, and PAR, together over all diseases.

The value of the lost time of non-employed patients for getting health care was calculated using the average number of days spent per non-employed patient for getting health care, average daily reservation wage of non-employed patients imputed using the average daily income of employed patients, proportion of patients not employed, total number of patients getting health care in last 12 months, and PAR, added together over all diseases.

### 2. Value of time of caregivers

The cost for caregivers for treatment received domestically was reached using the product of the average cost per patient for caregivers, the proportion of patients attended by caregivers when they received treatment in domestic health care facilities, total number of patients attending health care in last 12 months, and PAR, added together over all diseases.

The cost for caregivers for treatment received abroad was found using the product of the average cost per patient for caregivers, the proportion of patients attended by caregivers when they received treatment abroad, total number of patients attending health care in last 12 months, and PAR for all diseases combined. Because of the limited number of observations, this estimate was done at the aggregate level for all diseases together.

### 3. Expected market productivity loss of employed patients

Expected annual market productivity loss of employed patients due to morbidity was computed by multiplying the loss of expected annual income per employed patient due to morbidity by the total number of patients suffering from tobacco-related diseases and PAR for all diseases combined. The loss of expected annual income considers both the reduction in average annual income per employed patient and the reduction in employment probability of patients due to morbidity.

The average monthly salary per employed person reported in the national Labor Force Survey (LFS) 2016-17 was BDT 13,258, which was equivalent to average annual salary of BDT 159,096 in 2016 prices or BDT 178,155 in 2018 prices after adjustment for annual inflation. Let the annual average income of employed patients in the household survey be BDT X in 2018. If the national prevalence of the diseases is p and the annual average income per employed person among those without the disease is Y, the national annual average income is given by:

$$p * \text{BDT } X + (1-p) * \text{BDT } Y = \text{BDT } 178,155.$$

With p and X estimated from the household survey conducted for this study, we solved for Y.

In the same manner, we obtained the national employment rate of 0.65 among population aged 30 and older from the LFS 2016-17 and calculated the employment rate E among the patients of the same age group in the household survey. If the employment rate among the 30+ age group without the disease is Z, the national employment rate is reached by:

$$p * E + (1-p) * Z = 0.65$$

with p and E estimated from the health cost survey, we solved for Z.

The expected annual market productivity loss of employed patients due to morbidity was then calculated as the difference in the expected annual income between a patient and the expected annual income of a person if he/she did not have the disease, that is,  $Z * Y - E * X$ . This method closely resembles the case-control analysis where cases (participants with a particular health condition or health risk) are matched to controls (participants without the condition or risk) to measure health-related productivity loss and the analysis groups differ only by the presence of a particular health condition or risk (Mitchell & Bates, 2011).

### 4. Household productivity loss of non-employed patients

Annual household productivity loss of non-employed patients due to morbidity was found using the number of days ill in last 12 months, average daily household productivity of non-employed patients imputed by the average daily income reported by employed patients, proportion of non-employed patients, total number of patients at the national level and PAR by disease categories. These products were added across all disease categories to obtain the total annual household productivity loss from tobacco-attributable morbidity.

## Costs of Mortality

The economic cost of mortality (COSTMORT) due to tobacco-related illnesses involved estimation of income loss from premature mortality in the following stages:

1. The years of potential working life lost per death was determined for seven age groups in five-year intervals beginning at 30 and ending at the potential age of retirement at 64 (e.g., 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, and 60-64). For example, the potential working years lost to a person expiring at an age in the interval 30-34 was calculated as the number of years from the midpoint of the age group 32 to the endpoint of working age at 64, which is 32 years.
2. The number of tobacco-attributable deaths in each age group was determined by applying the proportion of tobacco-attributable deaths in the corresponding age group reported in the Global Burden of Disease Study 2017 to the total number of tobacco-attributable deaths determined from the health cost survey for this study. Due to limited number of observations on deaths reported in sample households, it was not possible to work out age-group specific death rates from the present survey. The age distribution of deaths from the Global Burden of Diseases Study was simulated for the present purpose.

3. The expected annual income of an employed person without a disease, as calculated in the Costs of Morbidity section described above, was imputed as the potential annual productivity of a prematurely deceased person. This expected annual income was assigned to each successive year, after adjustment for expected income growth at 6 percent annual rate (average annual growth rate of per capita GDP in Bangladesh) and discounting for future income stream at 3 percent annual rate, in the potential work life lost to that person. In contrast to the existing method of assigning economic value to only the potentially employed individuals, we assigned economic value to the working age lost to all individuals regardless of their potential employment status.

4. The sum of the discounted annual income over the potential working life years lost provided the present value of foregone lifetime income for each age group, which was then weighted by the age-specific probability of survival from one to the next age group obtained from the WHO Life Table for Bangladesh.

5. Finally, the age-specific present value of foregone lifetime income per person was multiplied by the total number of tobacco-attributable deaths in the corresponding age group to obtain the aggregate economic cost of premature mortality. Thus,

$$COSTMORT = \sum_a^{max a} [SURV(m)] [Y * (1 + g)^{m-a} / (1 + V)^{m-a}] \quad (4)$$

where SURV(m) is the probability that a person would survive to age m, max a is the maximum age group, Y is the average annual income of an individual without a disease mentioned in the Cost of Morbidity measure above, g is the growth rate of per capita income, V is the discount rate, and a is the age at death.

## Costs of Exposure to Secondhand Smoke

As the excess risk of disease prevalence from secondhand smoke exposure was statistically significant for the age group below 15, the health expenditures and indirect morbidity costs attributable to secondhand smoke exposure were estimated for children only. The private and public health expenditures for treating the secondhand smoke exposure caused illnesses among children were measured following the same method described above. Since children are below the working age, there is no estimate of current productivity loss due to morbidity. The cost of morbidity in this case includes only the costs incurred for caregiving.

The excess risk of death from secondhand smoke exposure was measured using the reported deaths among nonsmokers of all ages who were living in smoker's households compared with the reported deaths in the corresponding group who were living in nonsmokers' households. Thus, the cost of mortality was measured for all age groups. For premature deaths among children due to exposure to secondhand smoke, the full potential working life (assumed to begin at age 22, the midpoint of age group 20-24, and end at age 64) was considered lost and was accounted for in the same process as for adults. The combined economic cost from tobacco use and

exposure to secondhand smoke was finally given by:

$$TOTALCOST = PRHE + PUHE + COSTMORB + COSTMORT \quad (5)$$

SECTION 3

# FINDINGS

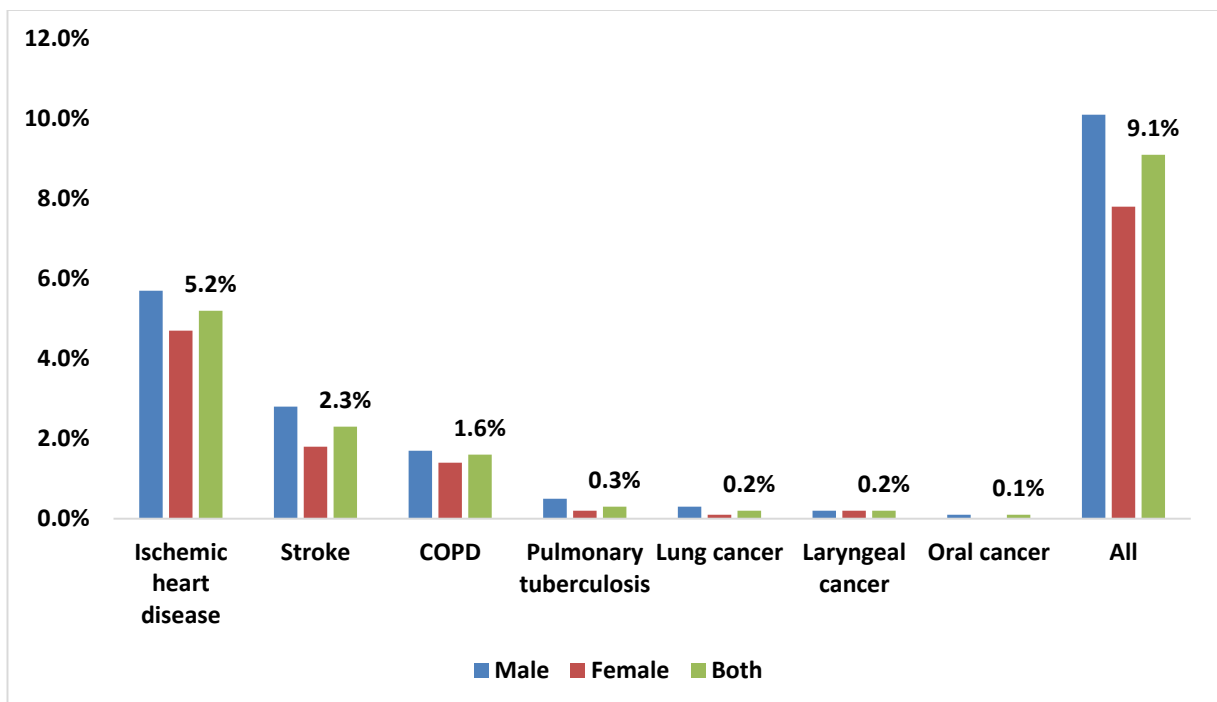
# 3.1 PREVALENCE OF TOBACCO-RELATED DISEASES

The overall prevalence of tobacco-related diseases stood at 9.1 percent (10.1 percent among males and 7.8 percent among females) for adults aged 30 years and older (Figure 3.1.1). The disease prevalence was generally higher among males than among females for all tobacco-related diseases, except laryngeal cancer for which the prevalence was the same (0.2 percent) across gender. Ischemic heart disease (IHD) was found to be the most prevalent disease

5.2 percent), followed by stroke (2.3 percent), chronic obstructive pulmonary disease (COPD) (1.6 percent), pulmonary tuberculosis (0.3 percent), lung cancer (0.2 percent), laryngeal cancer (0.2 percent) and oral cancer (0.1 percent), as shown in Figure 3.1.1. The prevalence of the three types of cancer combined (lung, laryngeal and oral cancers) was 0.7 percent overall (0.8 percent among males and 0.4 percent among females).

FIG 3.1.1 PREVALENCE OF TOBACCO-RELATED DISEASES AMONG

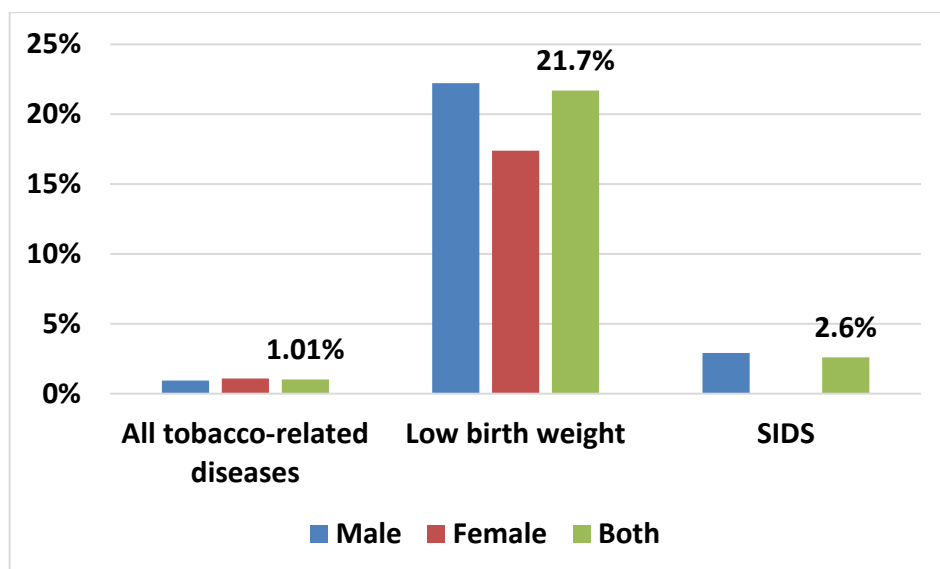
**Figure 3.1.1**  
**Prevalence of tobacco-related diseases among adults aged 30 and older**



Note: The prevalence of disease is weighted based on multistage probability sample design.



**Figure 3.1.2**  
**Prevalence of tobacco-related diseases among children younger than 15**



Note: The prevalence of disease is weighted based on multistage probability sample design.

Tobacco-related diseases and other secondhand smoke exposure induced diseases such as autism, asthma and lower respiratory infection were prevalent among 1.01 percent of children (0.94 percent among males and 1.09 percent among females) younger than 15 (Figure 3.1.2). Among 424 live births recorded in the survey for the last 12 months before the survey, 21.7 percent were reported to be low birth weight (22.2 percent among male live births and 17.4 percent among female live births) and 2.6 percent suffered from Sudden Infant Death Syndrome (SIDS) (2.9 percent among male infants and none among female infants).

The rate of SIDS is a close approximation to the national level infant mortality rate (deaths before less than one year of age) at 28 per 1,000 live births, including neo-natal mortality rate (deaths before less than one month of age) at 19 per 1,000 live births and post-neo-natal mortality rate (deaths between one month and 11 months) at 9 per 1,000 live births in 2016 (Bangladesh Bureau of Statistics, 2017).

**FIG 3.1.2 Prevalence of tobacco-related diseases among children younger than 15**

## 3.2 PREVALENCE OF TOBACCO USE (ADULTS AGED 30 AND OLDER)

Among adults 30 and older, 20.5 percent were current smokers (using cigarette, biri, hukkah, etc.) and 4.1 percent were former smokers; 25.3 percent were current smokeless tobacco users (using zarda, sadapata, gul, etc.) and 0.7 percent were former smokeless tobacco users (Table 3.2.1). Overall, 41.5 percent of adults 30 and older, with more than half of men (51.4 percent) and nearly a third of women (30.3%), were found to be current users of any form of tobacco.

Excluding respondents who were former smokers but currently using smokeless tobacco or former smokeless tobacco users but currently smoking, the prevalence of former use of any form of tobacco was 2.3 percent (3.6 percent among men and 0.8 percent among women). The rates of current and former use of any form of tobacco are thus mutually exclusive. Including current and former users of any form of tobacco, 43.8 percent adults 30 and older were identified as ever tobacco users.

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Smoking was predominant among men (37.8 percent) and very rare among women (0.9 percent). Unlike smoking, prevalence of smokeless tobacco use was higher among women (29.6 percent) than among men (21.5 percent). It should be noted that current use of smokeless tobacco was higher and former use of smokeless tobacco was much lower than the corresponding rates of smoking. The extremely low rate of former smokeless tobacco use (0.8 percent among men, 0.6 percent among women and 0.7 percent among both groups) suggests that cessation is much less common among smokeless tobacco users than smokers (as reflected in 4.1 percent former smoking rate). **TABLE 3.2.1 Prevalence of tobacco use among adults 30 and older**

**Table 3.2.1**

Prevalence of tobacco use among adults 30 and older

Tobacco use status	Male	Female	Both
<b>Current use</b>			
Smoking	37.8%	0.9%	20.5%
Smokeless tobacco use	21.5%	29.6%	25.3%
Any form of tobacco use	51.4%	30.3%	41.5%
<b>Former use</b>			
Smoking	6.3%	1.6%	4.1%
Smokeless tobacco use	0.8%	0.6%	0.7%
Any form of tobacco use	3.6%	0.8%	2.3%

Note: The prevalence of tobacco use is weighted based on multistage probability sample design.

The breakdown of current tobacco use by tobacco product categories in Table 3.2.2 shows that the majority smoke cigarettes (16.6 percent out of 20.5 percent) including a small fraction smoking both cigarette and biri (1.6 percent). Biri smokers constitute a quarter of all smokers (5.1 percent out of 20.5 percent). Among tobacco users of any form, the largest proportion use exclusively smokeless tobacco (21.0 percent), followed by exclusively smoked tobacco (e.g., cigarette, biri, hukkah, others) (16.2 percent) and dual use of smoked and smokeless tobacco (4.3 percent).

**TABLE 3.2.2 Prevalence of current tobacco use by product type among adults 30 and older**

**Table 3.2.2**

Prevalence of current tobacco use by product type among adults 30 and older

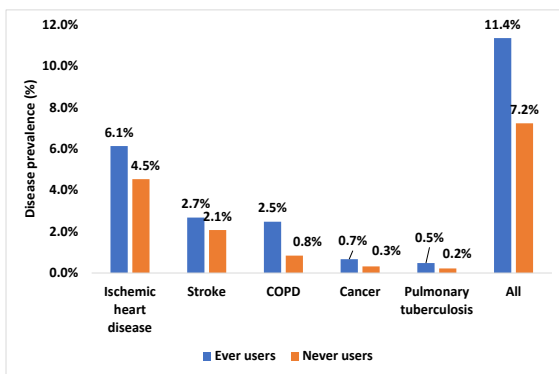
Tobacco product	Male	Female	Both
<b>Smoked</b>	<b>37.8%</b>	<b>0.9%</b>	<b>20.5%</b>
Cigarette	30.4%	0.7%	16.6%
Biri	9.5%	0.2%	5.1%
Both cigarette and biri	3.0%	0.0%	1.6%
Hukkah, other forms	0.5%	0.0%	0.2%
<b>Smokeless</b>	<b>21.5%</b>	<b>29.6%</b>	<b>25.3%</b>
Exclusively smoked	29.9%	0.7%	16.2%
Exclusively smokeless	13.6%	29.4%	21.0%
Dual (smoked and smokeless)	7.9%	0.2%	4.3%
<b>Any form of tobacco</b>	<b>51.4%</b>	<b>30.3%</b>	<b>41.5%</b>

Note: The prevalence of tobacco use is weighted based on multistage probability sample design.

### 3.3 EXCESS RISK OF TOBACCO-RELATED DISEASES ATTRIBUTABLE TO TOBACCO USE AND HOUSEHOLD EXPOSURE TO SECONDHAND SMOKE

The prevalence of tobacco-related diseases is generally significantly larger among ever tobacco users (both current and former) than among never tobacco users of age 30 and older, as shown by disease categories in Figure 3.3.1. Because of the very small percentage of cancer patients for each of lung, laryngeal and oral cancer, the combined statistics for the three types of cancers are presented here. The overall prevalence of tobacco-related diseases is 11.4 percent among ever tobacco users and 7.2 percent among never tobacco users. The fact that ever tobacco users demonstrated 4.2 percentage points greater prevalence of tobacco-related diseases than never tobacco users indicates that tobacco use significantly increases the risk of these diseases at the population level. **FIG 3.3.1 Prevalence of tobacco-related diseases by tobacco use status of adults 30 and older**

**Figure 3.3.1**  
Prevalence of tobacco-related diseases by tobacco use status of adults 30 and older



Note: The prevalence of disease is weighted based on multistage probability sample design.

Table 3.3.1 exhibits the disease-specific and overall risk ratios (RR) of tobacco-related diseases for adults of age 30 and older. The RR of 1.35 for ischemic heart disease means that patients who use tobacco products have a 35 percent greater likelihood of developing IHD than those who never used any tobacco product. The excess risk caused by tobacco use is greatest for COPD with an RR of 2.95. This means that tobacco users have 195 percent greater chance of having COPD. Overall, RR value being 1.57 means that tobacco users have 57 percent higher chance of developing any of these seven diseases than never users. **TABLE 3.3.1 Risk Ratio (RR) and Population Attributable Risk (PAR) due to tobacco use among adults 30 and older**

**Table 3.3.1**  
Risk Ratio (RR) and Population Attributable Risk (PAR) due to tobacco use among adults 30 and older

Diseases	Risk Ratio (RR)	Population Attributable Risk (PAR)
Ischemic heart disease	1.35	0.15
Stroke	1.28	0.13
Chronic obstructive pulmonary disease (COPD)	2.95	0.50
Pulmonary tuberculosis	2.14	0.37
Cancer (lung, laryngeal, oral)	2.09	0.36
All	1.57	0.22

Note: The prevalence of disease is weighted based on multistage probability sample design.

The highest Population Attributable Risk (PAR) was highest for COPD at 0.50 (Table 3.3.1). It means that 50 percent of the prevalence of COPD in the population occurred because of tobacco use. Overall, tobacco use caused 22 percent of all cases of the tobacco-related seven diseases considered in the present study.

Our estimates further showed that 48.7% children below age 15 in Bangladesh were exposed to secondhand smoke at home because of one or more smokers residing in the same household. We found that exposure of children to secondhand smoke at home significantly increased the risk of tobacco-related diseases, particularly asthma. As shown in Table 3.3.2, the prevalence of all tobacco-related diseases combined was 1.14 percent among children younger than

15 living in smokers' households, whereas the prevalence was 0.85 percent among children living in households without smokers. All diseases were combined due to very low prevalence by each disease category. **TABLE 3.3.2 RISK RATIO (RR) AND POPULATION ATTRIBUTABLE RISK (PAR) DUE TO HOUSEHOLD EXPOSURE TO SECONDHAND SMOKE AMONG CHILDREN YOUNGER THAN 15**

Table 3.3.2

Risk Ratio (RR) and Population Attributable Risk (PAR) due to household exposure to secondhand smoke among children younger than 15

	Disease prevalence		Risk Ratio (RR)	Population Attributable Risk (PAR)
	Households with smoker (%)	Households without smoker (%)		
Boys	1.18%	0.71%	1.66	0.24
Girls	1.10%	1.00%	1.10	0.05
Both	1.14%	0.85%	1.34	0.14

Note: The prevalence of disease is weighted based on multistage probability sample design.

An RR of 1.34 in Table 3.3.2 for boys and girls combined indicates that exposure to secondhand smoke at home increased the risk of diseases by 34 percent among children below age 15. The excess risk was found much greater among boys (66 percent) than among girls (10 percent). The combined population-attributable risk factor of 0.14 indicates that 14 percent of the prevalence of smoking-related diseases among children was directly linked to secondhand smoke exposure at home.

We did not find any evidence of excess risk of low birth weight or SIDS among the newborn due to household exposure of women in pregnancy to secondhand smoke. These health outcomes were, therefore, excluded from the calculation of RR, PAR and in turn from the calculations of associated economic costs.

## 3.4 NATIONAL LEVEL ESTIMATES OF THE NUMBER OF PATIENTS SUFFERING FROM TOBACCO-ATTRIBUTABLE ILLNESSES

Based on the prevalence of tobacco-related diseases as mentioned in Section 3.1 above, this study estimated that nationally more than 7 million adults 30 and older and more than 435,000 children younger than 15 were suffering from tobacco-related diseases (Table 3.4.1). The total number of patients with disease attributable to tobacco use and exposure to secondhand smoke was obtained by multiplying the total number of patients at the population level

by the PAR, which is 0.22 for tobacco use and 0.14 for exposure to secondhand smoke obtained in Section 3.3. Thus, we found that in 2018 approximately 1.6 million patients, including 1.5 million adults 30 and older and more than 60,000 children younger than 15, were suffering from diseases that can be attributed to tobacco use and secondhand smoke exposure at home. **TABLE 3.4.1 Total number of patients suffering from tobacco-related illnesses in Bangladesh, 2018.**

**Table 3.4.1**  
Total number of patients suffering from tobacco-related illnesses in Bangladesh, 2018.

Cause	Age group	Total population, 2017 (million)	Disease prevalence	Total number of patients	Population Attributable Risk	Tobacco-attributable total number of patients
Tobacco use of any form	30 and older	70.1	9.1%	7,017,546	0.22	1,537,103
Exposure to secondhand smoke	Below 15	43.8	1.0%	435,263	0.14	61,552

The disease-specific estimates of the number of adult patients are reported in Table 3.4.2. It shows that ischemic heart disease, stroke and COPD account for 85% and cancers (lung, laryngeal and oral) account for 9% of all the cases of tobacco-attributable diseases. Due to the small number of diseases-specific observations of secondhand smoke exposure status among children younger than 15, disease-specific PAR and number of patients suffering from tobacco-attributable diseases could not be obtained. Hence, aggregate level estimate of the number of children suffering from these diseases is reported in Table 3.4.1 above. **TABLE 3.4.2 Total number of patients suffering from tobacco-related illnesses by disease category for age group 30 and older in Bangladesh, 2018**

**Table 3.4.2**  
Total number of patients suffering from tobacco-related illnesses by disease category for age group 30 and older in Bangladesh, 2018

Diseases	Total number of patients	Number of patients attributable to tobacco use
Ischemic heart disease	3,675,087	558,836
Stroke	1,643,969	208,193
COPD	1,096,346	546,609
Pulmonary tuberculosis	234,941	86,319
Lung cancer	157,669	65,613
Laryngeal cancer	142,565	30,016
Oral cancer	66,969	41,517
<b>All</b>	<b>7,017,546</b>	<b>1,537,103</b>

## 3.5 NATIONAL LEVEL ESTIMATES OF TOBACCO-ATTRIBUTABLE MORTALITY

Based on deaths by causes, age group and the deceased's tobacco use for the five years before the survey, the death rate from tobacco-related diseases was estimated at 3.9 per 1,000 among the population 30 and older. Applying the age-specific death rates reported in the Bangladesh Sample Vital Statistics 2016 to the total population 30 and older, the average death rate for the age group 30 years and older turns out to be 10.9 per 1,000. Thus, more than a third (3.9 out of 10.9) deaths from all causes among adults 30 and older appear to have been due to tobacco-related illnesses.

The risk-ratio of death from tobacco-related diseases was 2.15 which means that tobacco users were 2.15 times more likely to die from tobacco-related diseases than non-tobacco users. The PAR corresponding to the mortality attributable to tobacco use was calculated at 0.37. This finding is close to higher end of the previous estimates of PAR at 0.30 for all vascular diseases, 0.38 for all cancers, 0.24 for respiratory diseases except tuberculosis, and 0.35 for pulmonary tuberculosis for men 25 to 69 years old as of 2010 (Alam, et al., 2013). Because of the limited number of cause-specific deaths reported in the survey, it was not feasible to obtain disease-specific death rates and PARs in this study.

Applying the death rate of 3.9 per 1,000 to the total population 30 and older, the annual total number of deaths from tobacco-related diseases among this age group was estimated at 272,933. Multiplying this total number of deaths by PAR of 0.37, the annual tobacco-attributable death among age group 30 and older was estimated at 100,961.

Based on nonsmoker deaths by causes and household members' smoking status for the 5 years before the survey, the death rate from tobacco-related diseases among nonsmokers was estimated at 0.8 per 1,000. The risk ratio of death from tobacco-related diseases among nonsmokers was 1.68, which means that nonsmokers living in smokers' households and hence exposed to secondhand smoke in the household were 1.68 times more likely to die from tobacco-related diseases than the nonsmokers who were not exposed to secondhand smoke in the household. The PAR corresponding to the mortality attributable to secondhand smoke exposure was calculated at 0.24.

Applying the death rate of 0.8 per 1,000 to the estimated total population of nonsmokers of all ages (121,526,465), the annual total number of deaths from tobacco-related diseases among nonsmokers was estimated at 102,037. Multiplying this total number of deaths by PAR of 0.24, the annual number of deaths attributable to secondhand smoke exposure was estimated at 24,757.

Note that in estimating the size of the nonsmoking population size, the smoking rate for adults 15 and older was applied across all age groups in the population. This is likely to produce an underestimate of the nonsmoking population size because the official estimate of the smoking rate among youth 13-15 is 6.9 percent in 2013 (World Health Organization, Regional Office for South-East Asia, 2015), which is far below the adult smoking rate of 23% recorded in 2009. Besides, the smoking rate among children below 13 is unknown or close to zero. Considering zero smoking rate among age group younger than 10 and 6.9 percent smoking rate among age group 10-14, the size of nonsmoking population would be increased to 130,564,510, increasing the estimated number of deaths from tobacco-related diseases among nonsmokers to 109,626 and the annual number of deaths attributable to secondhand smoke exposure to 26,598.

Adding the conservative estimate of 24,757 deaths attributable to secondhand smoke exposure to the estimated 100,961 deaths attributable to tobacco use, the total number of tobacco-attributable deaths was estimated at 125,718, accounting for 13.5 percent of all-cause deaths as of 2018. This estimate is somewhat larger than the estimate of 113,670 tobacco-attributable deaths in 2017, including 90,773 deaths due to tobacco use and 22,898 deaths due to secondhand smoke exposure, provided in the Global Burden of Disease Study 2017 results (Global Burden of Disease, Injuries, and Risk Factors Study, 2017).

## 3.6 DIRECT COSTS OF TOBACCO-ATTRIBUTABLE ILLNESSES

### 3.6.1 Private health expenditures

#### Inpatient care in domestic health care facilities

For patients 30 and older, the average out-of-pocket expenditure per day in inpatient care from domestic health care providers was BDT 8,238; the average length of hospital stay was more than 9.32 days per hospitalization, and the average number of hospitalizations per patient was 0.50 in the last one year before the survey. The disease-specific average out-of-patient expenditure per day in inpatient care, the average number of days per hospitalization and the average

number of hospital episodes per patient are reported in Table 3.6.1. The product of these averages provides the average out-of-pocket expenditure for inpatient care per patient. The average out-of-pocket expenditure for inpatient care per patient multiplied with the total number of patients who sought medical care in the last 12 months before the survey provides the total out-of-pocket expenditure for inpatient care. The disease-specific total expenditures are multiplied with corresponding PARs to obtain the disease-specific tobacco-attributable out-of-pocket expenditure for inpatient care, which add up to the total tobacco-attributable out-of-pocket health expenditure for inpatient care at BDT 26.7 billion. **TABLE 3.6.1 Tobacco-attributable out-of-pocket health expenditure for inpatient care for patients 30 and older**

**Table 3.6.1**

Tobacco-attributable out-of-pocket health expenditure for inpatient care for patients 30 and older

Disease	Average out-of-patient expenditure per day in inpatient care (BDT)	Average number of days per hospitalization	Average number of hospital episodes per patient	Total number of patients who sought medical care	PAR	Tobacco-attributable out-of-pocket expenditure for inpatient care (Billion BDT)
Ischemic heart disease	7,289	10.18	0.47	2,023,670	0.15	10.7
Stroke	9,325	8.69	0.65	905,244	0.13	6.1
COPD	3,972	6.36	0.24	603,698	0.50	1.8
Pulmonary tuberculosis	6,060	10.10	0.29	129,369	0.37	0.8
Lung cancer	16,596	13.15	0.59	86,820	0.42	4.7
Laryngeal cancer	9,952	6.14	0.80	78,503	0.21	0.8
Oral cancer	9,266	12.00	0.71	36,876	0.62	1.8
<b>All</b>	<b>8,238</b>	<b>9.32</b>	<b>0.50</b>	<b>3,864,180</b>	<b>0.22</b>	<b>26.7</b>

Note: The total number of patients who sought medical care in last 12 months for each disease is 55% of the total number of patients estimated in Table 3.4.2 above.

For the patients younger than 15, the average out-of-pocket expenditure per day in inpatient care from domestic health care providers was BDT 12,570; the average length of hospital stay was 6.40 days per hospitalization, and the average number of hospitalizations per patient was 0.34 in the last one year before the survey. The disease-specific averages could not be estimated for this age group because of lack of enough observations. Multiplying these averages with the total number of patients of this age group who sought medical care (239,675 children, which is 55 percent of 435,263 as reported in Table 3.4.1) in the last 12 months before the survey and the PAR (0.14) provides the total out-of-pocket health expenditure

## Outpatient care in domestic health care facilities

For patients 30 and older, the average out-of-patient expenditure per visit for outpatient care received from domestic health care providers was estimated at BDT 9,358 and the average number of visits for outpatient care per patient was 4. The disease-specific average out-of-patient expenditure per visit and the average number of visits per patient for outpatient care are reported in Table 3.6.2. The product of these averages provides the average out-of-pocket expenditure for

outpatient care per patient. The average out-of-pocket expenditure for outpatient care per patient multiplied with the total number of patients who sought medical care in the last 12 months before the survey provides the total out-of-pocket expenditure for outpatient care. The disease-specific total expenditures are multiplied with corresponding PARs to obtain the disease-specific tobacco-attributable out-of-pocket expenditure, which add up to the total tobacco-attributable out-of-pocket health expenditure for outpatient care at BDT 30.7 billion. **TABLE 3.6.2 Tobacco-attributable out-of-pocket health expenditure for outpatient care for patients 30 and older.**

Disease	Average out-of-patient expenditure per visit in outpatient care (BDT)	Average number of visits for outpatient care per patient	Total number of patients who sought medical care	PAR	Tobacco-attributable out-of-pocket expenditure for outpatient care (Billion BDT)
Ischemic heart disease	8,457	4.81	2,023,670	0.15	12.5
Stroke	11,190	3.11	905,244	0.13	4.0
COPD	7,433	3.07	603,698	0.50	6.9
Pulmonary tuberculosis	3,069	3.73	129,369	0.37	0.5
Lung cancer	23,890	2.77	86,820	0.42	2.4
Laryngeal cancer	15,640	13.79	78,503	0.21	3.6
Oral cancer	11,801	3.06	36,876	0.62	0.8
<b>All</b>	<b>9,358</b>	<b>4.01</b>	<b>3,864,180</b>	<b>0.22</b>	<b>30.7</b>

Note: The total number of patients who sought medical care in last 12 months for each disease is 55% of the total number of patients estimated in Table 3.4.2 above.

**Table 3.6.2**

Tobacco-attributable out-of-pocket health expenditure for outpatient care for patients 30 and older

For patients younger than 15, the average out-of-patient expenditure per visit for outpatient care received from domestic health care providers was estimated at BDT 4,567 and the average number of visits for outpatient care per patient was 3.86. The disease-specific averages could not be estimated due to lack of observations. The product of these averages with the total number of patients who sought medical care (239,675 children, which is 55 percent of 435,263 as reported in Table 3.4.1) in the last 12 months before the survey and the PAR (0.14) provides the total out-of-pocket health expenditure for outpatient care attributable to secondhand smoke exposure at BDT 0.6 billion.



## Treatment received abroad

For the patients 30 and older, the average out-of-pocket expenditure per visit for treatment received abroad was estimated at BDT 87,703, which includes foreign travel, lodging, food and other daily expenses along with the costs of treatment. The average number of visits per patient in last 12 months was 0.06. Disease-specific averages could not be estimated because of insufficient number or lack of observations on disease-specific cases receiving treatment abroad. Multiplying the average out-of-pocket expenditure per visit with the average number of visits per patient for the treatment received abroad, the number of patients (3,864,180) who sought medical care in last 12 months and the overall PAR (0.22), the total tobacco-attributable out-of-pocket health expenditure for treatment received abroad was estimated at BDT 4.6 billion. No cases of treatment received abroad were reported for the patients younger than 15.

The sum of the above three components of out-of-pocket health expenditures incurred for inpatient and outpatient care from domestic health care providers and for the treatment received abroad provided the national level total private health expenditure at BDT 63.5 billion—BDT 62.0 billion attributable to tobacco use and BDT 1.5 billion attributable to secondhand smoke exposure.

The study found that only 55 percent of the patients diagnosed with the tobacco-related diseases used health care services in past 12 months. Estimates of direct costs in terms of private health expenditures are conditional on this fact. Lack of access to health care services, insufficient household financial resources to afford adequate health care and absence of social insurance tend to keep about half of the patients from utilizing health care services. With increasing use of health care services, health care costs are expected to increase further. Had all patients used health care services, the total private health care expenditure would have nearly doubled to BDT 115.5 billion.

## 3.6.2 PUBLIC HEALTH EXPENDITURES

The revised budget for health sector covering the operating and development expenses allocated to the health services division and the medical education and family welfare division for the 2017-18 fiscal year was BDT 233 billion (Ministry of Finance, Finance Division, Government of Bangladesh, 2018-19). The national level use of public health care facilities in 2016 in terms of the number of attendees was 4,856,833 in inpatient care, 39,200,310 in outpatient care and 6,141,901 in emergency services (Ministry of Health and Family Welfare, Government of Bangladesh, 2017). The average length of stay in public hospitals including Upazila health complexes, district hospitals and medical college hospitals was 3.64 in 2016 (Ministry of Health and Family Welfare, Government of Bangladesh, 2017). The average length of hospital stays multiplied by the number of attended in inpatient care provided the total number of hospital days used by all patients at the national level at 17,678,872 days.

The breakdown of private health expenditures estimated from household survey data showed that inpatient care accounted for about a half of the total private health expenditures and the remaining half was incurred due to outpatient care (including

emergency services). In the absence of any breakdown of public health expenditure data by the type of health care services, it was assumed that the same distribution applied to the total public sector budget. Thus, half of the public sector budget apportioned for inpatient services was divided by the total number of hospital days to obtain the estimate of average cost per day in inpatient care at BDT 7,055. Similarly, the other half of the public sector budget was divided by the number of attendees in outpatient and emergency services to obtain the estimate of the average cost per patient at BDT 2,396.

The average public health care cost per hospital day and the average public health care cost per patient in outpatient and emergency services were then scaled up, using the health services utilization rate of the patients suffering from tobacco-related diseases, their total number who sought medical care and the overall PAR as estimated from the household survey data, to obtain the final estimate of the tobacco-attributable total public health expenditure at BDT 20.4 billion—BDT 20.0 billion attributable to tobacco use and BDT 0.4 billion attributable to secondhand smoke exposure. This estimate accounted for 8.8 percent of the total public health sector budget in 2018-19 fiscal year.

## 3.6.3 TOTAL HEALTH EXPENDITURE

Combining the private and public health expenditures, as estimated above, the total direct cost of tobacco-attributable illnesses amounted to BDT 83.9 billion (private expenditure of BDT 63.5 billion plus public expenditure of BDT 20.4 billion). A summary of the components of the direct costs are presented in Table 3.6.3 below.

**TABLE 3.6.3 Direct costs of tobacco-related illnesses in Bangladesh, 2018**

**Table 3.6.3**

Direct costs of tobacco-related illnesses in Bangladesh, 2018

	Tobacco use	Exposure to secondhand smoke
<b>Private health expenditures</b>	62.0	1.5
Domestic inpatient care	26.7	0.9
Domestic outpatient care	30.7	0.6
Treatment received abroad	4.6	-
<b>Public health expenditures</b>	20.0	0.4
Inpatient care	16.3	0.3
Outpatient care	3.7	0.1
<b>Total health expenditure</b>	82.0	1.9

# 3.7 INDIRECT COSTS OF TOBACCO-ATTRIBUTABLE ILLNESSES

## 3.7.1 Costs of morbidity

### 1. Value of time of patients 30 and older spent for attending health care services

The employment rate among patients 30 and older was 0.47 and the average daily income per employed patient was BDT 392.79. Those who were employed lost 7.91 working days on average for attending health care services in the last 12 months before the survey. The disease specific averages are provided in Table 3.7.1 below. The disease specific value of the loss of work days of the employed patients in the last column is given by the product of the average number of work days lost for attending health care services, average daily income per employed

patient, the proportion of patients employed, total number of patients attending health care in last 12 months, and corresponding PAR. These values added across all diseases provides the total tobacco-attributable cost due to loss of work days of employed patients for attending health care at BDT 1.09 billion. The value of loss of time of non-employed patients for attending health care services was estimated similarly at BDT 1.20 billion by imputing the average daily income of employed patients as their daily reservation income. The combined value of time of employed and non-employed patients spent for attending health care services was thus BDT 2.29 billion—BDT 1.09 billion for employed patients and BDT 1.20 billion for non-employed patients. **TABLE 3.7.1 Value of time of patients 30 and older for attending health care services**

**Table 3.7.1**

Value of time of patients 30 and older for attending health care services

Disease	Average number of days spent per patient for attending health care services	Average daily income per employed patient (BDT)	Proportion of patients employed	Total number of patients at the national level who sought medical care	PAR	Tobacco-attributable cost due to loss of days for attending health care services (billion BDT)	
						Employed patients	Non-employed patients
Ischemic heart disease	8.67	406.75	0.51	2,023,670	0.15	0.55	0.53
Stroke	9.73	399.93	0.40	905,244	0.13	0.18	0.27
COPD	4.02	348.08	0.52	603,698	0.50	0.22	0.20
Pulmonary tuberculosis	5.79	346.77	0.56	129,369	0.37	0.05	0.04
Lung cancer	10.33	459.06	0.41	86,820	0.42	0.07	0.10
Laryngeal cancer	3.60	476.71	0.36	78,503	0.21	0.01	0.02
Oral cancer	6.00	328.77	0.29	36,876	0.62	0.01	0.03
All	7.91	392.79	0.47	3,864,180	0.22	1.09	1.20

Note: The total number of patients who sought medical care in last 12 months for each disease is 55% of the total number of patients estimated in Table 3.4.2 above.

## 2. Value of caregivers' time

68 percent of patients 30 and older were attended by caregivers when they received treatment domestically in the last 12 months. On average, the payment for caregivers' time was BDT 4,367 per patient. The total cost of caregivers for domestically received treatment was estimated at BDT 2.43 billion. One percent of patients reported receiving caregivers' service during their treatment abroad with an average cost of BDT 41,042 per patient. The total cost of caregivers' time for treatment received abroad was estimated at BDT 0.37 billion.

The value of time spent for attending health care services attributable to secondhand smoke exposure for children younger than 15 included only the value of time of caregivers, which was BDT 4,824 per patient. This average cost per patient was multiplied by the proportion of patients attended by caregivers when they received treatment (0.13), the total number of patients younger than 15 at the national level who sought medical care (239,675) and corresponding PAR (0.14) to obtain the total value of time spent for attending health care services attributable to secondhand smoke exposure at BDT 0.02 billion.

The total value of caregivers' time spent was thus BDT 2.82 billion—BDT 2.43 billion for caregivers' time in domestic treatment of the patients 30 and older, BDT 0.37 for caregivers' time in treatment received abroad by the patients 30 and older, and BDT 0.02 billion for caregivers' time devoted to children younger than 15.

## 3. Expected market productivity loss of employed patients 30 and older

Given the disease prevalence of 9.1 percent and annual average income of employed patients 30 and older estimated from the household survey at BDT 143,368, and the annual national average income per employed person of BDT 178,155 (as obtained from the Labor Force Survey), the annual average income per employed person among those without the diseases was calculated at BDT 181,619. The shortfall of the annual average income between an employed person with the disease from that of an employed person without the disease was BDT 38,251 (BDT 181,619 – BDT 143,368), which represents the annual productivity loss per employed patient due to the morbidity caused by the disease.

Given the disease prevalence of 9.1 percent and employment rate of 0.47 among patients 30 and older estimated from the household survey, and the national employment rate of 0.65 among the population 30 and older (as obtained from the Labor Force Survey), the employment rate among the same age group without the diseases was estimated at 0.67. Thus, it turns out that the employment probability was lowered by 0.20 (0.67 – 0.47) among the patients due to their disease.

The expected annual market productivity loss of patients due to morbidity was calculated as the difference of the expected annual income of an adult 30 and older with the disease and from that of an adult of the same age group without the disease. Thus, the expected market productivity loss per patient was estimated as:  $0.67 * \text{BDT } 181,619 - 0.47 * \text{BDT } 143,368 = \text{BDT } 120,857 - \text{BDT } 67,676 = \text{BDT } 53,182$ , which is 44 percent of the potential expected annual income of BDT 120,857 of a person without the disease. This market productivity loss multiplied with the total number of patients at the national level (7,017,546) and PAR (0.22) provides an estimate of the total loss of market productivity due to tobacco-attributable morbidity at BDT 83.82 billion.

## 4. Household productivity loss of non-employed patients 30 and older

On average, patients reported to be ill for 12.68 days per month in last 12 months. The average daily income of employed patients imputed as the daily household productivity or daily reservation income of non-employed patients and multiplied by the number of days ill per month for 12 months provided the estimate of the annual household productivity loss per patient at BDT 59,787. The diseases specific estimates of annual household productivity loss per patient are presented in Table 3.7.2 below. The disease-specific household productivity loss per patient is scaled up using the total number of patients and PAR to obtain the national level estimate of household productivity loss and added across disease to obtain the total annual household productivity loss due to tobacco-attributable morbidity at BDT 44.02 billion.

**TABLE 3.7.2**  
**Household productivity loss of non-employed patients 30 and older**

**Table 3.7.2**  
Household productivity loss of non-employed patients 30 and older

Disease	Number of days ill per month	Annual household productivity loss per patient (BDT)	Proportion of non-employed patients	Total number of patients at the national level	PAR	Total household productivity loss due to tobacco attributable morbidity (billion BDT)
Ischemic heart disease	10.24	49,979	0.49	3,675,087	0.15	13.71
Stroke	16.68	80,073	0.60	1,643,969	0.13	10.06
COPD	10.53	43,981	0.48	1,096,346	0.50	11.65
Pulmonary tuberculosis	9.24	38,430	0.44	234,941	0.37	1.47
Lung cancer	19.33	106,501	0.59	157,669	0.42	4.11
Laryngeal cancer	18.40	105,258	0.64	142,565	0.21	2.03
Oral cancer	8.50	33,534	0.71	66,969	0.62	0.99
All	12.68	59,787	0.53	7,017,546	0.22	44.02

The total cost of tobacco-attributable morbidity is BDT 132.95 billion given by the sum of the following four sub-components mentioned above:

- Total value of time of patients spent for attending health care services: BDT 2.29 billion;
- Total value of caregivers' time: BDT 2.82 billion;
- Total expected loss of market productivity of employed patients: BDT 83.82 billion;
- Total loss of household productivity of non-employed patients: BDT 44.02 billion.

## 3.7.2 COST OF MORTALITY

Using the age-specific years of potential working age lost per death, number of tobacco-attributable deaths, expected annual productivity of an individual in the absence of a disease and the probability of survival from one age interval to the next, the total present value of foregone lifetime productivity from tobacco-attributable deaths was estimated at BDT 49.44 billion (Table 3.7.3). The number of tobacco-attributable deaths in the working age was extrapolated from the age-specific tobacco-attributable death rates in the Global Burden of Disease Study 2017. Thus, 39,505 deaths out of the estimated total of 100,961

deaths (as reported in Section 3.5 above) in the age group 30 and older attributable to tobacco use fell in the working age interval 30-64. In the absence of any estimate of age-specific annual productivity at the national level, the same level of productivity has been assumed for all age groups in the working age and adjusted for annual growth using the current 6% per capita GDP growth rate. **TABLE 3.7.3 Productivity loss due to premature mortality attributable to tobacco use for the age group 30 years and older**

**Table 3.7.3**

Productivity loss due to premature mortality attributable to tobacco use for the age group 30 and older

Age group (years)	Years of potential working age lost per death	Number of deaths attributable to tobacco use	Expected annual productivity of individuals without disease (BDT)	Probability of surviving between ages x and x+n	Present value of foregone lifetime productivity (billion BDT)
30-34	32	741	120,857	0.9935	4.24
35-39	27	1,101	120,857	0.9915	4.91
40-44	22	2,115	120,857	0.9881	7.10
45-49	17	4,116	120,857	0.9827	9.87
50-54	12	7,689	120,857	0.9681	12.05
55-69	7	9,499	120,857	0.9530	8.10
60-64	2	14,245	120,857	0.9077	3.17
Total		39,505			49.44

The total present value of foregone lifetime productivity from premature deaths attributable to secondhand smoke exposure was estimated at BDT 39.27 billion (Table 3.7.4). For the deaths up to age 22 (midpoint of age group 20-24), the full potential working life of 42 years (from 22 to 64) was considered lost for this estimation. Based on the extrapolation from the age-specific secondhand smoke attributable death rates in the Global Burden of Disease Study 2017, 9,637 deaths out of the estimated total of 24,757 deaths (as reported in Section 3.5 above) were considered to have lost

working life due secondhand smoke attributable premature mortality. As the age-specific present values of foregone lifetime productivity in Table 3.7.4 show, more than half of the total productivity loss on this account came from infant mortality in the first one year after birth and two-thirds of the total productivity loss was incurred due to premature deaths at ages below 15. **TABLE 3.7.4 Productivity loss due to premature mortality attributable to secondhand smoke exposure**

**Table 3.7.4**

Productivity loss due to premature mortality attributable to secondhand smoke exposure

Age group (years)	Years of potential working age lost per death	Number of deaths attributable to tobacco use	Expected annual productivity of individuals without disease (BDT)	Probability of surviving between ages x and x+n	Present value of foregone lifetime productivity (billion BDT)
<1	42	1,424	120,857	0.9725	21.06
1-4	42	281	120,857	0.9940	4.27
5-9	42	86	120,857	0.9975	0.01
10-14	42	33	120,857	0.9980	0.38
15-19	42	20	120,857	0.9960	0.22
20-24	42	14	120,857	0.9955	0.13
25-29	37	168	120,857	0.9950	1.28
30-34	32	259	120,857	0.9935	1.58
35-39	27	336	120,857	0.9915	1.60
40-44	22	627	120,857	0.9881	2.24
45-49	17	808	120,857	0.9827	2.05
50-54	12	1,490	120,857	0.9681	2.45
55-69	7	1,654	120,857	0.9530	1.45
60-64	2	2,438	120,857	0.9077	0.54
<b>Total</b>		<b>9,637</b>			<b>39.27</b>

## 3.8 COMPARISON OF THE ECONOMIC COSTS AND BENEFITS OF TOBACCO

Using the health cost approach, the annual total cost of tobacco in Bangladesh was estimated at BDT 305.6 billion in 2018 (\$3.6 billion)<sup>1</sup>, which was equivalent to 1.4 percent of the Gross Domestic Product (GDP) in 2017-18. Table 3.8.1 below summarizes the breakdown of this cost into the total direct cost of BDT 83.9 billion and the total indirect cost of BDT 221.7 billion. The indirect costs account for nearly three-fourths of the total cost, suggesting the enormous productivity loss (both in the market and at home) associated with tobacco-caused morbidity and mortality and consequent income loss to the households of tobacco users. While remaining invisible in national income accounting, these costs are incurred by the families of tobacco users suffering from tobacco-related deaths and diseases and in turn by the economy.

**TABLE 3.8.1 The costs (in billion BDT) of tobacco-attributable illnesses in Bangladesh, 2018**

**Table 3.8.1**

The costs (in billion BDT) of tobacco-attributable illnesses in Bangladesh, 2018

Components of the costs of tobacco-attributable illnesses	Tobacco use	Exposure to secondhand smoke	Total tobacco-attributable cost
<b>Direct cost</b>	82.0	1.9	83.9
Private health expenditure	62.0	1.5	63.5
Public health expenditure	20.0	0.4	20.4
<b>Indirect cost</b>	182.4	39.3	221.7
Cost of morbidity	132.9	0.0	132.9
Cost of mortality	49.4	39.3	88.7
<b>Total direct and indirect cost</b>	264.4	41.3	305.6

Note: Numbers may not add up exactly due to rounding of sub-components at the first decimal point.

The breakdown of direct costs in Table 3.8.1 further reveals that private health expenditures or out-of-pocket health care expenses of households for the treatment of diseases of tobacco using family members account for 76 percent of total direct cost (BDT 63.5 billion out of BDT 83.9 billion). It indicates that the bulk of the direct costs is borne by the tobacco users' households themselves. This burden of out-of-pocket health expenditure on tobacco users' households is higher than the national average share of out-of-pocket health expenditure in total health expenditure reported at 72 percent (World Bank, 2019). The World Bank statistics further show that nearly 14 percent of population spends more than 10 percent of household consumption or income on out-of-pocket health expenditure and 4.5 percent of the population are pushed below the poverty line by these expenditures in Bangladesh.

The public health expenditure component accounts for 24 percent of the total direct cost (BDT 20.4 billion out of BDT 83.9 billion), which is paid from taxpayers' money and is in turn borne by the society as a whole. This cost is significant—it

constitutes 8.9 percent of the revised budget for the health sector in 2018-19. Both the private and the public health expenditures represent massive drain on the nation's limited resources needed for health, education and all other necessities.

The health cost of exposure to secondhand smoke at home is estimated at BDT 41.3 billion (14 percent of total cost) which is largely driven by the cost of childhood mortality. It costs the economy at a much higher rate per death than the mortality among adults because of the longer span of remaining life and greater loss of potential productivity.

On top of the direct and indirect costs of BDT 305.65 billion that tobacco-attributable illnesses caused, households with tobacco users spent BDT 153.23 billion on tobacco products in 2016-17 which is BDT 162.37 in 2018 prices (Bangladesh Bureau of Statistics, 2018). The health costs and tobacco spending of households combined (BDT 305.65 billion + BDT 162.37 billion = BDT 468.02 billion) far exceeded the tax revenue (BDT 197.66 billion in 2016-17 or BDT 209.45 billion in 2018 prices) collected by the National Board of Revenue (NBR) of the Ministry of Finance from the tobacco sector in 2016-17 fiscal year.

One may argue that tax revenue constitutes a part of the contribution tobacco makes to the economy and that we need to look at the total contribution. In expenditure-based National Income Accounting, the total contribution of the tobacco sector to GDP would be reached by adding the household final consumption expenditure, private and public domestic investment and net export (export minus import). The data on private and public domestic investment (known as gross capital formation) in tobacco sector are not directly available in the National Income Accounts of Bangladesh. Using the ratio of gross capital formation to household final consumption expenditure at the national level (0.41), we can extrapolate the private and public domestic investment in tobacco sector as  $0.40 \times \text{BDT } 153.23 = \text{BDT } 62.61$  billion, where household final consumption expenditure is BDT 153.23. The export of unmanufactured tobacco, tobacco refuse, manufactured tobacco, tobacco substitute, cigarettes and other smoked tobacco products was BDT 3.90 billion and the import of unmanufactured tobacco refuse, manufactured tobacco, tobacco substitute, cigarettes and other smoked tobacco products, cigarette paper, and machinery for preparing or making tobacco products was BDT 3.53 billion in 2016-17. Thus, the net export was BDT 0.37 billion. Finally, household final consumption expenditure (BDT 153.23 billion), private and public domestic investment (BDT 62.61 billion) and net exports (BDT 0.37 billion) added up to the total contribution of tobacco sector to GDP at BDT 216.21 billion in 2016-17 prices, which is BDT 229.11 in 2018 prices. This economic contribution of tobacco sector is BDT 76.54 billion short of the estimated total cost of tobacco at BDT 305.65 billion. Tobacco thus appears to be causing net loss to the economy of Bangladesh.

<sup>1</sup> Bangladesh Bank official exchange rate in July 2018 was \$ 1 = BDT 83.75.



## 3.9 TOBACCO-ATTRIBUTABLE COSTS: 2004 AND 2018

Based on the study conducted in 2004 (World Health Organization, Regional Office for South-East Asia, 2007) and the current study conducted in 2018, the prevalence of tobacco-related illnesses among adults 30 and older remained at the same level, 9.0 percent in 2004 and 9.1 percent in 2018. In 2004, 2.9 million cases of tobacco-related illnesses were predicted to be found in the population, of which 1.2 million were attributed to tobacco use (with PAR 0.41). In 2018, more than 7 million cases were predicted to be found in the population, of which 1.5 million were attributed to tobacco use (with PAR 0.22). It is due to population growth that the number of cases with tobacco-related illnesses more than doubled between 2004 and 2018, while much lower PAR in 2018 almost leveled the number of tobacco-attributable cases at 1.2 million in 2004 and 1.5 million in 2018.

The estimate of mortality attributable to smoking and smokeless tobacco use increased from 57,583 cases in 2004 (with PAR 0.56) to 100,961 cases in 2018 (with PAR 0.37). The estimate of mortality attributable to secondhand smoke exposure is not available for 2004 from the WHO study. The Global Burden of Diseases Study estimated 69,513 deaths attributable to smoking and chewing tobacco and 17,816 deaths attributable to secondhand smoke exposure, totaling 87,329 deaths in 2004. The present study estimated 100,961 deaths attributable to smoking and smokeless tobacco use and 24,757 deaths attributable to secondhand smoke exposure, totaling 125,718 in 2018. Thus, it appears that the death toll of tobacco has been rising—38,389 more deaths are occurring every year as of 2018 compared with 2004 because of tobacco use and exposure to secondhand smoke.

The increase in the number of tobacco-attributable deaths concurrently with the declining trend in tobacco use prevalence observed in the recent past may seem counterintuitive. Because the harmful effects of tobacco use on health generally lag tobacco use initiation by more than a decade, we have to compare the number of tobacco-attributable deaths estimated in 2004 and 2018 among those who started using tobacco in the mid-1990s and the late-2000s. Earlier estimates of smoking prevalence among adults suggest that smoking prevalence remained relatively steady among men at around 40 percent, while declining somewhat among women, with the overall smoking prevalence hovering between 23-25 percent at the national level (Barkat, et al., 2012). Hence, the increase in the number of deaths from 2004 to 2018 likely reflects the continued increase in the number of tobacco users driven by population growth in the 1990s through the 2000s.

The economic implications of the significant increase in the cases of tobacco-attributable deaths and diseases are reflected in the increase in health care costs and loss of productivity as shown in Table 3.9.1. Between 2004 and 2018, total tobacco-attributable cost more than doubled (after adjustment for inflation) from BDT 135.8 billion in 2004 (expressed in 2018 constant prices) to BDT 305.6 billion in 2018. The breakdown of total cost by direct and indirect costs after adjustment for inflation indicates that productivity loss in a period of rapid economic growth accounted for most (83 percent) and increased health care spending (due to increased number of patients and health coverage) accounted for the remaining (17 percent) of the increased tobacco-attributable economic costs. **TABLE 3.9.1 Comparison of the tobacco-attributable cost estimates for Bangladesh between 2004 and 2018 (in billion BDT in 2018 prices)**

**Table 3.9.1** Comparison of the tobacco-attributable cost estimates for Bangladesh between 2004 and 2018 (in billion BDT in 2018 prices)

Components of the costs of tobacco-attributable illnesses	Tobacco use		Secondhand smoke exposure		Total tobacco-attributable cost	
	2004	2018	2004	2018	2004	2018
<b>Direct cost</b>	54.9	82.0		1.9		83.9
Private health expenditure	37.3	62.0		1.5		63.5
Public health expenditure	17.6	20.0		0.4		20.4
<b>Indirect cost</b>	65.4	182.4		39.3		221.7
Cost of morbidity	32.3	132.9		0.0		132.9
Cost of mortality	33.0	49.4		39.3		88.7
<b>Total direct and indirect cost</b>	120.3	264.4	15.5	41.3	135.8	305.6

Note: The components of the costs of tobacco-attributable illnesses in 2004 were adjusted for inflation to express in 2018 constant prices using the consumer price index available from the World Economic Database of the International Monetary Fund (International Monetary Fund, 2018).

While the present study was conducted in 2018 following similar research design as the study conducted in 2004, it made several improvements in terms of larger sample size, accuracy of measurements and variable definitions, availability of secondary data and more rigorous analytical approach. Part of the differences between the estimates in 2004 and 2018 can be attributed to these differences in the methods of data collection and measurements. Nevertheless, the large increase in the estimated number of deaths and diseases and the costs of illnesses can barely be interpreted as the artifact of the empirical approach. Rather, it speaks of the advancement of the tobacco epidemic in Bangladesh towards a matured and catastrophic state.

SECTION 4

# DISCUSSION AND CONCLUSION

This study estimated that tobacco use caused 125,718 deaths accounting for 13.5 percent of all deaths in Bangladesh in 2018. The estimate of the direct healthcare costs attributable to tobacco use amounted to BDT 83.9 billion annually, 76 percent of which was paid by tobacco users' households. The remaining 24 percent was financed through public health sector budget representing nearly 9 percent of total government health expenditure in the fiscal year 2018-19. The annual productivity loss, due to morbidity and premature mortality from tobacco-related diseases, was estimated to be BDT 221.7 billion. The total annual economic cost thus amounted to BDT 305.6 billion, which is equivalent to 1.4 percent of the GDP of Bangladesh in 2017-18. The annual estimate of total economic cost of tobacco in Bangladesh more than doubled since 2004.

Productivity loss accounted for most (83 percent) of the increase in tobacco-attributable costs, and increased health care expenditures explain the rest. For a rapidly growing economy such as Bangladesh's, this cost is expected to get larger over time and undermine the growth potential of households who fall prey to the scourge of the tobacco epidemic. It is therefore urgent that the government act on curbing the epidemic for sustaining the momentum of rapid economic growth with equity.

The study further observed that 14 percent of the total tobacco-attributable cost was caused by exposure to secondhand smoke. It reveals the enormity of the "negative externality" imposed by smokers on nonsmokers (largely children) by exposing them to secondhand smoke and an obvious case for government intervention to reduce smoking.

The costs of publicly funded health care are financed from tax revenue and are collectively borne by the taxpayers of the country irrespective of their tobacco use status. The fact that 9 percent of total government health expenditure was spent for treating tobacco-attributable diseases is a clear case of "market failure" over and above the "negative externality" caused by exposure to secondhand smoke. It calls for immediate government intervention to correct market prices by imposing higher taxes on tobacco products.

The above estimates are subject to a few caveats as follows:

(1) The prevalence of tobacco-related diseases was determined based on diagnosed cases with proven medical records. The undiagnosed cases or the diagnosed cases that were unable to show proven medical records were not included in the counts of tobacco-related diseases. As a result, the disease prevalence observed in this study underestimates the actual prevalence leading to underestimation of the cost of tobacco.

(2) The measurement of excess risk of diseases from tobacco use given by RR in this study can be confounded by the concurrence of multiple risks factors in addition to tobacco use (e.g., low physical activity, inadequate or unhealthy diet, obesity or overweight, high blood pressure, high blood glucose). In a nationally representative study in Bangladesh, 38% of adults 25 years or older reported to have at least three risk factors of noncommunicable diseases (NCDs) (Zaman, et al., 2015). As these risk factors were not independent for at least a third of the adult population under observation, the probability of disease prevalence from risk clustering can be greater than the sum of the probabilities of individual risk factors and the attribution of risk to tobacco use in isolation can be somewhat overstated for these cases. The surveillance of all the risk factors of NCDs was, however, beyond the scope of this study and can be addressed in future research.

(3) The measurement of the exposure to secondhand smoke used in this study was limited to exposure to indoor smoking among children residing in smokers' households only. The exclusion of outdoor or workplace exposures that can affect people of all ages caused underestimation of the effect of exposure to secondhand smoke.

(4) Although there is sufficient evidence to infer causal relationship between tobacco use and several diseases, this study was limited to only seven diseases (e.g., ischemic heart disease, stroke, COPD, pulmonary tuberculosis, lung cancer, laryngeal cancer, and oral cancer) caused directly by tobacco use and a few additional health conditions (autism, asthma, lower respiratory infection, low birth weight and sudden infant death syndrome) caused by exposure to secondhand smoke among children. Tobacco is a known risk factor for considerably more diseases (see discussion below about diabetes). The prevalence of tobacco-related diseases presented in this study is therefore an underestimate of the true prevalence and leads to underestimation of population-attributable risk and tobacco-attributable costs. This limitation is attributable to lack of enough observations to draw inferences on the linkage of all types of diseases to tobacco and can be addressed in future studies using a larger sample.

(5) In addition to the seven tobacco-related diseases analyzed in this study, a considerable number of diabetes cases were found in the household survey. Subsequently, diabetes was excluded from the estimation of the costs due to lack of statistical significance of the corresponding risk ratio, which is likely driven by the presence of confounding factors that were not controlled in the study. This limitation poses another source of underestimation of the costs of tobacco to the extent that tobacco use increases the risk of diabetes at the population level.

Despite these limitations, this study established that tobacco use imposes a significant financial burden on tobacco users themselves, their families, and on the nation. One of the major strengths of this study lies in its accounting for the lost time of non-employed individuals (e.g., homemakers, unemployed, students, retired, disabled) suffering or dying premature deaths from tobacco-related diseases by imputing value to their potential contribution to household productivity. This is an enhancement of the conventional human capital approach to the measurement of the indirect costs of tobacco-attributable morbidity and mortality that accounts for only the loss of market productivity of the employed population. Our approach in turn recognized the full economic loss that households incur due to tobacco-related illnesses, be it through the loss of market income or through the loss of household productivity. It thus offers a more comprehensive accounting of the indirect costs of tobacco-related illnesses.

Besides, the human capital approach is often deemed an inappropriate method of estimation of health-related productivity loss in the context of an economy with unemployment. Because the loss of market productivity from work-related disability or premature mortality of working individuals caused by a disease can be readily recovered by the employers through replacement of those employees with new employees of equal productivity. It may involve transitory frictional costs for employee search and recruitment with no significant repercussion on the long-run profitability of the business. The full economic loss approach taken in this study, in contrast, poses that the economic loss associated with the morbidity or mortality of a family members is permanent and irrecoverable from the perspective of a household. Hence it should be reflected in the measurement of economic costs of illness.

The second main strength of this study emerges from the attribution of the difference of expected income between people with diseases and people without diseases to the diseases in measuring the economic loss due to morbidity. The underlying principle is that work-related disability caused by certain disease can reduce both the average productivity and the employment probability of an individual, affecting the expected income in turn. More specifically,  $\text{expected income} = \text{probability of employment} * \text{average productivity} + (1 - \text{probability of employment}) * 0 = \text{probability of employment} * \text{average productivity}$ . Hence, change in expected income is the sum of both the changes in the probability of employment and the average productivity. Previous studies have considered only the changes in average productivity and thus underestimated the expected income loss due to morbidity.

Generally, studies measuring the economic cost of tobacco use diverse methods and the estimates are not readily comparable across populations, time and studies (Makate, et al., 2019). By maintaining the cost-of-illness approach followed in the 2004 WHO study in Bangladesh, this study succeeded to provide a consistent evidence-base for comparison of the economic costs of tobacco over time, measurement of progress in curbing the tobacco epidemic and timely intervention to accelerate the progress in tobacco control.

Though this study is comprehensive insofar as including direct costs and indirect productivity costs, it still misses a significant number of additional costs, and therefore remains an underestimate of the total costs of the tobacco burden. We recognize that this study has not accounted for the substantial costs of the environmental and health damages from tobacco cultivation, loss of food security due to use of scarce land resources for tobacco growing, smoking-related fire hazards, environmental pollution from littering of cigarette butts, and so on. Had these costs been estimated, the net loss from tobacco would have even larger. These costs can be measured in future research endeavors. Perhaps more importantly from a human perspective, we will never be able to gauge the pain and suffering of tobacco victims and their families.

The spending on tobacco and on health care use attributable to tobacco diverts resources away from necessities. The examination of consumption expenditure patterns by household members' tobacco use shows that households with tobacco users on average spend less on clothing, housing, education, energy, transportation and communication and more on food and medical expenses compared with households that have no tobacco user (Husain, Datta, Virk-Baker, Parascandola, & Khondker, 2018). While the larger share of food expenditure indicates that tobacco-user households are relatively lower-income households, the larger share of medical expenses is indicative of greater diseases burden on tobacco-user households driven by tobacco consumption. The crowding-out effect of tobacco consumption can indeed lead to displacement of basic needs among lower-income households contributing to impoverishment and overall economic and health inequity (Efroymsen, et al., 2001).

The need for reversing the adverse socioeconomic, environmental and health consequences of tobacco use on individuals and on the society is urgent. The vision of Tobacco-Free Bangladesh by 2040 underscores this need. The path to a tobacco-free state is, however, arduous and can be reached only with aggressive and effective tobacco control measures that:

- Raise tobacco taxes and prices;
- Monitor tobacco use and prevention policies;
- Protect people from tobacco smoke with smoke-free laws;
- Offer help for tobacco use cessation;
- Warn about the dangers of tobacco using graphic health warning labels on tobacco packages;
- Enforce bans on tobacco advertising, promotion and sponsorship;
- Tax tobacco farming land as industrial land to discourage tobacco cultivation;
- Provide incentive to tobacco farmers to shift to alternative and more viable livelihoods; and
- Enforce ban of tobacco sales to minors.

At present, 35.3% of Bangladeshis age 15 and older (an estimated 37.7 million adults) are smokers and/or smokeless tobacco users. If we start the clock now, 1.8 million tobacco users will have to quit tobacco use every year to make the country tobacco-free by 2040. A comprehensive tobacco tax reform with simplification of tax structure and increases in tobacco tax and prices can make this target feasible. Yet there will be new tobacco users, unless we can stop initiation of tobacco use among the youth completely. Global evidence shows that tax and price increases are particularly effective in deterring youth from smoking initiation. Tobacco tax increase can also reduce tobacco consumption more rapidly among the poor who are usually more price sensitive. The effect of tax and price increases in reducing tobacco consumption can be stronger, if tax policy can be aligned and combined with the non-tax policy measures under a nationwide comprehensive tobacco control program.

Estimates of the tobacco-attributable health care costs and productivity loss at the population level help to understand the economic impact of tobacco use and provide the evidence base for policymakers to implement comprehensive tobacco control policies to curb the epidemic. The progress in tobacco control policies in Bangladesh since the ratification of the WHO FCTC in 2004, followed by the passage of the Tobacco Control Act in 2005 and the Amendment in the Tobacco Control Act in 2013, has been limited. Despite the reduction in prevalence of tobacco use, Bangladesh is not going to meet the target of a Tobacco-Free Bangladesh by 2040 envisioned by the prime minister. It will take much stronger tobacco control measures

fortified with “best practices” and stricter compliance with the guidelines of the articles under the WHO FCTC, especially targeted to the youth who make up the generation of potential future smokers.

The goals of tobacco control are intertwined with the United Nations 2030 Sustainable Development Goals (SDGs) to eradicate extreme income poverty, reduced deaths from NCDs by one-third, and achieve universal health coverage ensuring provision of financial risk protection against impoverishment caused by illnesses (United Nations, 2016). Elimination of tobacco use can prevent the deaths and diseases attributable to tobacco use and secondhand smoke exposure altogether, thereby contributing significantly to the SDGs in Bangladesh by 2030.

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# GLOSSARY

## **Bangladesh Government's Fiscal Year**

July 1 to June 30

### **Languages**

Official Language: Bengali  
(English is widely used)

### **Administrative Structure**

Bangladesh has a unitary form of administration, as there is no province, or state. And it follows a parliamentary democracy, headed by a single-camera parliament led by the prime minister (the president is the head of state).

The country is run with eight administrative divisions, and 64 administrative districts.

The names of the divisions are as follows:

Dhaka Division (this includes Dhaka, the capital city), has 13 districts

Chittagong Division, has 11 districts

Khulna Division, has 10 districts

Rajshahi Division, has 8 districts

Rangpur Division, has 8 districts

Barisal Division, has 6 districts,

Sylhet Division, has 4 districts

Mymensingh Division, has 4 districts

And the government administration (including local government) is run with the following format:

Division

→ District (Zila)

→ Upazila/Thana

→ Union Council/Ward

→ Village/Jurisdiction Limit (JL)

(→ Households)



# LIST OF ABBREVIATIONS

ACS	American Cancer Society
BDT	Bangladeshi Taka
BBS	Bangladesh Bureau of Statistics
BMRC	Bangladesh Medical Research Council
CRUK	Cancer Research United Kingdom
COI	Cost of Illness
COPD	Chronic Obstructive Pulmonary Disease
GDP	Gross Domestic Product
GoB	Government of Bangladesh
GATS	Global Adult Tobacco Survey
MBBS	Bachelor of Medicine and Bachelor of Surgery
NBR	National Board of Revenue
NCD	Noncommunicable Disease
NGO	Non-Governmental Organization
\$	United States Dollar

# ***APPENDICES***

# ***APPENDIX 1. HOUSEHOLD DISEASE PROFILE QUESTIONNAIRE***

# MEASURING THE ECONOMIC COST OF TOBACCO USE IN BANGLADESH: A HEALTH COST APPROACH HOUSEHOLD DISEASE PROFILE QUESTIONNAIRE 2018

HOUSEHOLD IDENTIFICATION NUMBER (AT THE TIME OF DATA ENTRY):

IDENTIFICATION			
NAME OF HOUSEHOLD HEAD (Including nick name) _____		Father's Name : _____	
NAME OF THE RESPONDENT (HOUSEHOLD MEMBER TALKED TO): _____			
DIVISION:	<input style="width: 20px; height: 20px;" type="text"/>	DISTRICT:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>
UPAZILLA:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	WARD/UNION: _____	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>
PSU Number	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	Holding /GR No.	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>
HOUSEHOLD NO:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>		
DISTANCE FROM DIVISION CENTER: _____			
INTERVIEWER NAME: _____		Date: _____	
DATA ENTRY BY:			
TEAM NO:	<input style="width: 20px; height: 20px;" type="text"/> <input style="width: 20px; height: 20px;" type="text"/>	NAME:	
		DATE:	

# SECTION 1: TOBACCO PRODUCTS USE IN THE HOUSEHOLD

**Instruction for interviewer:** Please ask the following questions for household members aged 15 & above.

- A. Do you currently **smoke tobacco** of ANY kind: cigarettes, bidis, or hukka? 1=Yes ⇒ (go to A1) / 2=No ⇒ (go to B)
- A1. Do you currently **smoke cigarettes**? 1=Yes ⇒ (go to A2) / 2=No ⇒ (go to A3)
- A2. Do you currently **smoke cigarettes at least once a week**? 1=Yes ⇒ (go to A3) / 2=No ⇒ (go to A3)
- A3. Do you currently **smoke bidis**? 1=Yes ⇒ (go to A4) / 2=No ⇒ (go to A5)
- A4. Do you currently **smoke bidis at least once a day**? 1=Yes ⇒ (go to A5) / 2=No ⇒ (go to A5)
- A5. Do you currently **smoke hukka**? 1=Yes ⇒ (go to A6) / 2=No ⇒ (go to B)
- A6. Do you currently **smoke hukka at least once a day**? 1=Yes ⇒ (go to B) / 2=No ⇒ (go to B)
- B. Were you a tobacco **smoker** in the past? 1=Yes ⇒ (go to C) / 2=No ⇒ (go to C)
- C. Do you currently use **smokeless tobacco** (e.g. zarda, gul, sadapata)? 1=Yes ⇒ (go to C1) / 2=No ⇒ (go to D)
- C1. Do you currently use **smokeless tobacco at least once a day**? 1=Yes / 2 No ⇒ (go to D)
- D. Were you a **smokeless tobacco user** in the past? 1=Yes / 2 No
- [If A1=1, Ask E1] E1: How many cigarettes do you currently smoke per day?
- [If A3=1, Ask E2] E2: How many bidis do you currently smoke per day?
- [If A5=1, Ask E3] E3: How many times do you currently smoke hukka per day?
- [If C=1, Ask E4] E4: How many times do you currently use smokeless tobacco (i.e. zarda, gul, sadapata) per day?

**HR33:** Description of tobacco use in the family: Now you will be asked some general questions regarding the tobacco usage in your family

Q. No.	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	
VarName	PID	NAME	Age	Sex Male=1; Female=2	Relationship to head	A	A1	A2	A3	A4	A5	A6	B	C	C1	D	E1	E2	E3	E4	
	01																				
	02																				
	03																				
	04																				
	05																				
	06																				
	07																				
	08																				
	09																				
	10																				

**CODES for 005:** head=1, spouse=2, son=3, son-in-law=4, daughter=5, daughter-in-law=6, brother=7, sister=8, brother-in-law=9, sister-in-law=10, grandchild=11, mother=12, father=13, mother-in-law=14, father-in-law=15, grandfather=16, grandmother=17, nephew=18, niece=19, other relative=20, housekeeper=21, others (please specify) =22.

## SECTION 2: DISEASE STATUS [DS]

**Instruction for interviewer:** Please fill in the table below for all members of the HH.

- D1.1 Do you or any of the members of your household have ischemic heart disease (IHD)?  
 D1.2 What is the patient's current upper limit of blood pressure? (Write down after measuring)  
 D1.3 What is the patient's current lower limit of blood pressure? (Write down after measuring)  
 D2. Do you or any of the members of your household have stroke/transient ischemic attack (TIA)?  
 D3. Do you or any of the members of your household have oral cancer (oral cavity and oropharynx)?  
 D4. Do you or any of the members of your household have lung cancer (LC)?  
 D5. Do you or any of the members of your household have COPD or any other difficulty in breathing except long-term asthma?  
 D6. Do you or any of the members of your household have pulmonary tuberculosis (PT)?  
 D7. Do you or any of the members of your household have laryngeal cancer (LAC)/ larynx/ voice/ throat cancer?  
 D8.1 Do you or any of the members of your household have diabetes (DB)?  
 D8.2 How much is the current blood sugar? (Write down after measuring)  
 D9. Do any of the members of your household have autism (A)/intellectual/mental disabilities?  
 D10. Do you or any of the members of your household have asthma?  
 D11. Do you or any of the members of your household have respiratory infections?  
 D12. Was any child born in your family in last one year? Yes=1 (go to D14); No=2 (go to D14) [Ask only the respondent]  
 D13. Was the weight of the child less than 2.5 kg? If the respondent cannot say weight then ask, did the child have less than normal weight?  
 D14. Did any child die of sudden infant death syndrome (SIDS) in your household in last one year? [Ask only the respondent]

**[Note for interviewer: This question is for you] DD33: Is any disease diagnosed based on the above questions?**

Q. No.	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036
VarName	PID	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	DD
	01															
	02															
	03															
	04															
	05															
	06															
	07															
	08															
	09															
	10															

**CODES:** : yes=1, no=2, don't know=3, refused to answer=4.

**Instruction for interviewer:** If any cell in Table DD3 is reported 1 for an individual, then go to Table **TR33** (Diagnosis Test Report) below. If any individual is diagnosed with more than one disease, use one row for recording each disease with the same PID of the individual concerned. If all cells in Table DD3 are reported 2, 3 or 4 for different diseases under the same PID, then skip Table **TR33** and go to **Section 3** for the individual concerned.

**Disease Diagnosis Test Reports (TR)**

**TR33: Now you will be asked questions about the diagnosis test reports of the diseases**

Q. No.	037	038	039	040	041	042	043	044	045
VarName	PID	Disease Name	T1	T2	T3	T4	T5	T6	T7(comments)

**Codes for T7:** diagnosed=1, undiagnosed=2, need further diagnosis test=3, no need for diagnosis=4, others (please specify) =5.

## SECTION 3: DISEASE SYMPTOMS

**Instruction for interviewer:** Please ask the following set of questions for individuals who did not report any disease in Section 2 above (codes 2-5 in T7 in TR), in order to identify symptoms of tobacco-related diseases for them. Use Symptom code: 1=Yes, 2=No.

### IHD33: Symptoms of Ischemic Heart Disease (IHD)

Q. No.	046	047	048	049	050	051	052	053	054	055	056
VarName	PID	IHD01	IHD02	IHD03	IHD04	IHD05	IHD06	IHD07	IHD08	IHD09.1	IHD09.2
		Have you ever had any pain or discomfort or any pressure or heaviness in your chest? 1-Yes=> Continue 2-No=>Go to (TIA33)	Do you get the pain in the center of the chest or left chest or left arm? 1-Yes=> Continue 2-No=>Go to (TIA33)	Do you get it when you walk at an ordinary pace on level ground or when you walk uphill or hurry? 1-Yes=> Continue 2-No=>Go to (TIA33)	Do you slow down if you get the pain while walking?	Does the pain go away if you stand still or if you take a tablet/spray under the tongue?	Does the pain go away in less than 10 minutes?	Have you ever had a severe chest pain across the front of your chest lasting for half an hour or more?	Do you have squeezing pain over shoulder, arm or jaw?	After measuring Blood pressure with BP machine, write down the lower limit.	After measuring Blood pressure with BP machine, write down the upper limit.

### TIA33: Symptoms of Stroke (TIA)

Q. No.	057	058	059	060
VarName	PID	TIA 01	TIA 02	TIA 03
		Have you ever had any of the following symptoms: difficulty in talking, weakness or numbness of one side of face, arm and/or leg or one side of the body?	Does one or some of those symptoms disappear within one or two days?	Did you have slurred speech?



**OC33: Symptoms of Oral Cancer (OC)**

Q. No.	061	062	063	064	065	066	067	068	069	070	071
VarName	PID	OC01	OC02	OC03	OC04	OC05	OC06	OC07	OC08	OC09	OC10
		Is there any sore on the lips or in the mouth that does not heal (for a long time usually more than 14 days)?	Do you have any unusual bleeding, pain or numbness in the mouth?	Do you have white or red patch on the gums, tongue or lining of the mouth, tonsils or throat?	Is there any lump in the lips or in the mouth or throat?	Is there any foreign body feeling in the throat?	Have you felt any pain or difficulty in swallowing or chewing?	Do you have any swelling of the jaw that cause dentures to feel bad or become uncomfortable?	Is there any change in your voice (hoarseness) for more than two weeks?	Does it hurt when you swallow?	Do you have excessive salivation or excessive spit in day time?

**LC33: Symptoms of Lung Cancer (LC)**

Q. No.	072	073	074	075	076	077	078	079	080	081	082	083	084	085
VarName	PID	LC01	LC02	LC03	LC04	LC05	LC06	LC07	LC08	LC09	LC10	LC11	LC12	LC13
		Do you have bad breath?	Do you have any cough that persists for a long period? 1-Yes=> Continue 2-No=>Go to (LC05)	Does the cough produce sputum?	Does the sputum contain blood?	Do you have any chest pain during breathing or coughing? 1-Yes=> Continue 2-No=>Go to (LC09)	Are you losing your weight gradually?	Are you losing your appetite gradually?	Do you feel any breathlessness or any shortness of breath?	Is your voice becoming hoarse for more than 2 weeks?	Do you feel any wheezing or whistling during breathing out?	Do you have any difficulty in swallowing?	Do you have any chest pain when you laugh or cough?	Do you have severe respiratory distress?

**COPD33: Symptoms of Chronic Obstructive Pulmonary Disease (COPD)**

Q. No.	086	087	088	089	090
VarName	PID	COPD01	COPD02	COPD03	COPD04
		Do you have persistent cough (at least 6 months) for a long time? 1-Yes=> Continue 2-No=> Go to (PT33)	Do you have cough with lot of mucous/sputum?	Is the color of your sputum green /yellow?	Do you have shortness of breath during physical activities?

**PT33: Symptoms of Pulmonary Tuberculosis (PT)**

Q. No.	091	092	093	094	095	096
VarName	PID	PT01	PT02	PT03	PT04	PT05
		Do you have cough with sputum for more than 21 days? 1-Yes=> Continue; 2-No=> Go to (LAC33)	Do you have low-grade fever (especially at night)?	Are you losing weight gradually?	Have you stopped eating?	Do you sweat excessively, especially at night?

**LAC33: Symptoms of Laryngeal Cancer (LAC)**

Q. No.	097	098	099	100	101	102
VarName	PID	LAC 01	LAC 02	LAC 03	LAC 04	LAC 05
		Is there any change of your voice lately that does not go away?	Is there any ear pain that lasts a long time?	Is there a lump or swelling in the neck or throat?	Do you have trouble when swallowing food? Has this problem been going on for a long time?	Is it hard to breathe?

**DB33: Symptoms of Diabetes (DB)**

Q. No.	103	104	105	106	107	108	109	110	111	112	113	114
VarName	PID	DB01	DB02	DB03	DB04	DB05	DB06	DB07	DB08	DB09	DB10	DB10
		Are you often hungry and fatigued?	Are you thirsty quite often?	Do you pee much more than an average rate (average is between 4 to 7 times in 24 hours)	Do you feel exhausted more often?	Do you have dry mouth and itchy skin?	Do you think that your vision is blurred?	Do you think you are losing weight day by day?	Do you know whether any member of your family (mostly father, mother) lineage has diabetes?	Do sores on your body take a long time to heal?	Have you ever had your blood sugar measured by a doctor or other health worker?	How much is glucose in blood? (Note after measurement)

**A33: Symptoms of Autism (A)**

Q. No.	115	116	117	118	119	120	121	122	123	124	125	126
VarName	PID	A01	A02	A03	A04	A05	A06	A07	A08	A09	A10	A11
		Do any members have delayed speech development or not speak at all?	Do any members utter frequent repetition of a set of words?	Do any members speak in a way that sounds very monotonous or flat?	Do any members not respond to their name being called, despite having normal hearing?	Do any members react unusually negatively when asked to do something by someone else?	Are any members not aware of other people's personal space, or are they unusually intolerant of people entering their own personal space?	Do any members show little interest in interacting with other people, including children of a similar age?	Do any members not enjoy situations that most children of their age like, such as birthday parties?	Do any members prefer to play alone, rather than asking others to play with them?	Do any members avoid eye contact?	Do any members play with toys in a repetitive way?

**Instruction for interviewer:** If any of the cells of the diagnosis test report table TR33 in Section 2 or any tables for recording Disease Symptoms in Section 3 is reported 1, go back to the front page (Cover page) and fill in the grey part (Identified disease code in Disease Profile, Number of Tests, Verified (yes=1, no=2, others=3)). After then, continue the survey as usual and complete the rest of the survey.

## SECTION 4: INCOME & EXPENDITURE (IE)

In this section, questions related to Income & Expenditure of the household will be asked.

**Instruction for interviewer:** If the respondent answers an amount, write it down in blank place. If the respondent says 'do not know' or refuses to answer, please use the codes below the table.

### IE33: Income & Expenditure of the household

Q. No.	VarName			
127	IE01	In the last year, on average, how much was the total monthly income of your household? _____ Taka	888888	999999
<b>In last month, how much did your household spend on the following items?</b>				
128	IE02	Food and beverages: _____ Taka	888888	999999
129	IE03	Cigarettes: _____ Taka	888888	999999
130	IE04	Bidis: _____ Taka	888888	999999
131	IE05	Smokeless tobacco: _____ Taka	888888	999999
132	IE06	Clothing: _____ Taka	888888	999999
133	IE07	Housing: _____ Taka	888888	999999
134	IE08	Education: _____ Taka	888888	999999
135	IE09	Health care: _____ Taka	888888	999999
136	IE10	Repayment of loan: _____ Taka	888888	999999
137	IE11	Travel: _____ Taka	888888	999999
138	IE12	Other (specify): _____ Taka	888888	999999

Code: 888888= do not know, 999999= refused to answer.

## SECTION 5: CASHPOR HOUSING INDEX (CHI)

**Instruction for interviewer:** Please fill in information based on both the answer of respondent and your observation.

**CI33:** Now you will be asked some questions on the description of your housing.

Q. No.	VarName	
139	CHI01	Is the dwelling built on squatter land? 1=Yes, 2=No
140	CHI02	What is the ownership status of your dwelling? 1=Owned, 2=Rented, 3=Given by relative or other to use, 4= Provided by government
141	CHI03	How many rooms does the dwelling have? (Include detached rooms in same compound if in the same household)
142	CHI04	What is the approximate size of the house? (in square feet/ square meters)
143	CHI05	How many rooms in the households are used for sleeping?
144	CHI06	What is the observed structural condition of the main dwelling? (PLEASE RECORD AFTER OBSERVATION) 1=Seriously dilapidated, 2=Need major repairs, 3=Sound structure
145	CHI07	Main material of the floor of the main dwelling? (PLEASE RECORD AFTER OBSERVATION) 1= earthen, 2= cement, 3=tiles/mosaic, 4=marble
146	CHI08	Main material of the roof of the main dwelling? (PLEASE RECORD AFTER OBSERVATION) 1=thatch, 2=tin, 3=tiles, 4=concrete/brick
147	CHI09	What type of exterior walls does the dwelling have? (PLEASE RECORD AFTER OBSERVATION) 1=tarpaulin, plastic sheets, or branches and twigs, 2= mud walls, 3= iron sheets, 4= timber, 5= brick or stone with mud, 6= brick or stone with cement plaster
148	CHI10	What is the main source of drinking water for your household? <b>Piped Water</b> 1=in the house 2=neighbor's house 3=public tap <b>Tube Well</b> 4=in the house 5=neighbor's house 6=public tap <b>Surface Water</b> 7=well 8=pond 9=lake/dam, 10=River 11=others (Specify)
149	CHI11	How long does it take you to get water, and come back? On/in premises =96 MINUTES
150	CHI12	What kind of toilet facilities does your household have? 1=flush toilet/ high commode/low commode, 2=sanitary (ring/slab), 3=pit, 4=open space, 5=others (specify)
151	CHI13	What type of fuel does your household mainly use for cooking? 1=electricity, 2=liquified petroleum gas, 3=natural gas, 4= kerosene, 5=firewood (purchased), 6= coal/rice husk/saw dust, 7= cow dung (collected), 8=straw/tree leaves (collected)
152	CHI14	Does your household have the following facilities? (multiple codes allowed) 1=electricity, 2=radio, 3=TV, 4=telephone/mobile, 5=refrigerator 152.1 [ ] 152.2 [ ] 152.3 [ ] 152.4 [ ] 152.5 [ ]

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Q. No.	VarName	Survey Closing (SC)	
153	SC01	<b>Instruction for interviewer: Please read aloud to the respondent.</b> “Thank you for your time and cooperation. We will talk again if need arises for the survey.”	
154	SC02	<b>Instruction for interviewer:</b> This question is for you. Please rate the interview using the codes below.  1= believable; 2=somewhat believable; 3=something is wrong; 4= there are many mistakes.	

**Instruction for interviewer:** If any of the test reports of the patient are available, please photocopy and attach them with the questionnaire and make a list of them below.

- 1|
- 2|
- 3|
- 4|
- 5|

***APPENDIX 2. HOUSEHOLD HEALTH  
COST QUESTIONNAIRE***

# MEASURING THE ECONOMIC COST OF TOBACCO USE IN BANGLADESH: A HEALTH COST APPROACH

## HOUSEHOLD HEALTH COST QUESTIONNAIRE 2018

HOUSEHOLD IDENTIFICATION NUMBER (AT THE TIME OF DATA ENTRY):

HOUSEHOLD LOCATION: URBAN=1, RURAL=2  DISEASE CODE IDENTIFIED IN DISEASE PROFILE:  Verified (Yes=1, No=2, Others=3):

IDENTIFICATION			
NAME OF HOUSEHOLD HEAD (Including nickname) _____ Father's Name : _____			
NAME OF THE RESPONDENT (HOUSEHOLD MEMBER SPOKEN TO): _____			
DIVISION:	<input type="checkbox"/>	DISTRICT:	<input type="checkbox"/> <input type="checkbox"/>
UPAZILA:	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	WARD /UNION: _____	<input type="checkbox"/> <input type="checkbox"/> Village code: <input type="checkbox"/> <input type="checkbox"/>
PSU Number	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Holding /GR No.	<input type="checkbox"/> <input type="checkbox"/>
HOUSEHOLD NO:	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>		
DISTANCE FROM DIVISION CENTER: _____			
INTERVIEWER NAME: _____		Date: _____	
DATA ENTRY BY:			
TEAM NO:	<input type="checkbox"/> <input type="checkbox"/>	NAME:	
		DATE:	



# SECTION 1: HOUSEHOLD ROSTER (HR)

**Interviewer:** We would like some information about the people who usually live in your household. Please give me the names of the people who live in your household for more than 30 days in a year (**please start with household head**).

**Instruction for interviewer:** Note that the list of household members was obtained in the disease profile questionnaire. Please copy the PIDs, Names, Relationship to Household Head and Gender codes, and Age from that list in the disease profile questionnaire. Fill in the rest of the information (Marital Status, Education, and Occupation).

**HR33:** Socio-demographics of individual members of household.

Q. No.	001	002	003	004	005	007	008	009	010	011
VarName	HR0	HR02	HR03	HR04	HR05	HR06	HR07	HR08	HR09	HR10
	PID	Name	AGE (Years)	GENDER 1=Male 2=Female	RELATIONSHIP TO HEAD	MARITAL STATUS	EDUCATION		OCCUPATION	
							In School Now? 1=Yes, 2=No	Number of years of schooling completed	Primary	Secondary
	01									
	02									
	03									
	04									
	05									
	06									
	07									
	08									
	09									
	10									

**HR05 Code:** head=1, spouse=2, son=3, son-in-law=4, daughter=5, daughter-in-law=6, brother=7, sister=8, brother-in-law=9, sister-in-law=10, grandchild=11, mother=12, father=13, mother-in-law=14, father-in-law=15, grandfather=16, grandmother=17, nephew=18, niece=19, other relative=20, housekeeper=21, others (Please specify) =22

**HR06 Code:** married=1, unmarried=2, widow/widower=3, divorced=4, separated=5.

**HR09 and HR10 Codes:** owner farmer=01, tenant farmer=02, self-employed in non-farm agricultural activities (e.g., cattle, poultry raising, fisheries, plantation)=03, self-employed in non-agricultural activities (e.g., rickshaw pulling, tailoring, hair cutting, restaurant, grocery shop, tea stall)=04, farm wage laborer=05, non-farm agricultural wage laborer=06, non-agricultural wage laborer (e.g., industrial, construction, transport)=07, professional (e.g., physician, engineer, lawyer, teacher, researcher)=08, managerial, administrative or clerking service=09, student=10, children under 5 years age (not student)=11, unemployed=12, housewife/housekeeper/household manager=13, others (please specify)=14, refused=88, don't know=99

# SECTION 2: DISEASE STATUS (DS)

**Instruction for interviewer:** Please fill in the table below for all members of the HH.

**Instruction for interviewer:** Please fill in the table below for all members of the HH.

- D1.1 Do you or any of the members of your household have ischemic heart disease (IHD)?
- D1.2 What is the patient's current upper limit of blood pressure? (Write down after measuring)
- D1.3 What is the patient's current lower limit of blood pressure? (Write down after measuring)
- D2. Do you or any of the members of your household have stroke/transient ischemic attack (TIA)?
- D3. Do you or any of the members of your household have oral cancer (oral cavity and oropharynx)?
- D4. Do you or any of the members of your household have lung cancer (LC)?
- D5. Do you or any of the members of your household have COPD or any other difficulty in breathing except long-term asthma?
- D6. Do you or any of the members of your household have pulmonary tuberculosis (PT)?
- D7. Do you or any of the members of your household have laryngeal cancer (LAC)/ larynx/ voice/ throat cancer?
- D8.1 Do you or any of the members of your household have diabetes (DB)?
- D8.2 How much is the current blood sugar? (Write down after measuring)
- D9. Do any of the members of your household have autism (A)/intellectual/mental disabilities?
- D10. Do you or any of the members of your household have asthma?
- D11. Do you or any of the members of your household have respiratory Infections?
- D12. Was any child born in your family in last one year? yes=1 (go to D14); no=2 (go to D14) [Ask only the respondent]
- D13. Did the child weigh less than 2.5 kg? If the respondent cannot say weight then ask, did the child weigh less than normal?
- D14. Did any child die of sudden infant death syndrome (SIDS) in your household in last one year? [Ask only the respondent]

**[Note for interviewer:** This question is for you] **DD33:** Is any disease diagnosed based on the above questions?

Q. No.	021	022	023	024	025	026	027	028	029	030	031	032	033	034	035	036
VarName	PID	D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	DD
01																
02																
03																
04																
05																
06																
07																
08																
09																
10																

**CODES:** Yes=1, No=2, Don't Know=3, Refused to answer=4.

**Instruction for interviewer:** Please cross check the above disease roster with that obtained from the Household Disease Profile Questionnaire. If no disease is identified, discontinue the interview.

**Instruction for interviewer:** Please fill in the following table only for those household members whose diseases have been reported in the section above. Use one row for each disease repeating PID for individuals reporting multiple conditions

**DD01.** Has the person with the disease condition sought any care from a qualified doctor/health care center?  
 1= Yes (go to Section 3) 2= No (continue)

**Instruction for interviewer:** Please allow up to three responses for this question.

**DD02.** Why didn't the patient visit a qualified doctor or health care center?  
 1= lack of time, 2= too expensive, 3= disease is not that important, 4= refer self-medication, 5= health care facility too far from home, 6= care quality is not very good, 7= don't think the illness was too serious to go to a major clinic, 8= health workers and doctors are too rude, 9= other reasons (please specify)

Q. No.	031	032	033	034	035	036
VarName	DD00 (PID)	DD01	DD02.1 (Reason 1)	DD02.2 (Reason 2)	DD02.3 (Reason 3)	DD02.4 Other reasons (Please specify)

## SECTION 3: HEALTH-SEEKING BEHAVIOR AND HEALTH-CARE EXPENDITURES (LAST 1 YEAR) (HSB)

**Instruction for interviewer:** Please fill in the following table only for those household members whose diseases have been reported in the Instruction for interviewer: In the following table, fill out the PID and Disease Codes (**D1.1-D14**) from the Diseases Status Section (**Section 2**) and ask about each component of health care seeking behavior in last one year for each person with reported diseases. Use multiple rows for one person in case of multiple visits to doctors/ health care centers/hospital admissions.

In this section, questions will be asked regarding the health seeking behavior of the household members who have reported diseases. **HSB33.1:** Now you will be asked some questions about the health seeking behavior of the patient/s in the HH.

Q. No.	037	038	039	040	041	042	043	044	045	046	047
VarName	HSB00	HSB99	HSB01	HSB02	HSB03	HSB04	HSB05	HSB06	HSB07	HSB08	HSB09
	PID	Visit number	Disease code	For this illness, who did the patient take advice from?	Did the condition require outpatient visit or inpatient care in a hospital/health center/clinic? (if 1, continue; if 2, go to HSB06)	How many days did the patient stay in hospital/health center/clinic?	How much did you pay per day for the inpatient care? (Taka)	Which hospital/health center/clinic did the patient visit? State the name.	Is the hospital/health center/clinic private or public? (Private=1; Public=2)	Is the hospital/health center/clinic primary, secondary or tertiary health care facility? (Primary=1; Secondary=2; Tertiary=3)	How many working days did the patient lose due to seeking health care services in last one year?

**HSB02 Code:** hospital=1, health center/health clinic =2, health worker =3, MBBS doctor=4, village doctor= 5, pharmacy (medicine shop) =6, homeopath =7, ayurvedic/unani=8, spiritual healer (fakir etc.) = 9, self=10, no treatment=11, others (please specify) =12.  
**HSB03 Code:** 1=inpatient care in a hospital/health care center/ clinic; 2=outpatient visit.

# TREATMENT COSTS OF THE PATIENTS

**Instruction for interviewer:** Instruction for interviewer: In the following table, please fill in the PID and Disease Codes from “Section 2: Diseases Status (**Code D1.1-D14**)” in HSB11 and ask about each component of health expenses incurred in last one year for each person who reported diseases. Use multiple rows for one person in case of multiple visits.

**HSB33.1:** How much did your household spend on each of the following items for treatment for each person with the diagnosed diseases?

Q. No.	048	049	050	051	052	053	054	055	056	057	058	059	060			
VarName	HSB00	HSB99	HSB11	HSB12	HSB13	HSB14	HSB15	HSB16	HSB17	HSB18	HSB19	HSB20	HSB21			
	PID	Number of Visits/ visits to doctors	Disease Code	Doctor's Fee (Taka)	Medicine (Taka)	Medical Investigations/ Laboratory costs (Taka)	Payment for hired caregivers (Taka)	Transportation Costs (Taka)	Food Costs (Taka)	Lodging Costs (Taka)	Hospital Costs (Taka)	Total Costs (Taka)	Primary source of expenditure? 1=Current income; 2=Savings, 3=Loan, 4=Selling of property, 5=Insurance, 6=Gift, Other (specify)			
													1	2	3	Others

# INFORMATION ON ILLNESS EPISODES AND WILLINGNESS TO PAY [DS]

**Instruction for interviewer:** Instruction for interviewer: Please fill in the following table in order of the PID and disease code recorded in the previous table HSB33.2.

**DS33:** In this section, you will be asked questions about the illness episodes of the sick members in the HH.

Q. No.	127	128	129	130	131	132	133	134
VarName	DDS00(PID)	DDS1	DDS2	DDS 3	DDS4	DDS5	DDS6	DDS7
		When was the disease of the deceased person first detected? (Month and Year)	How many days after the onset of illness, did he/she consult a doctor/health care provider for the first time?	How many days after the diagnosis of the disease did the person die?	How long had the person been sick in a month after the detection of the disease?	How long had the person been sick in a month prior to death?	How much money was spent in total for the treatment of the deceased?	If you could afford, how much money would you have spent to get the deceased person completely recovered?

# SECTION 4: ABOUT THE CAREGIVER

## [PCG]

**Instruction for interviewer:** Please fill in the section below if a patient in this household received care from a caregiver (e.g. household member, relatives, friends, others) who was not paid for the caregiving. If the caregiver is a family member, provide the corresponding PID in PCG00. The information of family members on age, gender, education and occupation will be available from the household roster. If the caregiver is not a family member, leave the cell for PID blank and fill in the information on age,

Q. No.	VarName	
071	PCG33.1	Was the patient accompanied and/or cared by any other person (family member/friend/relative) during the visit to the health care facility? 1 = yes (Continue); 2 = no (skip to next section)

**PCG33.2:** Now you will be asked some questions about the care giver.

Q. No.	072	073	074	075	076	077	078	079	080	081	082	083
VarName	PCG01	PCG00	PCG02	PCG03	PCG04	PCG05	PCG06	PCG07	PCG08	PCG09	PCG10	PCG11
	Type of /Relation to caregiver	PID	Age	Gender Male=1 Female =2	Education (Years of schooling completed)	Occupation (Use code)	Monthly income (Taka)	No. of work days lost	Food Costs (Taka)	Lodging Costs (Taka)	Transport Cost (Taka)	Total Costs (Taka)

**PCG01** Code: household member=1; relative=2; friend=3; others=4 (Please specify). (If PCG01=1, go to PCG00; otherwise go to PCG02)  
**PCG05** Code: owner farmer=01, tenant farmer=02, self-employed in non-farm agricultural activities (e.g., cattle, poultry raising, fisheries, plantation)=03, self-employed in non-agricultural activities (e.g., rickshaw pulling, tailoring, hair cutting, restaurant, grocery shop, tea stall)=04, farm wage laborer=05, non-farm agricultural wage laborer=06, non-agricultural wage laborer (e.g., industrial, construction, transport)=07, professional (e.g., physician, engineer, lawyer, teacher, researcher)=08, managerial, administrative or clerking service=09, student=10, children under 5 years age(not student)=11, unemployed=12, housewife/housekeeper/household manager=13, others please specify)=14, refused=88, don't know=99

## SECTION 5: COST OF TREATMENT RECEIVED ABROAD [TRA]

If any member of the family goes abroad for medical treatment, you will be asked some questions on the treatment costs in this section.

Q. No.	VarName	
084	TRA01	Did anyone in your household receive treatment abroad in last one year? yes=1; no=2; don't know =88, refused=99 If yes=1 (Continue); no=2 (Go to Section 6)
085	TRA02	Was he/she treated for any of the listed health conditions? 1=ischemic heart disease, 2=stroke/transient ischemic attack, 3=oral cancer, 4=lung cancer, 5=chronic obstructive pulmonary disease (COPD), 6= pulmonary tuberculosis, 7= laryngeal cancer, 8= diabetes

**Instruction Instruction for Interviewer:** Please fill in the table below asking the household head about each patient treated abroad. Use separate row for each travel for treatment abroad.

**TRA33.1:** Now you will be asked some questions about the costs of treatment received abroad.

Q. No.	086	087	088	089	090	091	092	093	094	095	096	097
VarName	TRA00	TRA03	TRA04	TRA05	TRA06	TRA07	TRA08	TRA09	TRA10	TRA11	TRA12	TRA13
	PID	Visit number	Disease Code	Doctor's Fee	Medicine	Medical Investigations /Laboratory Costs	Payment for hired caregivers (if not family member)	Transportation Costs (Taka)	Food Costs (Taka)	Lodging Costs (Taka)	Hospital Costs (Taka)	Total Costs (Taka)



**Instruction for Interviewer:** Please fill in the section below if a patient in this household received care from a caregiver (e.g. household member, relatives, friends, others) who was not paid for the caregiving. If the caregiver is a family member, provide the corresponding PID in PCG00. The information of family members on age, gender, education and occupation will be available from the household roster. If the caregiver is not a family member, leave the cell for PID blank and fill in the information on age, gender, education and occupation.

In this section you will be asked questions about the caregivers during treatment received abroad.

Q. No.	VarName	
098	ACG33.1	Was the patient accompanied and/or cared by any other person (family member/friend/relative) during the visit to the health care facility abroad? 1 = Yes (Continue); 2 = No (Skip to Section 6)

**ACG33.2:** Now you will be asked some questions about the caregiver.

Q. No.	099	100	101	102	103	104	105	106	107	108	109	110
VarName	ACG00	ACG01	ACG02	ACG03	ACG04	ACG05	ACG06	ACG07	ACG08	ACG09	ACG10	ACG11
	PID	Type of /Relation to caregiver	Age	Gender Male=1 Female=2	Education (Years of schooling completed)	Occupation (Use code)	Monthly income (Taka)	No. of work days lost	Food Costs (Taka)	Lodging Costs (Taka)	Transport Cost (Taka)	Total Costs (Taka)

**ACG01** Code: household member=1; relative=2; friend=3; others=4 (Please specify). (If PCG01=1, go to PCG00; otherwise go to PCG02)  
**ACG05** Code: owner farmer=01, tenant farmer=02, self-employed in non-farm agricultural activities (e.g., cattle, poultry raising, fisheries, plantation)=03, self-employed in non-agricultural activities (e.g., rickshaw pulling, tailoring, hair cutting, restaurant, grocery shop, tea stall)=04, farm wage laborer=05, non-farm agricultural wage laborer=06, non-agricultural wage laborer (e.g., industrial, construction, transport)=07, professional (e.g., physician, engineer, lawyer, teacher, researcher)=08, managerial, administrative or clerking service=09, student=10, children under 5 years age(not student)=11, unemployed=12, housewife/housekeeper/household manager=13, others please specify)=14, refused=88, don't know=99

# SECTION 6: HEALTH INSURANCE [HI]

**Instruction for interviewer:** Please ask the following questions for those household members who have Health Insurance.

Q. No.	VarName	
111	HI33.1	Do you or any member of your household have any insurance coverage for health care? 1 = yes (Continue); 2 = no (Skip to Section 7)

**HI33.2:** Now you will be asked some questions regarding the health insurance coverage of the patients.

Q. No.	112	113	114	115	116
VarName	HI00	HI1	HI2	HI3	HI4
	PID	Do you or any member of your household have any insurance coverage/health insurance for health care? 1 = yes (continue); 2 = no (Skip this row and ask about next patient)	What type of health insurance do you have? 1 = employer provided; 2 = private; 3 = government provided	How much was paid by health insurance for your health care in last one year for the diseases reported in "DISEASE STATUS Section [Section 2]?"	Comments

## SECTION 7: DECEASED DURING THE LAST FIVE YEARS [DE]

**Instruction for interviewer:** Please fill in the table below for household members who died within the last five years. Assign PIDs starting from 100 (to avoid duplication with the PIDs of existing household members).

**DS33:** Now you will be asked some questions about the deceased in your households in the last five years.

Q. No.	117	118	119	120	121	122	123	124	125	126
VarName	DE00	DE01	DE02	DE03	DE04	DE05	DE06	DE07	DE08	DE09
	PID	Age at death	Did he/use.....? 1=smoked tobacco 2=smokeless tobacco 3=user of both 4=never user	Year of death	Gender: 1=male; 2=female	Primary Occupation	Secondary occupation	If the person was economically active before death, what was the income of the last working month before death?	What was the cause of death? 1 = natural death due to aging (go to Section 8); 2 =accident/injury (go to Section 8); 3=illness.	What was the name of the disease the person was diagnosed with?

**DE05 & DE06** Codes: Owner farmer=01, tenant farmer=02, self-employed in non-farm agricultural activities (e.g., cattle, poultry raising, fisheries, plantation)=03, self-employed in non-agricultural activities (e.g., rickshaw pulling, tailoring, hair cutting, restaurant, grocery shop, tea stall)=04, farm wage laborer=05, non-farm agricultural wage laborer=06, non-agricultural wage laborer (e.g., industrial, construction, transport)=07, professional (e.g., physician, engineer, lawyer, teacher, researcher)=08, Managerial, administrative or clerking service=09, Student=10, Children under 5 years age( not student)=11, unemployed=12, housewife/housekeeper/household manager=13, others (Please specify)=14, refused=88, don't know=99

**DE09** Code: 1=ischemic heart disease, 2=stroke/transient ischemic attack, 3=oral cancer, 4=lung cancer, 5=chronic obstructive pulmonary disease (COPD), 6= pulmonary tuberculosis, 7=laryngeal cancer, 8=diabetes, others=9.

# INFORMATION ON ILLNESSES OF THE DECEASED [DDS]

**Instruction for interviewer:** Please fill in the table below for household members who died within the last five years. Assign PIDs starting from 100 (to avoid duplication with the PIDs of existing household members).

**DS33:** In this section, you will be asked questions about the illnesses of the deceased members of the household.

Q. No.	127	128	129	130	131	132	133	134
VarName	DDS00(PID)	DDS1	DDS2	DDS 3	DDS4	DDS5	DDS6	DDS7
		When was the disease of the deceased person first detected? (Month and Year)	How many days after the onset of illness, did he/she consult a doctor/health care provider for the first time?	How many days after the diagnosis of the disease did the person die?	How long had the person been sick in a month after the detection of the disease?	How long had the person been sick in a month prior to death?	How much money was spent in total for the treatment of the deceased?	If you could afford, how much money would you have spent to get the deceased person completely recovered?

# SECTION 8: CASHPOR HOUSING INDEX (CHI)

**Instruction for interviewer:** Please ask the household member about the housing indicators. Fill in information based on both the answers of the respondent and your observation.

**CI33:** Now you will be asked some questions about your housing conditions.

Q. No.	VarName	
135	CHI01	Is the dwelling built on squatter land? 1=yes, 2=no
136	CHI02	What is the ownership status of dwelling? 1=owned, 2=rented, 3=given by relative or others to use, 4= provided by government
137	CHI03	How many rooms does the dwelling have? (Include detached rooms in same compound if in the same household)
138	CHI04	What is the approximate size of the house? (in square feet/ square meters)
139	CHI05	How many rooms in the households are used for sleeping?
140	CHI06	What is the observed structural condition of the main dwelling? (PLEASE RECORD AFTER OBSERVATION) 1=seriously dilapidated, 2=need major repairs, 3=sound structure
141	CHI07	Main material of the floor of the main dwelling? (PLEASE RECORD AFTER OBSERVATION) 1= earthen, 2= cement, 3=tiles/mosaic, 4=marble
142	CHI08	Main material of the roof of the main dwelling? (PLEASE RECORD AFTER OBSERVATION) 1=thatch, 2=tin, 3=tiles, 4=concrete/brick
143	CHI09	What type of exterior walls does the dwelling have? (PLEASE RECORD AFTER OBSERVATION) 1=tarpaulin, plastic sheets, or branches and twigs, 2= mud walls, 3= iron sheets, 4= timber, 5= brick or stone with mud, 6= brick or stone with cement plaster
144	CHI10	What is the main source of drinking water for your household? <b>Piped Water</b> 1=in the house 2=neighbor's house 3=public tap <b>Tube Well</b> 4=in the house 5=neighbor's house 6=public tap <b>Surface Water</b> 7=well 8=pond 9=lake/dam, 10=river 11=others (specify)
145	CHI11	How long does it take you to get water, and come back? on/in premises =96 MINUTES _____
146	CHI12	What kind of toilet facilities does your household have? 1=flush toilet/ high commode low commode, 2=sanitary (ring/slab), 3=pit, 4=open space, 5=others (specify)
147	CHI13	What type of fuel does your household mainly use for cooking? 1=electricity, 2= liquified petroleum gas, 3=natural gas, 4= kerosene, 5= firewood (purchased), 6= coal/rice husk/saw dust, 7= cow dung (collected), 8=straw/tree leaves (collected)

## SECTION 9: HOUSEHOLD INCOME [INC]

**Instruction for interviewer:** Please ask the household head and fill in the following table

Q. No.	VarName						
148	INC01	During the past year (2017), what was your total household income? Amount (taka)	Yearly	1	Monthly	2	Amount Taka:

**INC33:** In this section, please ask the respondent to report the of every individual in the household by source.

Q. No.	149	150	151	152	153	154	155	156	157	158	159	160	161
VarName	INC00	INC02	INC03	INC04	INC05	INC06	INC07	INC08	INC09	INC10	INC11	INC12	INC13
	PID	Income Code	Amount Taka	Income Code	Amount Taka	Income Code	Amount Taka	Income Code	Amount Taka	Income Code	Amount Taka	Others (Please specify)	Amount (taka)

**Income Code:** salaries and wages=1; business income=2; income from land/farming=3; stock/share/bond=4; rent=5; sale of asset=6; pension/retirement benefit=7; insurance/provident fund=8; charitable assistance=9; mosque/temple=10; community organization/informal organization/professional organization/cooperative society/club/NGO=11; relatives=12; remittance=13, others=14 (please specify)

**Instruction Instruction for Interviewer:** Please ask the following questions to the household head and report the answer at the household level.

Q. No.	VarName		
162	INC14	Of all sources of income, which three sources generated the highest amount of income for the household? a..... b..... c.....	
163	INC15	Please tell us how much money your household had in hand last month (including loans)? don't know=99 refused to answer=88	
164	INC16	Was last month's income noticeably higher, lower or the same in comparison to other months? low = 0, same = 1, high = 2, don't know=99, refused to answer= 88	
165	INC17	Did your household obtain any loans last month? yes = 1, no= 2	
166	INC18	How much was the loan amount? Amount (Taka)	
167	INC19	Was this amount significant? yes = 1, no = 2, don't know =99, refused to answer=88	
168	INC20	Do/did you feel difficulty in repayment of the loan? yes = 1, no= 2, don't know=99, refused to answer=88	

## SECTION 10: HOUSEHOLD EXPENDITURE [EXP]

**Instruction for interviewer:** Please answer the following questions on household expenditure thinking of all the members of your household. Write down the total amount in the last column.

Q. No.	VarName						
169	EXP01	During the last year (2017), what was your total household spending? Amount (taka)	Yearly	<input type="checkbox"/>	Monthly	<input type="checkbox"/>	Amount Taka:

**EXP33.1:** In this section, you will be asked to report spending by items and individual members of the household.

Q. No.	170	171	172	173	174	175	176	177	178	179	180	181	182
VarName	EXP00	EXP02	EXP03	EXP04	EXP05	EXP06	EXP07	EXP08	EXP09	EXP10	EXP11	EXP12	EXP13
	PID	Expenditure Code	Amount Taka	Expenditure Code	Amount Taka	Expenditure Code	Amount Taka	Expenditure Code	Amount Taka	Expenditure Code	Amount Taka	Others (Please specify)	Amount Taka

**Code:** EXP02, EXP04, EXP06, EXP08 & EXP10: food=1; health care=2 (including transportation, lodging, food); housing (including rent, bills, tax, furniture and things needed for household use and maintenance)=3; education (including travel cost, tiffin, etc.)=4; tobacco smoking=5; tobacco: smokeless =6; travel cost (marketing/office transportation/traveling etc.)=7; clothing/shoe (dresses, curtain, bedcover, bed sheet, etc.)=8; repayment of loan; others (please specify)=9.



**EXP33.2:** In this section, you will be asked questions about significant expenditures incurred in the last year (2017).

Q. No.	VarName		
183	EXP14	Was there any large expenditure in the last year (2017), such as, loan repayment, wedding, health care? yes= 1, no =2 (Move to the next Section 11)	
184	EXP14.1	Loan repayment	(Amount Taka)
185	EXP14.2	Wedding	(Amount Taka)
186	EXP14.3	Health Care	(Amount Taka)
187	EXP14.4	Others (Please specify).....	(Amount Taka)

---

**Instruction for interviewer:** Please ask about each basic need separately.

**EXP33.3:** How well would you say the present economic condition of the household permits you to satisfy the following basic needs of the household?

Q. No.	188	189	190	191	192
VarName	EXP15	EXP16	EXP17	EXP18	EXP19
	Food	Housing	Health care	Education	Clothing/shoe

**Code:** very well=1, well=2, with difficulty=3, unable=4

# SECTION 11: SMOKED TOBACCO USE (CIGARETTE, BIDI, HUKKAH ETC.) [IST]

**Instruction for interviewer:** : Fill in the following table for household members aged 15 and older.

Q. No.	VarName	
193	IST33.1	To the best of your knowledge, is any member of your household a current or a former smoker? 1=Yes (continue), 2=No (go to Section 13)

**Instruction for interviewer:** : If the answer is YES, please ask the following questions [writing down with PIDs].

**IST33.2:** In this section, you will be asked some questions about the use of SMOKED tobacco products.

Q. No.	194	195	196	197	198	199	200	201	202	203
VarName	IST00	IST01	IST02	IST03	IST04	IST05	IST06	IST07	IST08	IST09
	PID	Name	Tobacco use	Type of tobacco	Who influenced you to start tobacco use?	Age of initiation (years)	Years of usage	Amount of daily consumption at present	Unit of consumption	Frequency of consumption

**Codes:**

**IST02:** 1=current user (continue), 2=former user (go to next PID)

**IST03:** 1=cigarette; 2=bidi; 3= hukkah; 4=shisha; 5=others (please specify)

**IST04:** 1=grandfather/grandmother; 2=father/mother; 3=uncle/aunt (paternal/maternal); 4=friends; 5=others (please specify)

**IST08:** 1 = sticks; 2 =packs

**IST09:** 1=daily; 2=less than daily; 3=occasionally

# SECTION 12: SMOKED TOBACCO PRODUCT PURCHASES [PST]

**Instruction for interviewer:** :: If IST33.1=1 in Section 11 above, then fill in this section for household members aged 15 and older, otherwise go to Section 13.

**PST33:** In this section, you will be asked some questions related to the purchase of SMOKED tobacco products.

Q. No.	204	205	206	207	208	209	210	211	212	213
VarName	PST00	PST01	PST02	PST03	PST04	PST05	PST06	PST07	PST08	PST09
	PID	Where do you usually buy smoked tobacco products from?	In which language is the brand name of the product you purchase is written in?	Do you usually buy any specific brand? Yes=1	Name of that brand	What was the name of the brand you purchased last time?	In what form did you purchase?	How much did you purchase?	How much did you pay? Amount (Taka)	How often do you usually buy? (No. of times per week)

**Codes:**

**PST01:** 1=roadside vendor; 2= hawker (adult/ seller aged ≥18 years); 3= hawker (minor <18 years); 4=shop/hut; 5= others (specify)

**PST02:** 1=Bangla; 2=Hindi; 3=English; 4=others (specify)

**PST03:** 1=yes; 2=no [Go to PST05]

**PST06:** Quantity: 1= sticks/piece; 2= packet

## SECTION 13: SMOKELESS TOBACCO USE [ISLT]

**Instruction for interviewer:** : Fill in the following table for household members aged 15 & above

Q. No.	VarName	
214	ISLT33.1	To the best of your knowledge, is any member of your household a current or a former smokeless tobacco user? 1=Yes (continue), 2=No (go to Section 15)

**Instruction for interviewer:** : If the answer is YES, please ask the following questions [writing down with PIDs].

**ISLT33.2:** In this section, you will be asked some questions about the use of SMOKELESS tobacco products.

Q. No.	215	216	217	218	219	220	221	222	223	224
VarName	ISLT00	ISLT01	ISLT02	ISLT03	ISLT04	ISLT05	ISLT06	ISLT07	ISLT08	ISLT09
	PID	Name	Tobacco using status	Type of tobacco	Who influenced you to start tobacco use?	Age of initiation (years)	Years of usage	How frequently do you use smokeless tobacco?	Amount of daily consumption at present	Unit of consumption

**Codes:**

**ISLT02:** 1=current user (Continue), 2=former user (go to next PID)

**ISLT03:** 1=zarda, 2=gul, 3=pan masala, 4=sadapata; 5=nassi; 6=others (please specify)

**ISLT04:** 1=grandfather/grandmother; 2=father/mother; 3=uncle/aunt (paternal/maternal); 4=friends; 5=others=5 (please specify)

**ISLT07:** 1=daily (go to ISLT08); 2=less than daily (go to Section 14); 3=occasionally (go to Section 14)

**ISLT09:** 1=gram; 2=others (Please specify)

# SECTION 14: SMOKELESS TOBACCO PRODUCT PURCHASES [PSLT]

**Instruction for interviewer:** : If ISLT33.1=1 in Section 13 above, then fill in this section for household members aged 15 and older.

**PSLT33:** In this section, you will be asked some questions about the purchase of SMOKELESS tobacco products.

Q. No	225	226	227	228	229	230	231	232	233	234
VarName	PSLT00	PSLT01	PSLT02	PSLT03	PSLT04	PSLT05	PSLT06	PSLT07	PSLT08	PSLT09
	PID	Where do you usually buy smokeless tobacco products from?	In which language is the brand name of the product you purchase is written in?	Do you usually buy any specific brand?	Name of that brand	What was the name of the brand you purchased last time?	In what form did you purchase?	How much did you purchase? (weight in grams)	How much did you pay? Amount (Taka)	How often do you usually buy? (No. of times per week)

**Codes:**

**PSLT01:** 1=roadside vendor; 2= hawker (adult/seller aged ≥18 years); 3= hawker (minor <18 years); 4=shop/hut; 5= others (specify)

**PSLT02:** 1=Bangla; 2=Hindi; 3=English; 4=others (specify)

**PSLT03:** 1=yes; 2=no [Go to PSLT05]

**PSLT06:** Quantity: 1=loose; 2=pouch/pack/box

# SECTION 15: USE OF ELECTRONIC NICOTINE DELIVERY SYSTEM [ENDS]

**Instruction for interviewer:** ENDS or e-cigarettes are battery-powered devices that deliver nicotine by producing steam instead of smoke. Some look like cigarette but the same product is found in different shapes and names. These are exhausted after one time use and even available with re-used kit and cartridge. These kits are of different flavors and contain nicotine with different intensity level. Some people themselves fill the cartridge with liquid buyable in market. This study would indicate products as ENDS or e-cigarette with any of the above traits.

Q. No.	VarName	
235	ENDS33.1	Do you or any of your household members use e-cigarette? yes=1 (continue); n o=2(go to Section 16)

**ENDS33.2:** In this section, you will be asked some questions about the use of ENDS or e-cigarettes.

Q. No	236	237	238	239	240	241	242	243
VarName	ENDS00	ENDS01	ENDS02	ENDS03	ENDS04	ENDS05	ENDS06	ENDS07
	PID	Have you ever used ENDS or e-cigarette? 1= Yes (go to ENDS02); 2= No (skip this section and go to Section 16)	Have you used ENDS or e-cigarette in last 6 months? 1= Yes; 2= No	How frequently do you use ENDS or e-cigarette recently? DAILY=1; LESS THAN DAILY=2; NOT AT ALL=3	What is the reason for using ENDS or e-cigarette?			
					Reason1	Reason2	Reason3	Reason 4

**Codes for END04-END07:**

- 1=ENDS or e-cigarettes are less harmful than regular cigarettes;
- 2=People around me say that ENDS or e-cigarettes are less harmful than regular cigarettes;
- 3=ENDS or e-cigarettes help me reduce cigarette consumption;
- 4=ENDS or e-cigarettes can be used in places where smoking is prohibited;
- 5=ENDS or e-cigarettes help me quit regular cigarette consumption;
- 6=Others (please specify)

# SECTION 16: OTHER HABITS [OH]

**Instruction for interviewer:** This section asks questions about other habits, more specifically about alcohol consumption. Please use caution as this is a sensitive area to talk about. Explain to the respondent that asking this question is a part of the protocol and is not meant to offend or interfere with the privacy of their personal lifestyle choices. Fill in the following table for household members 15 and older.

Q. No.	VarName	
244	OH33.1	Do you or any of your household members consume alcohol? Yes=1 (continue); No=2(go to Section 17)

**OH33.2:** In this section, you will be asked some questions related to the other habits of the household members.

Q. No	245	246	247	248	249	250	251	252
VarName	OH00	OH1	OH2	OH3	OH4	OH5	OH6	OH7
	PID	Do you drink alcohol regularly?	How many days in a week do you drink?	How much do you drink in a day?"	What brand do you drink?	How long have you been drinking regularly?	Are you currently on medication for high blood pressure? 1=Yes 2=No	Are you currently on medication for diabetes? 1=Yes 2=No

**Code: OH1:** not applicable= 98, 1=never used, 2=stopped six months ago or before, 3=currently use/stopped within last six months.  
 [If answer is 98 or 1, go to next PID]  
**\*\* 1 standard drink is equivalent to 1 glass of wine (120ml) or 1 bottle of beer (285 ml) or 1 large highball/short glass of liquor (30ml)**

# SECTION 17: EXPOSURE TO SECONDHAND SMOKE [SS]

**Instruction for interviewer:** Please ask the household head about the following questions about exposure to secondhand smoke.

Q. No.	VarName	
253	SS01	Is indoor smoking allowed in your house? 1=Allowed; 2=Not allowed, but with exceptions; 3=Never allowed (go to SS04); 4=No rules (go to SS03)
254	SS02	Is smoking allowed in every room inside your house? 1=Yes 2=No
255	SS03	How often does anyone smoke inside your home? 1=Daily; 2=At least once a week but less than daily; 3=At least once a month but less than weekly; 4=Less than once a month; 5=Never

**SS33:** In this section, you will be asked some questions about the exposure of your household members to second-hand smoke outside of home.

Q. No.	256	257	258	259	260	261	262
VarName	SS00	SS04	SS05	SS06	SS07	SS08	SS09
	PID	Do you currently work outside of your home? 1=Yes (continue); 2=No (go to SS10)	Do you usually work indoors or outdoors? 1=Indoors (go to SS07); 2=Outdoors; 3=Both (go to SS07)	Are there any indoor areas at your work place? 1=Yes (continue); 2=No (go to SS10)	Which of the following best describes the indoor smoke-free policy where you work? 1=Allowed anywhere; 2=Allowed only in some indoor areas; 3=Not allowed in any indoor areas; 4=There is no indoor smoke-free policy	During the past 30 days, did anyone smoke in indoor areas where you work? 1=Yes (continue); 2=No (go to SS10)	Does anyone at your workplace have the permission to smoke every day if s/he wants to smoke? 1=Daily; 2=Weekly; 3=Monthly; 4=Less Than Monthly; 5=Never



**Table SS33 (Continued)**

Q. No.	263	264	265	266	267	268	269	270	271
VarName	SS00	SS10	SS11	SS12	SS13	SS14	SS15	SS16	SS17
	PID	During the past 30 days, did you visit any government building or government office? 1=Yes (continue); 2=No (go to SS12)	Did anyone smoke inside of any government buildings or government offices that you visited in the past 30 days? 1=Yes; 2=No	During the past 30 days, did you visit any health care facility? 1=Yes (continue); 2=No (go to SS14)	Did anyone smoke inside of any health care facilities that you visited in the past 30 days? 1=Yes; 2=No	During the past 30 days, did you visit any restaurant? 1=Yes (continue); 2=No (go to SS16)	Did anyone smoke inside of any restaurants that you visited in the past 30 days? 1=Yes; 2=No	During the past 30 days, did you use any public transportation? 1=Yes (continue); 2=No (go to SS18)	Did you see the driver or helper or any passenger smoking inside of any public transportation that you used in the past 30 days? 1=Yes; 2=No

**Table SS33 (Continued)**

Q. No.	272	273	274	275	276	277	278	279	280
VarName	SS00	SS18	SS19	SS20	SS21	SS22	SS23	SS24	SS25
	PID	During the past 30 days, did you visit any school? 1=Yes (continue); 2=No (go to SS20)	Did anyone smoke inside of any school that you visited in the past 30 days? 1=Yes; 2=No	During the past 30 days, did you visit any university? 1=Yes (continue); 2=No (go to SS22)	Did anyone smoke inside of any universities that you visited in the past 30 days? 1=Yes; 2=No	During the past 30 days, did you visit any private workplace? 1=Yes (continue); 2=No (go to SS24)	Did anyone smoke inside of any private workplaces you visited in the past 30 days? 1=Yes; 2=No	During the past 30 days, did you visit any cafe, coffee shop or tea house? 1=Yes (continue); 2=No (go to Section 18)	Did anyone smoke inside of any cafes, coffee shops, or tea houses that you visited in the past 30 days? 1=Yes; 2=No

## SECTION 18: TOBACCO TAX [TT]

**Instruction for interviewer:** Question TT01 is for the respondent of the household. Questions TT02-TT04 are for any tobacco user in the household. If there are no tobacco users in the household, skip questions TT02-TT04 and go to Section 19.

**TT33:** In this section, you will be asked some questions related to tobacco taxation and prices.

Q. No.	VarName		
281	TT01	Do you think that the government should impose higher taxes on tobacco products (cigarette/bidi/smokeless tobacco)? 1= Yes; 2=No; 88= Don't know; 99= Refused to answer	
282	TT02	In the last 6 months, did the price of the tobacco product you use increase? 1= Yes; 2=No; 3=Do not use any definite brand; 88= Don't know; 99= Refused to answer	
283	TT03	In the last 6 months, did you make any attempt to reduce the cost of the tobacco product you use? 1= Yes; 2=No; 88= Don't know; 99= Refused to answer	
284	TT04	As an attempt to reduce the cost of tobacco products, what did you do? 1=Quit tobacco use; 2=Decreased consumption, but did not quit; 3=Switched to cheaper brand of the same product; 4= Switched to cheaper tobacco product (e.g. from cigarette to bidi); 5= Switched from smoked to smokeless tobacco product; 6=Searched for cheaper source of purchase to buy the same brand at lower price; 7=Purchased the same brand in bulk; 8=Purchased from a duty free shop; 9=Others (Please specify)	

# SECTION 19: NGO/ MICROCREDIT PROGRAM PARTICIPATION [NGO]

**Instruction for interviewer:** Please fill in the following table if any of the household member participates in NGO/Microcredit organizations.

**NG33:** In this section, you will be asked some questions about the participation of household members in NGO/Microcredit organizations

Q. No.	VarName	
285	NGO01	Are you or any of your household members a lender from any microcredit organization? 1= Yes; 2=No (go to NG003); 8= Don't Know; 9= Refused to answer
286	NGO02	Have you or any of your household members ever been asked whether you are a smoker while taking loan from any microcredit organization? 1= Yes; 2=No; 8= Don't Know; 9= Refused to answer
287	NGO03	Have you ever faced difficulty in getting loan from microcredit organizations due to tobacco smoking (cigarette, bidi) attribute? 1= Yes; 2=No; 8= Don't Know; 9= Refused to answer
288	NGO04	If the microcredit organizations declare that they will not provide loans to tobacco smokers, will you continue to smoke tobacco? 1= Yes; 2=No; 8= Don't Know; 9= Refused to answer
289	NGO05	Have you ever heard that NGO activists suggest quitting tobacco smoking? 1= Yes; 2=No; 8= Don't Know; 9= Refused to answer
290	NGO06	Has any NGO activist ever suggested that you should quit tobacco smoking? 1= Yes; 2=No; 8= Don't Know; 9= Refused to answer
291	NGO07	If you are applying for a job that allows only nonsmokers as eligible job candidates, will you continue to smoke? 1= Yes; 2=No; 8= Don't Know; 9= Refused to answer
292	NGO08	Would advice from any of the following people persuade you to quit tobacco use? 1= Local primary school teacher; 2= Local high school teacher; 3= Imam of the mosque/ Priest; 4= Local members/ chairman; 5= NGO activists; 6= Local elites; 7= Others (Please specify)
293	NGO09	Have you ever heard advice for quitting tobacco use in the mosque or temple or any religious places? 1= Yes; 2=No; 8= Don't Know; 9= Refused to answer

Q. No.	VarName	Survey Closing (SC)
294	SC01	<b>Instruction for interviewer: Please read aloud to the respondent.</b> "Thank you for your time and cooperation. We will talk again if need arises for the survey."
295	SC02	<b>Instruction for interviewer:</b> This question is for you. Please rate the interview using the codes below. 1= Believable; 2=Somewhat believable; 3=Something is wrong; 4= There are many mistakes.

\*\*\*\*\*

## ***APPENDIX 3. MAP OF BANGLADESH WITH ALL 64 DISTRICTS***

[PROCURED FOR THE SURVEY, FROM ORBIT PUBLISHING HOUSE, DHAKA, BANGLADESH]

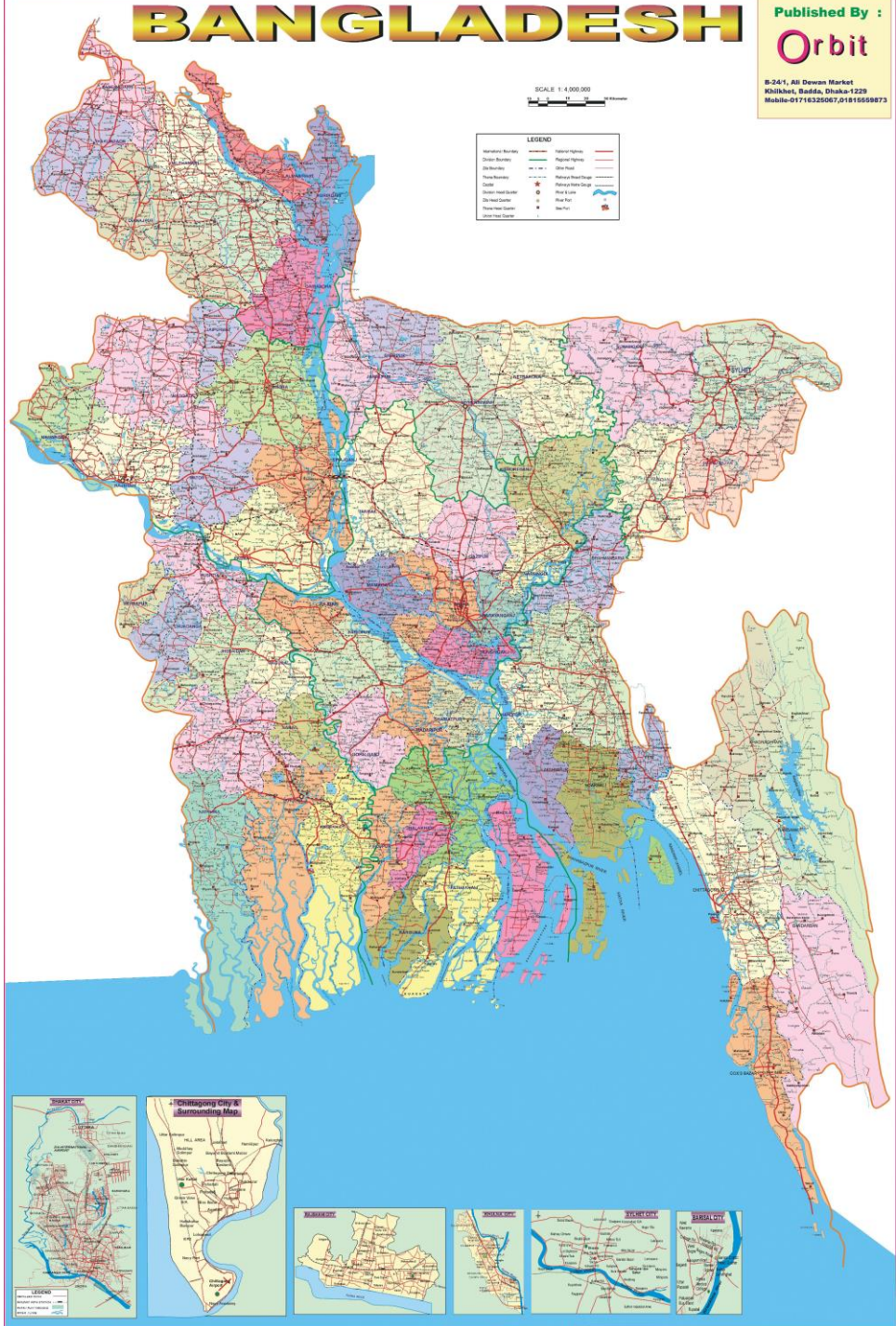
# BANGLADESH

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SCALE 1 : 4,000,000

LEGEND		
National Boundary	International Boundary	Water Body
State Boundary	Regional Boundary	Canal
District Boundary	City Boundary	Major Road
Town Boundary	Urban Area	Expressway
City	Urban Area	Highway
Urban Area	Urban Area	Water Body
Urban Area	Urban Area	Water Body
Urban Area	Urban Area	Water Body
Urban Area	Urban Area	Water Body
Urban Area	Urban Area	Water Body



# PROACTT BANGLADESH PROJECT WORKSHOP, JULY 20-23, 2017



# PROACTT BANGLADESH PROJECT DISSEMINATION EVENT, FEBRUARY 23, 2019









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