



**tobaccotaxation**

Economic Research Informing  
Tobacco Taxation Policy



УНИВЕРЗИТЕТ У БАЊОЈ ЛУЦИ

UNIVERSITY OF BANJA LUKA

# The Economic Burden of Smoking in Bosnia and Herzegovina, 2019

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## List of Abbreviations

BD – Brčko district

BiH – Bosnia and Herzegovina

CDS – Costs of dispensing and shaking drugs

CTC – Caregivers and transportation costs

CPS-II – The Cancer Prevention Study II

COPD – Chronic obstructive pulmonary disease

FBiH – Federation of Bosnia and Herzegovina

GDP – Gross domestic product

HIF – Health Insurance Fund

ICD – International Classification of Diseases

IMCS – Indirect mortality costs of smoking

IMF – International Monetary Fund

OOP – Out of pocket

RBH – Russia, Belarus, and Hungary

RR – Relative risk

RS – Republic of Srpska

SAF – Smoking-attributable fraction

SAMC – Smoking-attributable mortality cost estimation

STC-SEE – Survey on Tobacco Consumption in Southeastern Europe

UIC – University of Illinois Chicago

USA – United States of America

WB – World Bank

WHO – World Health Organization



## Executive Summary

Bosnia and Herzegovina (BiH) is a country with about 3.28 million inhabitants, located at the crossroads of south and southeastern Europe in the Balkan Peninsula. According to the World Bank classification, BiH is an upper-middle-income country with a gross domestic product (GDP) per capita of 6,031 USD. The Country is divided into two main entities, Republic of Srpska (RS) and Federation of Bosnia and Herzegovina (FBiH), and Brčko District (BD), which is the self-administrative unit in BiH. FBiH is further divided into 12 cantons. Of the total population in BiH, about 62.85 percent live in FBiH, 34.79 percent in RS, and 2.37 percent in BD.

The national health system uses the Bismarck model based on solidarity and reciprocity. It follows the territorial organization of the country, so there is one central Health Insurance Fund (HIF) for RS, one HIF for BD, and 12 HIFs in FBiH, one for each canton. The HIFs finance most health care costs, with out-of-pocket health expenditures comprising about 29.33 percent of the current health care expenditure. Most health care facilities are established by entities or municipalities and are characterized by a high level of indebtedness caused by high levels of expenditures that are not covered by revenues.

BiH ranks the eleventh in the world in terms of smoking prevalence. A survey of adults conducted in BiH in 2019 shows that 41.1 percent of adults are current smokers. Among daily smokers, more than 20 percent started smoking daily before the age of 18, while almost 60 percent started between the ages of 18 and 24. Almost half of current smokers smoke more than 20 cigarettes per day. Since smoking is one of the leading causes of death and illness, it imposes a large burden on the health care system and the economy. However, the lack of comprehensive estimates of the economic costs of smoking obscures the need for the state to take more decisive action to decrease tobacco use in BiH.

The aim of this research is to provide the first comprehensive estimation of the economic costs of smoking in BiH to establish an evidence base for a more informed tobacco tax policy. The estimation of the economic costs of tobacco provides information about the direct costs of smoking as well as the indirect morbidity and mortality costs of smoking in 2019.

This study finds that the total economic burden of tobacco use in BiH in 2019 is between 718.74 and 973.68 million Bosnia-Herzegovina convertible marks (BAM), or an average value of 831.44 million BAM (or 2.36 percent of GDP).

Direct smoking-attributable costs are estimated between 557.30 and 765.99 million BAM, with an average value of 648.30 million BAM. The share of direct smoking-attributable costs in total health costs in BiH is between 25.57 and 35.14 percent, depending on the relative risk (RR) used. Indirect morbidity costs are between 50.59 and 66.67 million BAM (average 57.82 million BAM), and indirect mortality costs are between 110.85 and 141.01 million BAM, (average 125.32 million BAM). Based on the average value of estimated costs the share of direct, indirect morbidity, and indirect mortality costs is 1.84, 0.16, and 0.34 percent of GDP in 2019, respectively.

The results of this study provide information that requires strong and prompt government action to decrease smoking prevalence and intensity in BiH to improve the health and lives of its inhabitants.

Key policy recommendations from this study are the following:

- The government should reintroduce the regular annual increase of the tobacco excise tax—which was abandoned in 2019—to decrease consumption of tobacco and exposure to secondhand smoke, encourage smoking cessation, and discourage smoking initiation. This would reduce diseases from smoking and their related future medical costs, increase productivity of workers, and save lives. This excise tax increase should be at the very least equal to the increase in inflation and income in order to achieve its full positive impact.
- Health Insurance Funds should provide increased resources for comprehensive cessation programs to decrease the prevalence and negative effects of smoking in the future, especially those correlated with smoking-related health care costs.
- The government should stop considering tobacco excise revenues as net budget revenues and the tobacco excise as an instrument to collect budget revenues. Since smoking imposes costs on society that exceed the excise revenues, tobacco tax's primary goal should not be budget financing, but rather decreasing tobacco use and using the revenues to support mass media/social media-based public education programs, cessation support programs, and other measures to decrease tobacco use.
- The government should make determined efforts to improve the implementation of non-price measures, such as enforcing smoke-free areas in public spaces, utilizing the influence of media and social platforms to motivate reduction of or quitting smoking, and expanding the use of visual health warnings—all of which will help to change the cultural perception of smoking as normal for youth and adults in BiH.
- The government should mandate recording of smoking status in the health file of every patient.

## Introduction

Tobacco use is one of the leading causes of death in all countries regardless of income level. More than eight million people in the world died from a tobacco-related disease in 2019. Although on a global level smoking prevalence is decreasing (32.7 percent in 2000 versus 22.3 percent in 2020), as well as the absolute number of smokers in the world (1.37 billion in 2000 versus 1.30 billion in 2020), the number of annual deaths is expected to keep growing since tobacco-related diseases slowly kill both its users and those exposed to secondhand smoke (SHS).<sup>1</sup> Upper-middle-income countries, such as BiH, experienced the lowest decrease in smoking prevalence in the last two decades compared to other country income groups. Upper-middle-income countries started in 2000 with an average prevalence rate of 27.9 percent, which declined moderately to 24.1 percent in 2020. These trends are not encouraging and indicate that tobacco use will continue to be among the leading causes of death in this group of countries. Additionally, smoking places a heavy economic burden on societies throughout the world. The amount of health care expenditure due to smoking-attributable diseases was estimated at 5.7 percent of global health expenditure in 2012, while the total economic costs of smoking (direct health care, indirect morbidity, and mortality costs) were equivalent in magnitude to 1.8 percent of the world's annual gross domestic product (GDP). Almost 40 percent of this cost occurred in low- and middle-income countries.<sup>2</sup>

BiH ranks eleventh in the world in terms of smoking prevalence.<sup>3</sup> A survey of adults conducted in BiH in 2019 showed that 41.1 percent of adults were current smokers. Among daily smokers, more than 20 percent started smoking daily before the age of 18, while almost 60 percent started between the ages of 18 and 24. Almost half of current smokers smoke more than 20 cigarettes per day.<sup>4</sup> These findings suggest that the population in BiH is susceptible to the development of smoking-related diseases, which result in not only loss of lives but also high treatment costs of such diseases and loss of productivity due to absence from work, among other costs.

BiH has a state health system that covers almost all health care costs for BiH residents, but Health Insurance Funds (HIFs), as well as hospitals and other state health institutions, struggle with the problem of relatively high amounts of liabilities. The lack of sufficient finances for providing adequate health care and new investments are common characteristics of the health system in BiH. Smoking-attributable health care costs also impose a substantial burden for the government, and their reduction in the future will help to deal with the financial problems of the state health system. For adequate smoking-attributable cost management, it is necessary to quantify the economic cost of tobacco use, but a comprehensive estimation of smoking-attributable costs does not exist in BiH. To the authors' best knowledge, there is only one study that estimated the economic cost of tobacco use in BiH. The study estimated the total health care costs attributable to the treatment of health problems related to smoking and estimated these costs in 2015 at 109 million BAM (60.05 million USD).<sup>5</sup>

Policy makers in BiH see the collection of budget revenues as a primary objective of the tobacco excise and ignore the fact that smoking imposes significant burdens on society through the diseases it causes, which require expensive treatments and result in decreased labor productivity and reduced life expectancy. Policy makers may be reluctant to increase the tobacco tax and use tax policy effectively

to decrease tobacco consumption due to the absence of a reliable estimate of the economic costs of smoking. Therefore, the aim of this research is to establish the first comprehensive estimation of direct and indirect smoking-attributable costs in BiH. Previous research conducted in BiH has shown that increasing the tobacco tax would reduce tobacco consumption,<sup>6</sup> which implies that increasing the tobacco tax would also reduce the related economic costs of tobacco use. Through the current study, policy makers will be introduced to reliable estimates of the economic costs of tobacco use in BiH and made aware of the fact that increasing the tobacco tax could be an efficient tool for reducing these costs in addition to helping to address the financial problems of the over-indebted state health system.

The estimation of the economic costs of tobacco provides information about: (i) the direct costs of smoking incurred from treatment of smoking-induced illness (inpatient hospitalization, outpatient visits, treatment abroad, drugs, non-medical costs), (ii) indirect morbidity costs of smoking (value of lost productivity due to absence from work), and (iii) indirect mortality costs of smoking (value of the life lost due to premature death). These estimates provide a comprehensive picture of smoking-induced illnesses and smoking-related costs for the government that can inform and improve tobacco taxation policies.

## Methodology and Data Sources

Due to the specificity of the estimation, each component of economic costs of tobacco use (direct, indirect mortality, and indirect morbidity) is presented separately. BiH consists of two entities— Federation of BiH (FBiH) and Republic of Srpska (RS)—and Brčko District (BD) <sup>7</sup>, which is the self-administrative unit in BiH. Further, FBiH is divided into 12 cantons. The total sum of the economic costs of smoking in BiH is the sum of costs by territorial units for RS, FBiH, and BD. The methodology of this study is mostly derived from the World Health Organization (WHO) (2011).<sup>8</sup>

### Smoking-attributable fraction (SAF)

Determining the smoking-attributable fraction (SAF) is one of the most important steps in estimating the economic costs of smoking. SAF represents a proportion of the health care costs, deaths, and other measures of health outcomes that can be attributed to smoking. This study employs the epidemiological approach in calculating SAF, which requires two fundamental elements—namely the smoking prevalence in the target population (including current and former smokers) and the estimate of relative risk (RR). SAF is calculated using the formula<sup>9</sup> for all diseases and for each smoking-attributable disease and by gender and age group:

$$SAF_i = SAF_{ic} + SAF_{if}$$

$$SAF_{ic} = \frac{P_c \times (RR_{ic} - 1)}{P_c \times (RR_{ic} - 1) + P_f \times (RR_{if} - 1) + 1} \times 100\%$$

$$SAF_{if} = \frac{P_f \times (RR_{if} - 1)}{P_c \times (RR_{ic} - 1) + P_f \times (RR_{if} - 1) + 1} \times 100\%$$

*SAF<sub>i</sub> = smoking-attributable fraction for current and former smokers (total)*

*SAF<sub>ic</sub> = smoking-attributable fraction for current smokers*

*SAF<sub>if</sub> = smoking-attributable fraction for former smokers*

*P<sub>c</sub> = prevalence of current smokers*

*P<sub>f</sub> = prevalence of former smokers*

*P<sub>n</sub> = percentage of never smokers, which equals (1 – P<sub>c</sub> – P<sub>f</sub>)*

*RR<sub>ic</sub> = relative risk of developing a particular tobacco-related disease i (such as lung cancer) or occurrence of an event i (such as incurring disability days) for current smokers compared to never smokers*

*RR<sub>if</sub> = relative risk of developing a particular tobacco-related disease i (such as lung cancer) or occurrence of an event i (such as incurring disability days) for former smokers compared to never smokers*

Data on smoking prevalence (including current and former smokers) by gender and age group are taken from a survey conducted in BiH in 2019 (STC-SEE).<sup>10</sup> This survey is preferred over the Household Budget Survey (HBS) because STC-SEE provides information for both current and former smokers. Also, STC-SEE data were collected at the individual level while HBS is household-level data (i.e., HBS data provide only information on whether a household consumes tobacco, but it is not known how many of its members are smokers).

RR is used to measure the strength of the association between the risk of developing a disease for smokers compared to non-smokers.<sup>11</sup> Since the RR estimate for BiH is not available, this study adopts it from other countries. A thorough literature search was conducted to identify the most appropriate country whose RR estimate could be applied in a study for BiH. The authors determined that, when local RR is not available, it is common in the literature on economic costs to use the RR from the USA. However, given significant differences between the USA and BiH in terms of income, lifestyle, and quality of health services, this study instead uses RRs from Russia, Belarus, and Hungary—which are more similar to BiH—while the USA RR is used as a robustness check. Since RR for BiH is not available it is expected that the actual cost estimate is between the estimates based on the Russia/Belarus/Hungary RR (henceforth, RBH RR) and the USA RR.

In addition, although the morbidity and mortality RRs may not be identical, estimates of morbidity RR are very limited. For this reason, most studies, including this one, use the mortality RR for morbidity as well. Very limited evidence on whether using the mortality RR is appropriate for health utilization and morbidity suggests that using the mortality RR may underestimate the health care costs. Hence, the SAF for health cost estimated with the mortality RR may be conservative.<sup>12</sup>

While the USA RR may not be the best fit for BiH, it is one of few RRs that is estimated by type of illness, age, and gender, which allows for focus only on selected tobacco-related diseases. For that purpose, the diseases are selected based on the following list of diseases indicated in the estimation of the USA RR (CPS II) according to the International Classification of Diseases (ICD10): A15-A19, C00-C16, C25, C32, C33, C34, C53, C64-C65, C67, C18, C20, C22, C92, I00-I09, I20-I25, I26-I51, I60-I69, I70-I78, E10-E14, J10-J11, J12-J18, J40-J44. The names of smoking-related diseases associated with these codes are presented in the Appendix (Table A1). On the other hand, the RRs for Russia, Belarus, and Hungary are estimated for all diseases. Accordingly, the primary cost estimate presented in this study is for all diseases, while the estimate for only selected diseases is presented as the robustness check.

## Direct costs of smoking

The direct costs of smoking are the value of goods and services consumed by a smoker as part of health care treatment for a smoking-related disease. Estimated direct costs of smoking consist of two components: direct medical costs and direct non-medical costs. Direct medical costs include health care costs at the primary, secondary, and tertiary levels of health care; the costs of medical rehabilitation; drugs; and treatment abroad. Direct non-health care costs include transportation to the health providers and caregiving. However, in some studies, the transportation and caregivers' costs are treated as direct health care costs, while in others they are considered as indirect morbidity costs.<sup>13</sup> This study treats the transportation and caregivers' costs as direct costs of smoking. Data on

non-health care costs are not available in BiH, so they are estimated based on its share in direct medical costs from other studies.

Different methods are available for quantifying the direct health care costs of smoking. In this research the annual cost approach is preferred over the lifetime cost approach due to the availability of data. The annual cost approach estimates the economic cost of tobacco by using the cross-section approach. The lifetime cost approach uses longitudinal data on health care costs, which are not available in BiH. Based on the available data on health care costs and other required data, the economic costs of tobacco use are estimated for 2019.

Data specification for estimation of the direct costs of smoking are presented in the Appendix (Table A2). After the calculation of the SAF according to the procedure described above, the estimation procedure of the direct health care costs of cigarette smoking is conducted following the steps described below.<sup>14</sup>

**1. Collection of total health care expenditure.** In BiH, these costs are almost completely financed by state HIFs. As mentioned above, BiH consists of two entities, FBiH and RS, and one special district, BD. In addition, FBiH consists of 12 cantons. Each territorial unit (RS, 12 FBiH cantons, and BD) has separate HIFs that are not consolidated. An additional complexity in collecting the data is the difference in the level of digitization of the HIFs' systems: only the HIF of RS is fully digitized and keeps records of the costs by patient, including information on their age, gender, and diseases that have been treated.

Consequently, it is only possible to obtain detailed data for RS—which represents about one-third of the BiH territory and population—with information on health care claims by type of disease, gender, and age group. For FBiH and BD, it is only possible to obtain the data on the aggregate level. The disaggregation is conducted by multiplying the total cost with the shares of the costs by age, gender, and disease in RS. This approach is appropriate as a second solution since BiH is a small country (by area and by population) with a homogenous demographic structure, socioeconomic characteristics, and almost identical smoking habits and lifestyle.

**2. Estimation of total smoking-attributable health care costs financed by state HIFs.** As mentioned above, this study estimates the costs for selected smoking-related diseases and for all diseases. Smoking-attributable cost by disease and for all diseases are estimated by multiplying the total health care costs (either for a particular disease or for all diseases) by the corresponding SAF.

**3. Estimation of smoking-attributable out-of-pocket (OOP) costs.** While most health care costs in BiH are financed by the state HIFs, certain costs are still OOP. The World Bank and WHO publish data for OOP costs as a percentage of total current health expenditure. With the above estimated health costs covered by insurance, OOP costs can be estimated as  $(\text{share of OOP} / (1 - \text{share of OOP}) * \text{insurance-covered cost})$ . This cost does not include non-medical costs (e.g., costs of caregivers and transportation costs). Consequently, total direct smoking-attributable medical cost is estimated by dividing the total health insurance covered costs attributed to smoking with  $(1 - \text{share of OOP})$ . As the OOP costs are estimated at the aggregate level (information on OOP costs by age and gender is not available), it is disaggregated by age group, assuming the shares of each age group in the total direct smoking-attributable medical costs financed by the health fund.

- 4. Estimation of non-medical costs** (caregivers and transportation costs). As official data on non-medical costs are not available in BiH, these costs are estimated by assuming the average share (11.26 percent) in direct smoking-attributable medical costs, based on the estimates from similar studies.<sup>15 16 17 18 19</sup>
- 5. Estimation of total direct smoking-attributable health cost.** The total smoking-attributable direct health cost is the sum of above estimated smoking-attributable costs financed by the state HIFs, smoking-attributable OOP costs, and caregivers and transportation costs.

## Indirect morbidity costs

Indirect morbidity costs of smoking refer to the value of lost productivity by persons who are sick or disabled due to smoking-related diseases. Table A3 (Appendix) describes the data that are used to estimate the indirect morbidity cost of smoking. As in the case of direct costs, indirect morbidity costs are estimated for all diseases and for selected smoking-related diseases.

The estimation procedure for the indirect morbidity costs of smoking includes the following steps:<sup>20</sup>

- 1. Obtaining the data on national work-loss days.** Work-loss days is the number of workdays that an employee is away from work because of illness, and it is used to measure lost productivity. As explained above, since only the HIF of RS provides records on disbursements by type of illness, age, and gender, these data are used to estimate the work-loss days in FBiH and BD.

The total national number of work-loss days caused by smoking-related diseases is calculated using two different databases. First, disbursements for workers in RS who are absent from work more than 30 days are financed by the HIF of RS. Data for inpatient hospitalization and disability days from work refunded to the employer by HIF RS are available for each smoking-related disease, stratified by gender and age group. Second, since the HIF of RS does not have information regarding disbursements for workers who are absent from work up to 30 days—because the HIF RS does not refund the salary to the employer if the worker’s disability days are fewer than 30—this part of the national work-loss days is estimated based on information on inpatient hospitalization.

Also, since these data do not clarify whether a patient who is hospitalized for up to 30 days is employed or not, the total number of hospitalization days is multiplied by the employment rate (by age and gender). The employment rate is adjusted for the informal employment rate in 2019, which is 30.5 percent according to the estimation of the International Labour Organization.<sup>21</sup> Work-loss days for workers who are absent but not hospitalized are not included in the calculation due to lack of data. For FBiH and BD, national work-loss days are estimated based on the data for RS, as explained above, corrected by the ratio of employed persons in these territorial units provided in the Appendix, Table A9.

The sources of data for employment rates by entities, gender, and five-year age groups are: estimation of RS and FBiH total population in 2019 by Official Statistics Reports, employed people in legal entities in RS and FBiH, and International Labor Organization informal employment in 2019 report. Adding the ILO’s informal employment follows the logic of the



report: there is 69.5 percent formal and 30.5 percent of informal employment (Appendix, Table A42).

2. **Obtaining the mean daily gross salary data used in morbidity cost estimation.** In RS, the daily salary is estimated based on the average monthly salary data, stratified by gender, obtained from the RS Tax Administration. For FBiH and BD, data on salary by age and gender are not available, so it is estimated based on the salary by age and gender in RS corrected by the difference in absolute level obtained from the official statistics.<sup>22 23</sup> Since the average gross salary in FBiH in 2019 is 1.39 percent higher than in RS, the correction coefficient for gross salaries by age and gender in RS to calculate salaries in FBiH is 1.0139 (Table A41).

Average gross salary in mortality cost estimation in 2019 by territorial units, gender, and five-year age groups for ages 15–79 is calculated based on available official data sources: the Tax Administration of RS and the Institute of Statistics of RS and FBiH. Average net salary, by gender and five-year age groups, in RS is divided by 0.67 in order to calculate the average gross salary in 2019 in the RS entity. This number is then used in FBiH gross salary estimation, due to the lack of data by gender and five-year age groups for FBiH and BD entities, as shown in Appendix Table A22. Average gross salaries in the RS entity are multiplied by the coefficient 1.013858<sup>1</sup> to estimate average gross salaries in FBiH and BD. Due to unavailability of data on net salary for FBiH and BD, the base for calculation of salary by age and gender in FBiH and BD is gross salary in RS (by age and gender), adjusted by the difference in average salary (coefficient) in 2019.

3. **Estimation of indirect morbidity costs of smoking.** According to the formula for calculation of smoking-attributable indirect morbidity costs,<sup>24</sup>

$$\begin{aligned}
 SAI_{ikj} &= SAI1_{ij} + \sum_{n=1}^{Nn} (SAI2_{ikj}) \\
 &= SAF_{ij} \times TWLD_{ij} \times ERN_j + \sum_{n=1}^{Nn} (SAF_{ikj} \times TNHC_{ikj})
 \end{aligned}$$

*SAI<sub>ikj</sub>* = smoking-attributable indirect morbidity costs by disease *i*, health care service type *k* among population subgroup *j*

*SAI1<sub>ij</sub>* = smoking-attributable indirect morbidity costs resulting from productivity losses due to disease *i* among population subgroup *j*

*SAI2<sub>ikj</sub>* = smoking-attributable indirect morbidity costs resulting from non-health care payments to caregivers and for transportation related to the utilization of health care service type *k* due to disease *i* among population subgroup *j*

*SAF<sub>ikj</sub>* = smoking-attributable fraction of indirect morbidity costs for disease *i* using health care service type *k* among population subgroup *j*

*TWLD<sub>ij</sub>* = total yearly work-loss days by entities, due to disease *i* among population subgroup *j*

*ERN<sub>j</sub>* = mean daily earnings or salary for population subgroup *j*

*TNHC<sub>ikj</sub>* = total yearly non-health care costs (such as payments to caregivers and for transportation to health care providers) by entities related to the utilization of health care service type *k* due to disease *i* among population subgroup *j*

*N<sub>k</sub>* = total types of health care services

<sup>1</sup> The coefficient is calculated by dividing the average net salary in FBiH by the average net salary in RS, according to available official statistics data for 2019.

Finally, the total smoking-attributable morbidity cost by entities is the product of SAF, total work-loss days, and mean daily earnings by population subgroup (gender and age group) and by disease. If the calculation is based on total RR, instead of work-loss days by disease, the total work-loss days for all diseases are used.

### Indirect mortality costs

The indirect mortality cost of smoking, also called smoking-attributable indirect mortality cost (SAMC), is the value of lives lost due to premature death caused by smoking. For the estimation of these costs, the human capital approach is preferred over the willingness-to-pay approach.<sup>25</sup> The human capital approach values life according to the value of what the individual produces (i.e., it values the lost productivity using forgone market earnings) while willingness-to-pay approach values life according to the amount of money that someone would pay to avoid death. The human capital approach is more market-oriented, more objective, and thus more commonly used. The data used for SAMC estimation are described in the Appendix, Table A4.

The estimation of SAMC includes the following steps:<sup>26</sup>

1. **Obtaining the total number of deaths.** These data are obtained from the official statistics, stratified by age group and gender, by causes of death according to the International Classification of Diseases (ICD10) (see Appendix, Table A1, for all death causes). The number of deaths by age, gender, and disease is available for all territorial units in BiH.
2. **Estimation of present value of lifetime earnings (PVLE).** PVLE is a discounted value of assumed earnings in the future, following an approach developed by Max and Rice et al. (2004). This approach considers life expectancy of the person according to gender and the five-year age group to which the person belongs, the rates of labor force participation, the mean annual earning for each age and gender group, and the growth rate of labor productivity.

The future earnings are discounted to the present value using a country-specific discount rate. Rates of labor force participation are calculated for gender and five-year age groups by dividing the total number of employed people in corresponding stratification groups with the total number of living people for the corresponding stratification group. The annual growth rate in productivity used in the SAMC estimation is 3.11 percent (GDP per capita growth rate for the period 2011–2019) and the annual discount rate is three percent.

3. **Estimation of smoking-attributable mortality cost.** Cost by gender and age group estimated by the formula below for the product of the SAF, total number of deaths, and PVLE.<sup>27</sup> As with direct and indirect morbidity costs, the indirect mortality cost is estimated for only selected tobacco-related diseases (using SAF based on USA RR by disease) and for all diseases (using SAFs based on USA RR and RBH RRs for all diseases), by entities.

$$SAMC_{ij} = SAF_{ij} \times \sum_{a=MINa}^{MAXa} (TDEATH_{ija} \times PVLE_{ja})$$

$SAF_{ij}$  = smoking-attributable fraction of death from disease  $i$  for population subgroup  $j$

$TDEATH_{ija}$  = total number of deaths from disease  $i$  for population subgroup  $j$  (note that death data are usually available only by gender and age) whose age at death is within the five-year age group “ $a$ ”

$PVLE_{ja}$  = total discounted present value of lifetime earnings for population subgroup  $j$  whose age is within the five-year age group “ $a$ ”

$MIN_a$  = minimum age group

$MAX_a$  = maximum age group

SAMC estimation by entity follows the same pattern used for direct cost estimation. Data sources used to estimate the SAMC include average gross salary by entity, employment rate by entity, annual growth rate in productivity, annual discount rate for the whole country, number of people surviving to age  $x$  ( $l_x$ ) by country, and person-years lived between age  $x$  and  $x+n$  ( $nL_x$ ) by country.

## Smoking prevalence, RRs, and SAFs

Smoking prevalence, RRs, and calculated SAFs for both entities of BiH are used in the calculations of direct and indirect costs by entity.

Following WHO (2011), SAFs are calculated for age groups 35–54, 55–64, 65–74, and 75+; by gender; and for current and former smokers’ subgroups.<sup>28</sup>

### Prevalence

Smoking prevalence in each entity, by age, gender, and smoking status is presented in Table 1. Due to a small sample size for former smokers, prevalence rates for former smokers are not calculated for each age group separately but rather for all adults 35+. In addition, due to insufficient information, smoking prevalence among women 65–74 years of age in RS is assumed to be equal to smoking prevalence in the same age group in FBiH, since the population preferences are similar and the population of both entities is economically, culturally, and ethnically interlaced. Smoking prevalence among women 75+ years of age in FBiH is assumed to be equal to their male counterparts (although, based on other age groups in FBiH, this may be overestimating prevalence among females aged 75+). Data show that among both male and female adults smoking prevalence declines with age, and in all age groups the percentage of current smokers is higher among male than female adults.

**Table 1.** Smoking prevalence in BiH by entity, 2019 (%)

By entity	Current smokers				Former smokers			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
Entity RS								
Male	69.77	53.90	59.83	25.32	8.00	8.00	8.00	8.00
Female	37.67	33.04	24.84*	19.73	18.13	18.13	18.13	18.13
Entity FBiH and BD								
Male	56.48	45.15	47.28	5.48	16.19	16.19	16.19	16.19
Female	46.94	30.22	24.84	5.48**	5.77	5.77	5.77	5.77

Source: Authors’ calculations based on STC-SEE

\* Data of entity FBiH. \*\* Data are from current smoker male, 75+ age group.

*Relative risks*

Table 2 presents RRs for the USA and Belarus, which are used in the cost estimation. The estimation according to the Russia and Hungary RR is in Appendix Table A6. For all causes of death, USA RRs by type of smoking-related disease are listed in Appendix Table A5. As already mentioned, USA RR is used as the robustness check in this study. RRs for RBH are available only for current smokers 35+. For all causes of death, RRs for former smokers are approximated based on the ratio of RRs for current and former smokers in the USA. For example, the ratio of USA RRs for current and former smokers in age group 35–54 is 1.917, so the Russia RR for former smokers in this age group is estimated as  $(1.97/1.917 = 1.03)$ . In those cases where the estimated RR for former smokers is below one, the estimate is rounded up to one to avoid getting negative values in the SAF estimation of former smokers (Appendix tables A7–A8).

**Table 2.** USA and Belarus RRs for all causes, by smoking status

	Relative risk of current smokers				Relative risk of former smokers			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Male</b>								
USA RR	2.55	2.97	3.02	2.4	1.33	1.47	1.57	1.41
Belarus RR	1.82	1.82	1.82	1.82	1.00	1.00	1.00	1.07
<b>Female</b>								
USA RR	1.79	2.63	2.87	2.47	1.22	1.34	1.53	1.43
Belarus RR	1.64	1.64	1.64	1.64	1.12	1.00	1.00	1.00

Sources: United States Department of Health and Human Services, 2014, p. 772; Stefler et al. 2018, p. 24

*SAF for direct medical and indirect morbidity costs*

Tables 3 and 4 present calculated SAFs for RS and FBiH and BD, all causes, respectively based on RRs from Belarus and the USA. In a few cases, estimated SAF for former smokers equals zero, which is due to RR being equal to 1 (as presented in the text above).

In the authors’ primary research conducted with the Belarus RR (tables 3 and 4) the highest SAF is for men in the current smoker group, but there are some cases in the former smoker group where women have a larger SAF than men. As RRs for current smokers are higher than for former smokers, and the percentage of current smokers is higher than former smokers in BiH, it is not surprising that the SAF for current smokers is higher than for former smokers, regardless of which RR is used. In both entities the SAF values are similar and do not show significant differences by gender or age.

**Table 3.** Estimated SAF in RS based on USA and Belarus RRs for all causes, by gender, age, and smoking status, 2019 (%)

	SAF for current smokers				SAF for former smokers				Total SAF			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Males</b>												
USA RR	51.31	50.57	53.61	25.55	1.25	1.79	2.02	2.37	52.56	52.37	55.64	27.92
Belarus RR	36.39	30.65	32.91	17.11	0.00	0.00	0.00	0.46	36.39	30.65	32.91	17.57
<b>Females</b>												
USA RR	22.25	33.65	29.76	21.20	2.98	3.85	6.16	5.70	25.23	37.51	35.92	26.90
Belarus RR	19.10	17.45	13.72	11.21	1.69	0.00	0.00	0.00	20.79	17.45	13.72	11.21

Source: Authors’ calculations

**Table 4.** Estimated SAF in FBiH and BD based on USA and Belarus RRs for all causes, by gender, age, and smoking status, 2019 (%)

	SAF for current smokers				SAF for former smokers				Total SAF			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Males</b>												
USA RR	45.39	45.25	46.65	6.71	2.77	3.87	4.51	5.81	48.16	49.13	51.16	12.52
Belarus RR	31.65	27.02	27.94	4.26	0.00	0.00	0.00	1.06	31.65	27.02	27.94	5.32
<b>Females</b>												
USA RR	26.80	32.58	31.07	7.29	0.92	1.30	2.05	2.25	27.72	33.87	33.11	9.54
Belarus RR	22.98	16.21	13.72	3.39	0.52	0.00	0.00	0.00	23.50	16.21	13.72	3.39

Source: Authors' calculations

**Table 5.** Estimated SAF in RS based on USA RR by disease, by gender, age, and smoking status, 2019 (%)

Smoking-related diseases	SAF for current smokers				SAF for former smokers				Total SAF			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Males</b>												
Lung cancer	87.97	88.31	91.36	79.12	2.57	2.60	3.04	6.35	90.54	90.91	94.40	85.47
Other cancers	33.42	31.45	43.73	22.37	1.86	0.71	2.12	2.76	35.28	32.16	45.86	25.13
Coronary heart disease	65.33	50.73	50.16	19.48	2.16	1.97	2.21	2.01	67.49	52.70	52.37	21.49
Other heart disease	49.27	43.88	41.58	14.17	0.28	2.20	1.46	1.02	49.56	46.08	43.04	15.19
Cerebrovascular disease	49.27	43.88	40.74	10.74	0.28	2.20	1.07	0.85	49.56	46.08	41.81	11.59
Other vascular disease	49.27	43.88	77.33	48.47	0.28	2.20	1.99	2.81	49.56	46.08	79.32	51.28
Diabetes mellitus	49.27	43.88	22.30	0.00	0.28	2.20	3.16	0.48	49.56	46.08	25.46	0.48
Influenza, pneumonia, tuberculosis	68.81	86.05	47.39	13.18	2.78	2.69	2.49	2.82	71.58	88.73	49.87	16.01
Chronic obstructive pulmonary disease	68.81	86.05	91.62	79.42	2.78	2.69	3.05	6.33	71.58	88.73	94.66	85.75
<b>Females</b>												
Lung cancer	78.13	77.46	73.28	68.80	5.01	9.47	13.70	15.41	83.14	86.94	86.97	84.21
Other cancers	9.18	25.35	20.09	14.89	3.79	3.61	3.60	3.97	12.97	28.96	23.69	18.86
Coronary heart disease	55.07	41.73	33.90	18.64	8.19	2.14	6.48	5.76	63.27	43.86	40.39	24.40
Other heart disease	35.17	24.13	16.71	12.27	0.00	1.35	4.16	4.81	35.17	25.48	20.87	17.08
Cerebrovascular disease	35.17	24.13	23.21	11.94	0.00	1.35	3.20	1.57	35.17	25.48	26.41	13.51
Other vascular disease	35.17	24.13	54.02	44.26	0.00	1.35	8.55	8.70	35.17	25.48	62.57	52.96
Diabetes mellitus	35.17	24.13	11.30	95.13	0.00	1.35	4.43	0.05	35.17	25.48	15.73	95.18
Influenza, pneumonia, tuberculosis	63.93	61.84	15.06	16.77	4.82	14.76	4.10	3.05	68.75	76.60	19.16	19.82
Chronic obstructive pulmonary disease	63.93	61.84	71.95	65.23	4.82	14.76	20.40	18.20	68.75	76.60	92.35	83.43

Source: Authors' calculations

For men from FBiH and BD who belong to the 35–54 age group, between 31.65 (Belarus RR, Table 5) and 37.67 percent (Appendix Table A8) of all direct medical and indirect morbidity costs are caused by treating smoking-related diseases. The US SAF follows the same pattern as in the RS entity: the smoking-attributable fraction for men is higher, then for women For women in FBiH aged 35–54,

estimated SAF are higher than in the RS entity and capture around 23.50 percent of all direct medical and indirect morbidity costs (tables 5 and 6).

Men have the highest share of costs due to smoking-related diseases in direct medical and indirect morbidity costs in both entities (by lung cancer, Influenza, pneumonia, tuberculosis, and COPD) (Table 5, and 6). A similar pattern of cost share by disease is seen among women. In the RS entity, from the total amount of direct medical and indirect morbidity costs of smoking-attributable diseases, lung cancer carries 85.47–94.40 percent for men and 83.14–86.97 percent for women. Also, the major difference between genders is that 95.18 percent of all medical and morbidity costs by diabetes mellitus for women aged 75+ is caused by smoking, while that percentage for men is only 0.48. The age category analysis shows that the highest amount of costs caused by smoking differs from disease to disease. The most vulnerable age for both genders is 35–54, since in that age group both genders have the highest SAF rates—men for four diseases and women for five (tables 5 and 6).

**Table 6.** Estimated SAF in FBiH and BD based on USA RR by disease, by gender, age, and smoking status, 2019 (%)

Smoking-related diseases	SAF for current smokers				SAF for former smokers				Total SAF			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Males</b>												
Lung cancer	82.92	83.76	86.00	38.49	6.06	5.95	7.33	28.87	88.99	89.71	93.33	67.35
Other cancers	28.31	27.55	37.16	5.68	3.95	1.51	4.62	6.54	32.26	29.05	41.78	12.22
Coronary heart disease	58.91	45.32	43.20	4.86	4.87	4.25	4.88	4.69	63.78	49.57	48.08	9.55
Other heart disease	43.88	38.64	35.42	3.41	0.63	4.68	3.18	2.29	44.51	43.32	38.60	5.70
Cerebrovascular disease	43.88	38.64	34.78	2.52	0.63	4.68	2.34	1.86	44.51	43.32	37.12	4.37
Other vascular disease	43.88	38.64	71.21	16.17	0.63	4.68	4.68	8.75	44.51	43.32	75.90	24.93
Diabetes mellitus	43.88	38.64	17.88	0.00	0.63	4.68	6.49	0.96	44.51	43.32	24.37	0.96
Influenza, pneumonia, tuberculosis	62.07	81.19	40.43	3.08	6.26	6.12	5.44	6.17	68.33	87.31	45.87	9.26
Chronic obstructive pulmonary disease	62.07	81.19	86.29	38.85	6.26	6.12	7.35	28.95	68.33	87.31	93.64	67.80
<b>Females</b>												
Lung cancer	84.06	81.51	80.82	48.01	1.38	3.47	4.81	12.32	85.44	84.98	85.63	60.33
Other cancers	11.48	24.31	20.60	4.78	1.21	1.20	1.17	1.46	12.69	25.52	21.77	6.24
Coronary heart disease	63.56	40.19	35.47	6.27	2.42	0.72	2.16	2.22	65.98	40.90	37.63	8.49
Other heart disease	40.33	22.75	17.19	3.88	0.00	0.44	1.36	1.74	40.33	23.19	18.56	5.62
Cerebrovascular disease	40.33	22.75	23.73	3.67	0.00	0.44	1.04	0.55	40.33	23.19	24.77	4.23
Other vascular disease	40.33	22.75	57.36	19.80	0.00	0.44	2.89	4.46	40.33	23.19	60.25	24.26
Diabetes mellitus	40.33	22.75	11.65	84.52	0.00	0.44	1.46	0.05	40.33	23.19	13.11	84.58
Influenza, pneumonia, tuberculosis	70.84	66.81	15.49	5.43	1.36	5.55	1.34	1.13	72.21	72.37	16.84	6.56
Chronic obstructive pulmonary disease	70.84	66.81	83.57	44.76	1.36	5.55	7.55	14.32	72.21	72.37	91.12	59.08

Source: Authors' calculations

The total SAF values by disease are higher in RS than in FBiH and BD (tables 5 and 6) for all age categories for men and for women aged 55+. Women in the age group 35–54 are an exception, since smoking has a higher contribution to the direct and indirect mortality costs in FBiH than RS. The ratio of SAF values by diseases, by gender, and among age groups in both entities is almost the same. The same diseases cause the highest SAF values in all territorial units in BiH. For men who are from FBiH and BD, the highest amount of direct medical and indirect morbidity costs are caused by lung cancer. Smoking causes between 67.35–93.33 percent of costs for treating lung cancer among men, depending on age, and 60.33–85.63 percent among women. The other diseases with the highest SAF values are coronary heart diseases, COPD, and influenza, pneumonia, and tuberculosis.

#### *SAF for indirect mortality costs*

Following the methodology of indirect mortality cost estimation by Rice et al., the authors use five-year age intervals (Appendix tables A44–A47), which are narrower than the age intervals used in the previous direct medical and indirect morbidity costs estimations. The age intervals used in these indirect mortality cost estimations are 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70–74, 75–79, 80–84, 85+; while the age intervals used in the direct medical and indirect morbidity cost estimations are 35–54, 55–64, 65–74, and 75+.

The SAF used to estimate the mortality cost is calculated in the same way as in direct and morbidity estimation, using the formula described above.

In the authors' primary research by RBH RR, the highest SAF is calculated using the Hungary RR, followed by the Russia and Belarus RRs. In the RS entity (Appendix Table A46) the age category of current smokers with the highest SAF values is 50–54 for men and 75–79 for women, which means that those age categories have the highest share of smoking-attributable deaths (and costs) in all cause deaths for current smokers (40.18–46.24 percent for men, 39.02–53.49 percent for women). By the USA RR, the share of smoking-related deaths (and costs) in total deaths is the highest for ages 60–64 (60.06 percent) for men and women ages 75–79 (59.51 percent).

## Results

### Direct cost estimation

Direct cost estimation consists of two major parts: direct medical costs and direct non-medical costs. Direct medical costs consist of the three parts. The first two parts refer to the health treatment of illnesses and the costs of dispensing and shaking drugs (CSDS), and both are financed by the HIF. The third part is the out-of-pocket (OOP) costs. Direct non-medical costs include the caregivers and transportation costs (CTC).

### Direct smoking-attributable costs

The estimated direct cost (all cause) is 557.30 million BAM, based on the Belarus RR (Table 7). The first component of direct costs is medical cost estimation, and it ranges between 500.89–688.46 million BAM in 2019, depending on the RR used (Table 7 and Appendix Table A10).

The direct medical costs without CSDS are 350.03 million BAM, by the Belarus RR. The CSDS are estimated at 11.26 percent of direct medical smoking-attributable costs, based on available literature (Appendix Table A14), which is 3.96 million BAM. The OOP expenditure, as part of direct medical costs, is estimated at 29.33 percent of current health expenditure in 2019 and assigned to direct medical costs (estimated range is 146.91–201.93 million BAM, depending on RR used).

The second component of direct costs is non-medical costs, which are between 56.41–77.53 million BAM, depending on the RR used.

The estimated direct costs have the same pattern regarding the RR used: the costs estimated using Hungary RRs are the highest, followed by the estimation using Russia RRs, while the lowest cost is with the usage of Belarus RRs (Table 6 and Appendix Table A10). The USA RR (all cause) direct medical cost estimation is used as a robustness validation with even higher values (976.70 million BAM), compared to the average of the RBH estimations (648.30 million BAM). People aged 35–54 have the highest contribution to the direct cost estimation, in both genders. Men cause, on average by the RBH RR estimation (Appendix Table A10), around 26 percent more all-cause direct costs than women do (374.39 million BAM and 273.91 million BAM, respectively).



**Table 7. Direct costs in BiH, by gender, age, and cost component, based on USA and Belarus RRs for all causes, 2019 (in million BAM)**

No.	According to USA, all-cause RRs	35+			35-54			55-64			65-74			≥75		
	Type of smoking-attributable cost (in million BAM)	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
1	Direct medical cost (without OOP and CDSD)	613.44	256.15	357.29	170.64	68.74	101.90	180.22	74.78	105.45	206.94	83.76	123.18	55.64	28.88	26.76
2	Costs of dispensing and shaking drugs (CDSD)	6.93	2.90	4.03	1.93	0.78	1.15	2.04	0.85	1.19	2.34	0.95	1.39	0.63	0.33	0.30
3	Out-of-pocket costs (OOP)	257.47	107.51	149.96	71.62	28.85	42.77	75.64	31.39	44.26	86.86	35.16	51.70	23.35	12.12	11.23
4	Caregivers and transportation costs (CTC)	98.86	41.28	57.58	27.50	11.08	16.42	29.04	12.05	16.99	33.35	13.50	19.85	8.97	4.65	4.31
5	<b>Total</b>	<b>976.70</b>	<b>407.84</b>	<b>568.85</b>	<b>271.68</b>	<b>109.45</b>	<b>162.24</b>	<b>286.95</b>	<b>119.06</b>	<b>167.89</b>	<b>329.48</b>	<b>133.36</b>	<b>196.12</b>	<b>88.58</b>	<b>45.98</b>	<b>42.61</b>
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost	877.84	366.56	511.28	244.18	98.37	145.82	257.90	107.01	150.90	296.13	119.86	176.27	79.62	41.32	38.29
2	Direct non-medical cost	98.86	41.28	57.58	27.50	11.08	16.42	29.04	12.05	16.99	33.35	13.50	19.85	8.97	4.65	4.31
No	According to Belarus, all-cause RRs															
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost (without OOP and CDSD)	350.03	138.16	211.86	126.02	57.77	68.25	94.77	35.41	59.37	103.18	33.56	69.62	26.05	11.43	14.63
2	Costs of dispensing and shaking drugs (CDSD)	3.96	1.57	2.39	1.42	0.65	0.77	1.07	0.40	0.67	1.17	0.38	0.79	0.29	0.13	0.17
3	Out-of-pocket costs (OOP)	146.91	57.99	88.92	52.89	24.25	28.65	39.78	14.86	24.92	43.31	14.09	29.22	10.94	4.80	6.14
4	Caregivers and transportation costs (CTC)	56.41	22.27	34.14	20.31	9.31	11.00	15.27	5.71	9.57	16.63	5.41	11.22	4.20	1.84	2.36
5	<b>Total</b>	<b>557.30</b>	<b>219.98</b>	<b>337.32</b>	<b>200.64</b>	<b>91.98</b>	<b>108.67</b>	<b>150.90</b>	<b>56.37</b>	<b>94.52</b>	<b>164.28</b>	<b>53.44</b>	<b>110.84</b>	<b>41.48</b>	<b>18.19</b>	<b>23.29</b>
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost	500.89	197.72	303.18	180.33	82.67	97.67	135.62	50.67	84.96	147.65	48.03	99.62	37.29	16.35	20.93
2	Direct non-medical cost	56.41	22.27	34.14	20.31	9.31	11.00	15.27	5.71	9.57	16.63	5.41	11.22	4.20	1.84	2.36

Source: Authors' calculations

## Indirect morbidity cost estimation

### Bosnia and Herzegovina – country-level morbidity costs

The total morbidity cost is estimated to be between 50.6 and 66.7 million BAM, depending on the assumed RBH RRs (Table 8, Appendix Table A20).

Total smoking-attributable indirect morbidity costs are 50.6 million BAM, based on the Belarus RR. If indirect morbidity cost is calculated based on USA RR, then it goes up to 78.4 million BAM (Table 8).

For men, morbidity costs are between 33.8 million BAM, based on the Belarus RR, and 40.1 million BAM based on Hungary RR. The corresponding estimates for women are between 16.7 million BAM, based on Belarus RR, and 26.6 million BAM, based on Hungary RR (Table 8, Appendix Table A20). Among men, smoking causes the highest morbidity costs for the age group 35–54 (between 21.4–25.3 million BAM) and the lowest among those 75 years and older, between 12.2–16.9 thousands BAM (Table 8, Appendix Table A20). Similarly, for women, the highest costs are for the group 35–54 (between 11.9–18.8 million) and lowest for those 75 years or older (between 8.3–17.3 thousands).

**Table 8.** Morbidity costs in BiH, by gender and age, based on USA and Belarus RRs for all causes, 2019 (in thousands of BAM)

Gender ↓	Age group →	35+	35-54	55-64	65-74	>=75
<b>Males</b>						
	USA RR	53,974.42	31,922.69	21,046.14	982.26	23.33
	Belarus RR	33,861.54	21,416.74	11,880.98	551.60	12.23
<b>Females</b>						
	USA RR	24,447.24	14,237.77	9,543.53	643.17	22.77
	Belarus RR	16,728.00	11,943.68	4,512.46	263.53	8.32
<b>Total</b>						
	USA RR	78,421.65	46,160.46	30,589.67	1,625.43	46.10
	Belarus RR	50,589.54	33,360.43	16,393.44	815.13	20.55

Source: Authors' calculations

### Indirect morbidity costs for the entities

Total smoking-attributable indirect morbidity costs in RS entity are 20.1 million BAM (Belarus RR). When USA RR is used, these costs are 30.8 million BAM.

For men in RS entity in 2019, indirect morbidity costs are between 13.8–16.2 million, based on different RBH RRs used for the calculation (Table 9, Appendix Table A21). At the same time, in RS entity the levels of the same costs for women are between 6.3–10.3 million, again different in accordance with different RBH RRs used for the calculations (Table 9, Appendix Table A21). When analyzing specific age groups, the highest costs for men are in the age group 35–54 and the lowest among those above 75 years, where it is measured in thousands. The same age comparison is present for women, having the highest costs for the group 35–54 and the lowest for those 75 years and older.

The total smoking-attributable indirect morbidity costs in the FBiH and BD are 30.4 million BAM, with usage of Belarus RR. When using USA RR, these costs increase to almost 47.6 million BAM (Table 9, Appendix Table A21).

For women in FB&H and BD in 2019 the indirect morbidity costs are between 10.4 and 16.2 million, depending on different RBH RRs used for the calculations (Table 9, Appendix Table A21). At the same time, the level of the same costs for men in this entity are between 20 and 23.9 million, again different in accordance with different RBH RRs used for the calculations (Table 9, Appendix Table A21). When analyzing specific age groups, the highest costs for men are in the age group 35–54 and the lowest are among those 75 years and older. The same age comparison is present for women, having the highest cost for the group 35–54 and the lowest for those 75 years and older.

**Table 9.** Morbidity cost by entity, by gender and age, based on USA and Belarus RRs for all causes, 2019 (in thousands of BAM)

Age group → All-cause RRs ↓	TOTAL for 35+	35-54	55-64	65-74	>=75
<b>RS</b>					
<b>Males</b>					
USA RR	21,350.21	12,355.83	8,649.23	333.80	11.35
Belarus RR	13,822.10	8,555.25	5,062.24	197.47	7.14
<b>Females</b>					
USA RR	9,502.20	5,306.30	4,103.36	88.80	3.73
Belarus RR	6,316.66	4,371.69	1,909.50	33.91	1.56
<b>Total</b>					
USA RR	30,852.40	17,662.13	12,752.59	422.61	15.08
Belarus RR	20,138.76	12,926.94	6,971.75	231.37	8.70
<b>FBiH</b>					
<b>Males</b>					
USA RR	32,624.21	19,566.87	12,396.91	648.45	11.98
Belarus RR	20,039.45	12,861.50	6,818.73	354.13	5.09
<b>Females</b>					
USA RR	14,945.04	8,931.47	5,440.17	554.37	19.04
Belarus RR	10,411.34	7,571.99	2,602.96	229.62	6.77
<b>Total</b>					
USA RR	47,569.25	28,498.33	17,837.08	1,202.82	31.01
Belarus RR	30,450.78	20,433.49	9,421.69	583.75	11.85

Source: Authors' calculations

### Smoking-attributable mortality cost (SAMC)

The estimated SAMC in BiH using Belarus RRs for the total population aged 35 and older is 110.85 million BAM. It ranges between 90.18 and 108.25 million BAM for men and 20.67–32.75 million BAM for women in 2019, depending on the applied RR (Table 10, Appendix Table A48). The age group with the highest contribution to the SAMC is the youngest one, aged 35–54. Also, smoking causes higher mortality costs among men than women. The difference between genders is highlighted in the 55–64 age category among current smokers, where smoking causes five times higher mortality costs among men than women (Appendix tables A52–A53). As for the direct and indirect morbidity costs, the indirect mortality cost based on the USA RR is higher than the one based on the Belarus RR.

**Table 10.** Mortality costs in BiH, by gender, age, and total, based on USA and Belarus RRs for all causes, 2019 (in million BAM)

All-cause RR↓	Total (current + former smoker)				
Age group →	35+	35-54	55-64	65-74	>=75
<b>Men</b>					
USA	155.94	94.95	49.28	11.21	0.50
Belarus	90.18	59.05	25.20	5.66	0.26
<b>Women</b>					
USA	31.15	16.25	11.27	3.31	0.33
Belarus	20.67	13.65	5.43	1.42	0.17
<b>Total (men &amp; women)</b>					
USA	187.09	111.20	60.55	14.52	0.83
Belarus	110.85	72.71	30.63	7.08	0.43

Source: Authors' calculations

### Direct costs estimation by diseases – robustness validation

Taking advantage of the estimated USA RR by type of smoking-related diseases, the direct cost is also estimated for only selected diseases that are attributed to smoking (Table 11). It is estimated that male smokers bear around two-thirds (87.47 million BAM) of total direct medical costs of 136.68 million BAM (Table 11). The results show that adults 65–74 years of age have the highest health cost burden, regardless of gender. For men, the diseases for which treatment causes the most of the costs are other cancers and coronary heart diseases (15.2 and 15.5 percent of total direct smoking-related costs, or 13.32 and 13.57 million BAM, respectively). The costs of treatments for these diseases are followed by COPD (14.3 percent, corresponding to 12.49 million BAM) and diabetes mellitus (13.8 percent of total smoking-related costs for men, corresponding to 12.07 million BAM). Among women, smoking causes the highest costs for the treatment of diabetes mellitus (27.2 percent, or 13.40 million BAM) and COPD (16.3 percent of total direct smoking-related costs, or 8.00 million BAM). The cost of lung cancer treatment for men is almost three times higher than for women (10.40 and 3.76 million BAM, respectively) and contributes 11.89 percent (for men), and 7.64 percent (for women) to total direct medical costs by diseases in BiH.

**Table 11.** Direct medical costs in BiH, by gender and age, based on USA RR by disease, 2019 (in million BAM)

Smoking-related diseases	35+ (total)	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	10.40	0.89	4.12	4.63	0.77
Other cancers	13.32	2.20	4.01	6.11	1.01
Coronary heart disease	13.57	3.22	4.91	4.71	0.73
Other heart disease	11.07	2.09	3.35	4.67	0.96
Cerebrovascular disease	3.89	0.64	1.20	1.74	0.31
Other vascular disease	6.24	0.53	1.55	3.29	0.86
Diabetes mellitus	12.07	3.34	5.79	2.89	0.03
Influenza, pneumonia, tuberculosis	4.42	1.54	1.62	1.03	0.24
COPD	12.49	0.72	2.69	5.28	3.81
<b>Sum of all smoking-related causes</b>	<b>87.47</b>	<b>15.17</b>	<b>29.23</b>	<b>34.36</b>	<b>8.71</b>
<b>Females</b>					
Lung cancer	3.76	0.72	1.51	1.31	0.22
Other cancers	5.22	0.89	2.35	1.58	0.41
Coronary heart disease	5.83	0.98	1.59	2.53	0.73
Other heart disease	5.59	1.17	1.08	2.04	1.29
Cerebrovascular disease	2.32	0.54	0.44	0.87	0.47
Other vascular disease	2.22	0.18	0.32	1.09	0.63
Diabetes mellitus	13.40	1.74	2.55	1.93	7.18
Influenza, pneumonia, tuberculosis	2.88	1.23	1.11	0.30	0.24
COPD	8.00	0.65	1.67	3.08	2.60
<b>Sum of all smoking-related causes</b>	<b>49.21</b>	<b>8.10</b>	<b>12.61</b>	<b>14.73</b>	<b>13.77</b>

Source: Authors' calculations

Table 12 shows the estimated direct costs for smoking-related diseases once CSD, OOP, and CTC are added.

**Table 12.** Total direct costs in BiH, by gender, based on USA RR by disease, 2019 (in BAM)

	Cost description	Male and female	Female	Male
1	Total medical cost for all diseases	1,737.18	914.86	822.32
2	Total medical cost for smoking-related diseases	575.89	367.46	208.43
3	Total smoking-attributable direct medical cost (without CSD)	136.69	49.21	87.47
4	CSD	19.64	10.37	9.27
6	Smoking-attributable CSD	6.93	2.90	4.03
7	Total smoking-attributable direct medical cost financed by state HIFs (3+6)	143.62	52.12	91.50
8	Out-of-pocket expenditure	59.60	21.62	37.98
9	Direct medical smoking-attributable costs (7+8)	203.22	73.74	129.48
10	CTC	22.89	8.30	14.58
11	Direct smoking-attributable cost (9+10)	226.11	82.05	144.06

Source: Authors' calculations

## Bosnia and Herzegovina – morbidity by diseases, robustness validation

Since RRs for specific diseases are only available for the USA, morbidity costs by diseases are also separately calculated just based on USA RRs. Costs connected to coronary heart diseases, other cancers, and other heart diseases—at 2.6, 1.9, and 1.6 million BAM, respectively—have the highest participation in total cost caused by smoking for men, followed by cerebrovascular disease and lung cancer (with around 1.2 million BAM in costs of treatments for each of these diseases). The lowest costs for men are other vascular disease costs and COPD, both with less than 0.6 million BAM (Table 13).

Analyzing the sum of all disease indirect morbidity costs, men are at 11.4 million BAM and women at 3.2 million BAM, with almost a fourfold difference between them. There is no specific indirect morbidity cost for women that is higher than 1 million, but it is interesting to note that among women the highest morbidity costs are the costs of lung and other cancers, at more than 536,000 and 743,000, respectively. Therefore, it can be concluded that tobacco clearly causes different levels of morbidity costs for different specific diseases for the two genders (Table 13).

Additionally, there are several differences between smoking-caused morbidity costs for the specific diseases for different age groups by gender. For example, the highest cost for men ages 35–54 is coronary heart disease, but for the 55–64 and 65–74 age groups the highest cost is for other cancers. On the other hand, the age group 75 and older has the highest cost for lung cancer. A similar situation is seen for women, where the highest cost for 75 and older is other heart disease, compared to those younger than 65 for whom the highest cost is connected to other cancers. Women in the age group 65–74 differ from other age groups with the highest cost for cerebrovascular diseases (Table 13).

**Table 13.** Morbidity costs in BiH, by gender and age, based on USA RR by disease BiH, 2019 (in thousands of BAM)

Tobacco attributed disease ↓	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	1,165.40	371.63	766.88	25.66	1.24
Other cancers	1,902.00	770.61	1,005.53	124.74	1.12
Coronary heart disease	2,623.32	1,615.65	972.34	34.66	0.67
Other heart disease	1,559.72	694.26	815.16	49.48	0.82
Cerebrovascular disease	1,161.11	485.65	659.11	15.85	0.49
Other vascular disease	558.59	225.42	321.37	10.90	0.90
Diabetes mellitus	784.85	416.32	368.43	0.09	0.00
Influenza, pneumonia, tuberculosis	1,043.56	560.68	472.46	9.99	0.42
COPD	585.91	108.78	408.60	66.28	2.25
Sum of all smoking-related causes	11,384.46	5,249.01	5,789.88	337.64	7.92
<b>Females</b>					
Lung cancer	535.58	195.73	333.11	6.20	0.53
Other cancers	743.04	282.48	416.44	43.73	0.39
Coronary heart disease	445.14	199.94	234.31	10.08	0.82
Other heart disease	377.41	240.96	126.47	8.58	1.41
Cerebrovascular disease	343.33	200.57	86.09	55.88	0.79
Other vascular disease	78.55	35.62	38.45	3.99	0.49
Diabetes mellitus	125.03	63.51	61.35	0.13	0.04
Influenza, pneumonia, tuberculosis	429.06	254.05	170.91	3.66	0.44
COPD	157.09	43.02	103.87	8.15	2.05
Sum of all smoking-related causes	3,234.25	1,515.87	1,571.00	140.39	6.97

Source: Authors' calculations

*Entity Republic of Srpska*

Costs connected to coronary heart diseases, other cancers, and other heart diseases—at more than one million, 743,000, and 624,000 BAM, respectively—have the highest share of total costs for men, followed by cerebrovascular disease and lung cancer, both a little less than half a million BAM. The smallest costs for men are other vascular disease costs and chronic obstructive pulmonary disease, the only two at less than 300,000 BAM (Table 14). Analyzing the sum of all disease costs, men are at 4.5 million BAM and women at 1.2 million BAM, again almost a fourfold difference. There is no specific disease cost for women that is higher than 301,000, but it is interesting to note that among women the highest morbidity costs are the costs of lung and other cancers, at more than 225,000 and 300,000, respectively. Therefore, it can be concluded that tobacco clearly causes different levels of morbidity costs for different specific diseases for the two genders in RS, as observed with BiH (Table 14).

Additionally, there are several differences between morbidity for the specific diseases for different age groups for the two genders. For example, the highest cost for men ages 35–54 is coronary heart disease, but for the 55–64 and 65–74 age groups the highest cost is for other cancers. On the other hand, for the age group 75 and older the highest cost is for lung cancer. A similar situation is seen for women, where the highest cost for those 75 and older is other heart disease, compared to those younger than 64 where the highest cost is connected to other cancers. Women in the age group 65–74 differ from other age groups with the highest cost for cerebrovascular diseases (Table 14).

**Table 14.** Morbidity costs in RS, by gender and age group, based on USA RR by disease, 2019 (in thousands of BAM)

Smoking-related diseases	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	482.07	148.83	323.31	9.45	0.48
Other cancers	763.40	298.13	420.93	43.83	0.52
Coronary heart disease	1,021.61	610.96	398.54	11.78	0.32
Other heart disease	624.22	272.21	334.40	17.18	0.43
Cerebrovascular disease	464.94	189.67	269.74	5.28	0.26
Other vascular disease	223.42	88.00	131.70	3.30	0.41
Diabetes mellitus	311.35	161.83	149.48	0.03	0.00
Influenza, pneumonia, tuberculosis	409.82	214.76	191.78	3.11	0.18
COPD	227.37	41.08	163.53	21.98	0.78
Sum of all smoking-related causes	4,528.20	2,025.48	2,383.42	115.93	3.37
<b>Females</b>					
Lung cancer	225.02	76.56	147.81	0.58	0.07
Other cancers	300.82	112.23	181.13	7.40	0.07
Coronary heart disease	176.64	76.86	98.94	0.70	0.14
Other heart disease	142.49	87.26	54.36	0.62	0.25
Cerebrovascular disease	118.99	72.52	37.01	9.31	0.14
Other vascular disease	29.71	12.94	16.44	0.27	0.06
Diabetes mellitus	48.84	22.82	26.00	0.01	0.00
Influenza, pneumonia, tuberculosis	172.87	99.57	72.95	0.27	0.08
COPD	61.07	16.68	43.67	0.54	0.18
Sum of all smoking-related causes	1,276.44	577.44	678.31	19.70	0.99

Source: Authors' calculations

*Entity Federation of BiH*

Analyzing the sum of costs calculated for each smoking-related disease, men's costs are more than three times higher than women's—6.9 million BAM for men compared to less than two million BAM for women (Table 15). There is no specific disease cost for women that is higher than half a million BAM, but it is interesting to note that among women the highest morbidity costs are the costs of lung and other cancers. Therefore, it can be concluded that tobacco clearly causes different levels of morbidity costs for different specific diseases for the two genders in FBiH and BD as in other parts of the country (Table 15).

Additionally, there are several differences between morbidity for the specific diseases for different age groups by the two genders. For example, the highest cost for men ages 35–54 and 55–64 is coronary heart disease, but for those older than 65 it is chronic obstructive disease. A similar situation is seen for women, where the highest cost for those ages 75 and older is other heart disease, compared to those younger than 65, where the highest cost is connected to other cancers. Women in the age group 65–74 differ from other age groups with the highest cost for cerebrovascular diseases (Table 15).

**Table 15.** Morbidity costs in FBiH and BD, by gender and age, based on USA RR by disease, 2019 (in thousands of BAM)

Smoking-related diseases	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	683.34	222.79	443.57	16.21	0.77
Other cancers	1,138.60	472.48	584.60	80.91	0.60
Coronary heart disease	1,601.70	1,004.69	573.79	22.88	0.35
Other heart disease	935.50	422.05	480.76	32.30	0.39
Cerebrovascular disease	696.17	295.99	389.37	10.58	0.23
Other vascular disease	335.17	137.42	189.67	7.60	0.48
Diabetes mellitus	473.50	254.49	218.95	0.07	0.00
Influenza, pneumonia, tuberculosis	633.73	345.92	280.68	6.88	0.25
COPD	358.54	67.70	245.07	44.29	1.48
Sum of all smoking-related causes	6,856.25	3,223.53	3,406.46	221.71	4.55
<b>Females</b>					
Lung cancer	310.56	119.18	185.30	5.62	0.46
Other cancers	442.22	170.25	235.31	36.34	0.32
Coronary heart disease	268.51	123.08	135.37	9.38	0.69
Other heart disease	234.92	153.70	72.11	7.95	1.16
Cerebrovascular disease	224.34	128.05	49.08	46.56	0.65
Other vascular disease	48.84	22.68	22.01	3.72	0.43
Diabetes mellitus	76.20	40.69	35.35	0.12	0.04
Influenza, pneumonia, tuberculosis	256.20	154.47	97.97	3.40	0.36
COPD	96.01	26.34	60.20	7.61	1.87
Sum of all smoking-related causes	1,957.80	9,38.43	892.70	120.70	5.98

Source: Authors' calculations



## Mortality cost estimation – robustness validation

The highest cost in the current smoker group is among men aged 35+, caused by death from lung cancer (28.09 million BAM), while among women that amount is 5.95 million BAM (Table 16). Men died about 2.3 times more frequently than women from lung cancer in 2019 (Appendix Table A40). In total, men have almost five times higher SAMC by disease than women (100.68 million BAM and 21.42 million BAM, respectively) (Table 16), while the SAMC for men who are former smokers in BiH is even higher, at more than seven times that for women (17.9 million BAM and 1.7 million BAM, respectively) (Appendix tables A50, A53, total). The age group that generates the highest SAMC is the youngest one (35–55) for both genders. Other vascular and COPD diseases cause the least deaths for both genders (Appendix Table A41). SAMC estimations by entities are presented in the Appendix, tables A51 and A54.

**Table 16.** Mortality costs in BiH, by gender, age, and total, based on USA RR by disease, 2019 (in million BAM)

Smoking-related diseases	Total (current + former smokers)				
	35+	35-54	55-64	65-74	>=75
<b>Male</b>					
Lung cancer	28.09	11.01	13.95	2.99	0.13
Other cancers	10.23	5.52	3.58	1.08	0.05
Coronary heart disease	27.18	18.23	7.59	1.32	0.04
Other heart disease	13.74	8.21	4.54	0.93	0.05
Cerebrovascular disease	8.63	4.75	3.12	0.73	0.02
Other vascular disease	1.82	1.06	0.50	0.25	0.01
Diabetes mellitus	3.17	1.41	1.50	0.26	0.00
Influenza, pneumonia, tuberculosis	5.41	3.61	1.63	0.17	0.01
COPD	2.41	0.51	1.29	0.55	0.07
<b>Sum of all smoking-related causes</b>	<b>100.68</b>	<b>54.29</b>	<b>37.70</b>	<b>8.30</b>	<b>0.38</b>
<b>Female</b>					
Lung cancer	5.95	2.83	2.57	0.54	0.02
Other cancers	2.59	1.24	1.11	0.22	0.01
Coronary heart disease	4.50	2.84	1.21	0.42	0.03
Other heart disease	2.93	1.94	0.71	0.23	0.04
Cerebrovascular disease	2.38	1.51	0.55	0.29	0.03
Other vascular disease	0.35	0.20	0.07	0.08	0.01
Diabetes mellitus	0.77	0.36	0.31	0.10	0.00
Influenza, pneumonia, tuberculosis	1.14	0.76	0.36	0.03	0.00
COPD	0.79	0.17	0.44	0.15	0.03
<b>Sum of all smoking-related causes</b>	<b>21.42</b>	<b>11.85</b>	<b>7.33</b>	<b>2.06</b>	<b>0.18</b>
<b>Total (male and female)</b>	<b>122.10</b>	<b>66.14</b>	<b>45.03</b>	<b>10.36</b>	<b>0.57</b>

Source: Authors' calculations

The total economic costs of smoking estimated as a sum by disease for smoking-related diseases (using USA RR by disease) is much smaller and amounts to 362.8 million BAM (Table 17) or 1.03 percent of GDP in BiH in 2019. The share of direct, indirect morbidity, and indirect mortality costs in total costs is 62.3, 4.0, and 33.7 percent, respectively.

**Table 17.** Total tobacco-attributable cost by entity and total, based on USA RR by disease (in million BAM)

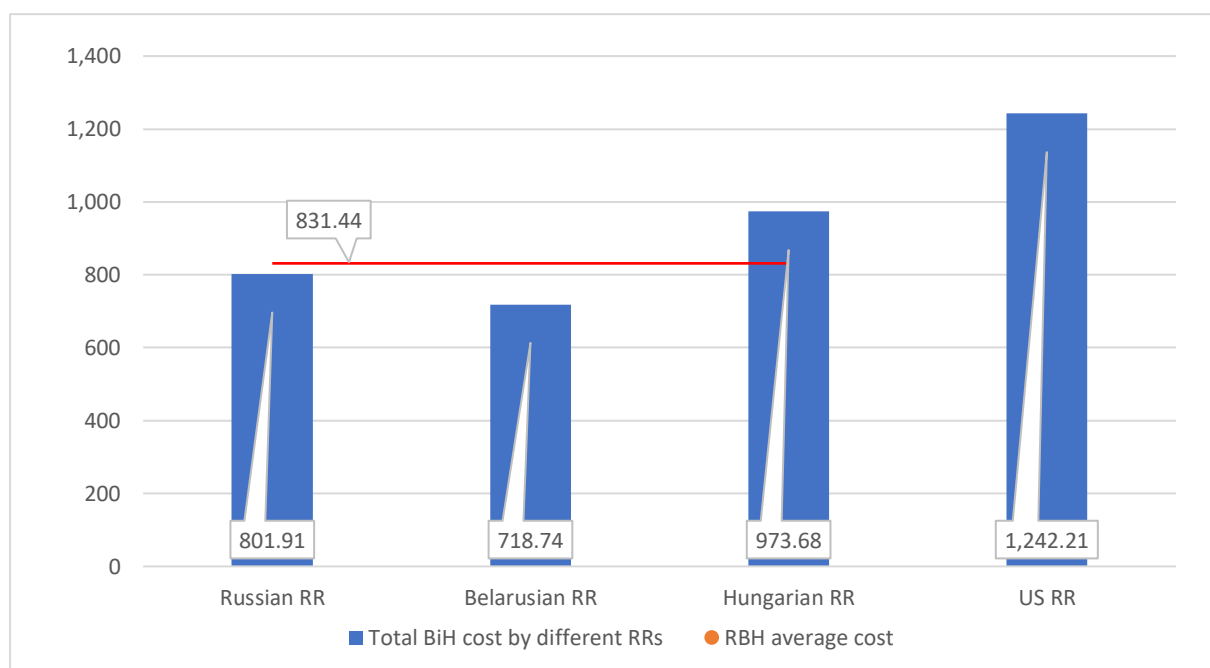
COST OF SMOKING IN 2019	Republic of Srpska			Federation of BiH and Brčko District			Bosnia and Herzegovina		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Direct costs	57.35	33.86	91.21	86.71	48.19	134.91	144.06	82.05	226.11
Indirect morbidity cost	4.53	1.28	5.80	6.86	1.96	8.81	11.38	3.23	14.62
Indirect mortality cost	37.89	6.80	44.69	62.79	14.62	77.41	100.68	21.42	122.10
<b>TOTAL</b>	<b>99.76</b>	<b>41.94</b>	<b>141.70</b>	<b>156.36</b>	<b>64.77</b>	<b>221.13</b>	<b>256.12</b>	<b>106.70</b>	<b>362.82</b>

Source: Authors' calculations

### Total cost based on the different countries' all-cause RRs

The total cost of smoking-related diseases in BiH in 2019 is between 718.74 and 973.68 million BAM (according to Belarus, Russia, and Hungary RRs), Figure 1 (Table 18, Appendix tables A57 and A58). The average of those three estimations is 831.44 million BAM and the robustness check (USA RR) is 1.24 billion BAM (Table 19).

**Figure 1.** Total tobacco-attributable cost for BiH by different RRs (in million BAM)



Source: Authors' calculations

Analysis by gender shows that higher costs are attributed to men—almost two times higher than women for Belarus RR (1.8 times higher) (Table 18). Additionally, analyzing separate types of costs in all three RR options, the highest costs are direct costs, followed by indirect mortality costs and indirect morbidity costs, respectively (Table 18, Appendix tables A57–A58).

**Table 18.** Total tobacco-attributable cost in BiH based on the Belarus RR (in million BAM)

COST OF SMOKING IN 2019	Republic of Srpska			Federation of BiH and Brčko District			Bosnia and Herzegovina		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Direct costs	140.70	82.71	223.41	196.62	137.27	333.89	337.32	219.98	557.30
Indirect morbidity cost	13.82	6.32	20.14	20.04	10.41	30.45	33.86	16.73	50.59
Indirect mortality cost	40.30	7.30	47.60	49.88	13.37	63.25	90.18	20.67	110.85
<b>TOTAL</b>	<b>194.82</b>	<b>96.33</b>	<b>291.15</b>	<b>266.54</b>	<b>161.05</b>	<b>427.59</b>	<b>461.36</b>	<b>257.38</b>	<b>718.74</b>

Source: Authors' calculations

**Table 19.** Total tobacco-attributable cost in BiH based on the US RR (in million BAM)

COST OF SMOKING IN 2019	Republic of Srpska			Federation of BiH and Brčko District			Bosnia and Herzegovina		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Direct costs	227.04	164.75	391.79	341.81	243.09	584.90	568.85	407.84	976.70
Indirect morbidity cost	21.35	9.50	30.85	32.62	14.95	47.57	53.97	24.45	78.42
Indirect mortality cost	67.89	10.74	78.63	88.05	20.41	108.46	155.94	31.15	187.09
<b>TOTAL</b>	<b>316.28</b>	<b>185.00</b>	<b>501.28</b>	<b>462.49</b>	<b>278.44</b>	<b>740.93</b>	<b>778.77</b>	<b>463.44</b>	<b>1,242.21</b>

Source: Authors' calculations

The total average cost of smoking for RS is 336.23 million BAM and for FBiH and BD it is 495.21 million BAM (Table 20). In all territorial units of BiH the costs are significantly higher for men, as in RS, based on Russia RR. But in all three all-cause RRs, smoking-attributed costs for men are higher percentages than those attributed to women (Table 18, Appendix tables A58–A59).

**Table 20.** Average total smoking-attributable cost in BiH based on the RBH RRs

	Republic of Srpska			Federation of BiH and Brčko District			Bosnia and Herzegovina		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
in million BAM									
Direct costs	155.07	104.69	259.77	219.32	169.22	388.53	374.39	273.91	648.30
Indirect morbidity cost	15.14	7.87	23.01	22.16	12.66	34.81	37.30	20.52	57.82
Indirect mortality cost	44.51	8.94	53.46	55.49	16.37	71.86	100.00	25.31	125.32
<b>TOTAL</b>	<b>214.73</b>	<b>121.50</b>	<b>336.23</b>	<b>296.96</b>	<b>198.24</b>	<b>495.21</b>	<b>511.69</b>	<b>319.75</b>	<b>831.44</b>
in million EUR									
Direct costs	79.29	53.53	132.82	112.13	86.52	198.65	191.42	140.05	331.47
Indirect morbidity cost	7.74	4.02	11.76	11.33	6.47	17.80	19.07	10.49	29.57
Indirect mortality cost	22.76	4.57	27.33	28.37	8.37	36.74	51.13	12.94	64.07
<b>TOTAL</b>	<b>109.79</b>	<b>62.12</b>	<b>171.91</b>	<b>151.84</b>	<b>101.36</b>	<b>253.20</b>	<b>261.63</b>	<b>163.48</b>	<b>425.11</b>

Source: Authors' calculations

## Share of costs by type, based on specific country's RRs

Direct costs represent more than three quarters' share of total smoking-attributed costs, for each of the all-cause RRs used for the estimation. By Belarus RR estimation the share is 77.54 percent, which is quite close to the estimation using USA RR robustness check of 78.63 percent. Indirect morbidity costs represent a share of 7.04 percent of total costs, and indirect mortality costs are 15.47 percent (Table 21). Analyzing the share of costs in GDP, the total cost of smoking is 2.04 percentage of GDP of BiH in 2019 (on average 2.36 percent). Using USA RRs, the share of the economic costs of smoking in BiH's GDP is 3.53 percent. The share of mortality cost in BiH GDP is 0.31 percent, according to Belarus RR. Direct costs' share in medical costs is around a quarter. Average RBH smoking-attributed cost based on average values for the three RRs used represents almost 30 percent of medical costs (Table 21), while the robustness check is 44.81 percent.

**Table 21.** Specific cost types' share of total costs, GDP and total medical cost, depending on the applied RR

Based on all-cause RRs of the country	COST OF SMOKING IN 2019	% of total cost	% of GDP	% of medical cost
BELARUS	Direct costs	77.54%	1.58%	25.57%
	Indirect morbidity cost	7.04%	0.14%	
	Indirect mortality cost	15.42%	0.31%	
	TOTAL	100.00%	2.04%	
AVERAGE RBH RR	Direct costs	77.97%	1.84%	29.74%
	Indirect morbidity cost	6.95%	0.16%	
	Indirect mortality cost	15.07%	0.36%	
	TOTAL	100.00%	2.36%	
USA	Direct costs	78.63%	2.77%	44.81%
	Indirect morbidity cost	6.31%	0.22%	
	Indirect mortality cost	15.06%	0.53%	
	TOTAL	100.00%	3.53%	

Source: Authors' calculations

## Limitations of the study

Several weaknesses in this study could affect the accuracy of assessment of the economic costs of smoking in BiH, but none of these weaknesses would change the significance or direction of these findings.

The first weakness is the lack of RR estimates for BiH and inability to estimate them. For this reason, the study relies on estimates from countries that are geographically and culturally close to BiH (Russia, Belarus, and Hungary) and that are similar to BiH in terms of lifestyle and the quality of health care services. However, not many countries were identified to meet this criterion for which RR has been estimated. Most studies on the economic costs of smoking use the USA RR from the Cancer Prevention Study II (CPS-II).<sup>29</sup>

Using RRs from Russia, Belarus, and Hungary could lead to underestimation of smoking-related costs in BiH. There are four RRs by gender, estimated by four different time frames, each seven years long, while the trend of increase of RR is expressed during the time. The authors' analysis shows that Belarus

RR for the period 2006–2013 (which is used in the authors' estimation of costs of smoking in 2019) goes from 1.82 to 2.78 for the period 2014–2021.<sup>2</sup>

Also, the authors of this study highlight the indirect cohort approach limitations of surveys conducted in those three countries, since the relatives of people who smoke (and drink) answered the questionnaire. The sample comes from the European parts of Russia and Belarus. The survey was conducted only in medium-size towns, while “female smoking prevalence rates are more than twice as high in the largest cities.<sup>30</sup>” Women RRs are underestimated especially in Russia, “due to cultural stigma associated with smoking and drinking among women.”<sup>31</sup> Answers were based on behavior recall in the last seven years, which leads to misreporting of events or reporting with a limited degree of accuracy, a fundamental limitation of the collected data.<sup>32</sup>

The authors are also aware that the use of RRs from the Cancer Prevention Study II (CPS-II), USA, has its own limits, since in some studies it has been criticized due to the sample features (only volunteers, with a high proportion of white, educated people from the middle class, and/or adults who were more health conscious than others).<sup>33 34 35 36</sup>

The second weakness, as described previously, is a lack of a detailed database for health costs for all of BiH. Namely, the FBiH entity, which covers about two-thirds of the territory and population of BiH, and BD do not keep data on medical costs and national work-loss days digitally and by diseases according to ICD-10 codes. Therefore, the direct medical and indirect morbidity smoking-attributable costs for FBiH and BD are estimated on an aggregate level according to their share by age and gender in RS.

The third weakness of this study is probable underestimation of indirect morbidity and indirect mortality costs. The wages used in this analysis are underestimated due to the existence of untaxed wages. For indirect costs estimation, the authors have used data on wages from the Tax Administration Office of RS entity, which is underestimated, but there is no study in BiH that estimates untaxed wages in BiH that can be used for the official data corrections. A second source of possible underestimation of indirect costs is the very large proportion of unemployed persons in BiH who are not really unemployed. They live in rural households and achieve significant agricultural production for their own consumption and for sales, but loss of this part of productivity caused by smoking-related diseases is not captured through this study due to lack of data. The third potential reason for the low estimated indirect costs is a very low level of productivity and wages in BiH. In 2019, productivity in BiH measured by GDP per capita was 5.73 times lower than in the European Union,<sup>37</sup> while wages were 2.44 times lower than those in the European Union.<sup>38 39</sup> The fourth source of underestimated indirect morbidity cost is the fact that employed persons who were on sick leave for fewer than 30 days and were not hospitalized are not included in the estimation due to lack of data.

Another limitation is the lack of RRs calculated following the medical cost and “work-loss” ratio approach, which is the best option for the estimation of direct medical and indirect morbidity cost, respectively.<sup>40</sup> Instead, the authors used mortality RRs. While the evidence is limited, a couple of the available studies show that morbidity RR may be higher than the mortality RR.<sup>41</sup>

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<sup>2</sup> Estimation by second degree polynomial.

## Summary, Discussion, and Conclusion

This research estimates the annual economic burden of tobacco smoking in BiH, and it is the first one of its kind. For this purpose, a variety of databases are combined and used to estimate the cost of smoking by gender, age groups, diseases, and entities.

Based on the average value of estimated costs, the share of direct, indirect morbidity, and indirect mortality costs is 1.84, 0.16, and 0.34 percent of GDP in 2019, which gives the share of total smoking-attributable costs in GDP of 2.36 percent.

Notably, the share of direct costs is estimated between 77.52–78.68 percent of total smoking costs (718.48–973.68 million BAM), depending on RR used. It is the highest share of direct cost in total smoking-attributable costs regarding the studies done so far (based on available studies, direct costs are between 7.40–51.10 percent of the total cost, depending on the country, Appendix Table 60). Given that the detrimental impact of smoking on health is greatest in the long run, taking into account the currently high smoking prevalence in BiH these costs can be expected to grow rapidly in the future.

The combined smoking-attributable costs for cancers and heart diseases are estimated at 50.30 percent (68.76 million BAM) of total direct costs of all smoking-related diseases. Those diseases carry 66 percent of all smoking-related deaths (Appendix Table A40) and 64.33 percent of all-cause deaths in BiH in 2019. A disaggregated analysis is conducted by disease, gender, entity, and age group. Men contribute almost double what women contribute to the direct cost by disease. People aged 65–74 carry the major share of this cost.

The indirect costs of smoking share in BiH are estimated as follows: 6.85–7.04 percent of total smoking cost for morbidity and 14.48–15.47 percent for mortality. Those shares in other studies are 0.87–21.80 morbidity, and 38.70–92.60 for mortality costs.

The total tax revenue collected from the tobacco sector in 2019 is 1,038.68 million BAM or 7.05 percent of total budget revenue. The total economic burden of tobacco use in 2019 is between 718.74 and 973.68 million BAM, depending on the RR applied. The share of cost of smoking in BiH in total tobacco tax revenues is between 69.20–93.74 percent. It is possible, due to underestimated indirect cost of smoking, that the cost of smoking exceeds the tobacco tax revenues in BiH.

Based on the findings of this study, the following policy recommendations are offered to policy makers:

- The government should reintroduce the regular annual increase of the tobacco excise tax—which was abandoned in 2019—to decrease consumption of tobacco and exposure to secondhand smoke, encourage smoking cessation, and discourage smoking initiation. This would reduce diseases from smoking and their related future medical costs, increase productivity of workers, and save lives. This excise tax increase should be at the very least equal to the increase in inflation and income in order to achieve its full positive impact.
- Health Insurance Funds should provide increased resources for comprehensive cessation programs to decrease the prevalence and negative effects of smoking in the future, especially those correlated to smoking-related health care costs.
- The government should stop considering tobacco excise revenues as net budget revenues and tobacco excise as an instrument to collect budget revenues. Since smoking imposes costs on society that exceed the excise revenues, tobacco tax's primary goal is not budget financing but

rather decreasing tobacco use and using the revenues to support mass media/social media-based public education programs, cessation support programs, and other measures to decrease tobacco use.

- The government should make determined efforts to improve the implementation of non-price measures, such as enforcing smoke-free areas in public spaces, utilizing the influence of media and social platforms to motivate reduction of or quitting smoking, and expanding the use of visual health warnings—all of which will help to change the cultural perception of smoking as normal for youth and adults in BiH.
- The government should mandate recording of smoking status in the health file of every patient.

## Appendices

### Methodology and data

**Table A1. Smoking-related diseases (ICD10)**

Lung cancer	C33, C34
Other cancers	C00-C16, C25, C32, C53, C64-C65, C67, C18, C20, C22, C92
Coronary heart disease	I20-I25
Other heart disease	I00-I09, I26-I51
Cerebrovascular disease	I60-I69
Other vascular disease	I70-I78
Diabetes mellitus	E10-E14
Influenza, pneumonia, tuberculosis	J10-J11, J12-J18, A15-A19
Chronic obstructive pulmonary disease	J40-J44

Data	Code	Stratification	Source	Notes
Prevalence of ever smokers		Gender and age group	STC-SEE database, 2019	Based on HBS data (latest for 2015) the authors can only calculate prevalence for current smokers.
Prevalence of current smokers		Gender and age group	STC-SEE database, 2019	
Relative risk of developing a particular tobacco-related disease i for current smoker compared to never smoker		Gender and age group, total (i.e., for all diseases) and by disease		Estimates of RRs for BiH do not exist.
Relative risk of developing a particular tobacco-related disease i for former smoker compared to never smoker		Gender and age group, total and by disease	Studies from, Russia, Belarus, Hungary, and CPS-II (USA)	RRs for Russia, Belarus, and Hungary are only available for all causes and current smokers. The missing former smoker RRs for those countries are created based on the coefficient of the relationship among current and former smokers by USA RRs.
Total national annual (2019) expenditures in the country and the annual costs for treating disease i using health care service k among population subgroup j		All diseases and for selected smoking-related diseases based on the reviewed studies (ICD-10 codes), health care service (primary, secondary, treatment abroad, co-financing drugs), age and gender	HIF of RS Ministry of Health of FBiH Government of BD	As described above, disaggregated data are available for only one entity of BiH (RS). For the second entity—FBiH and BD—the data are available on an aggregate level. Data by age, gender, and disease for these territorial units are estimated according to their portion in the total health care costs in RS.
Out-of-pocket medical costs	OOP	Total		World Bank and WHO publish data for out-of-pocket costs as % of current health expenditure (the latest data are for 2018).
Non-medical costs (caregivers and transportation costs)	NMC	Total	Similar studies	As primary data are not available for BiH, these costs are estimated as a % of total costs of smoking, which is available in similar studies.



**Table A2.** Data description for estimation of the direct costs of tobacco use

Data	Code	Stratification	Source	Notes
Prevalence of ever smokers	P <sub>e</sub>	Gender and age group	STC-SEE database, 2019	Based on HBS data (latest for 2015) the authors can only calculate prevalence for current smokers.
Prevalence of current smokers	P <sub>c</sub>	Gender and age group	STC-SEE database, 2019	
Relative risk of developing a particular tobacco-related disease i for current smoker compared to never smoker	RR <sub>ic</sub>	Gender and age group, total (i.e., for all diseases) and by disease	Studies from Russia, Belarus, Hungary,[i] and CPS-II (USA)[iii]	Estimates of RRs for BiH do not exist.
Relative risk of developing a particular tobacco-related disease i for former smoker compared to never smoker	RR <sub>if</sub>	Gender and age group, total and by disease	Studies from Russia, Belarus, Hungary, <sup>42</sup> and CPS-II (USA) <sup>43</sup>	Rrs for Russia, Belarus, and Hungary are only available for all causes and current smokers. The missing former smoker RRs for those countries are created based on the coefficient of the relationship among current and former smokers by USA RRs.
Total national annual (2019) expenditures in the country and the annual costs for treating disease i using health care service k among population subgroup j	THE <sub>ikj</sub>	All diseases and for selected smoking-related diseases based on the reviewed studies (ICD-10 codes), health care service (primary, secondary, treatment abroad, co-financing drugs), age and gender	HIF of RS Ministry of Health of FBiH Government of BD	As described above, disaggregated data are available for only one entity of BiH (RS). For the second entity—FBiH and BD—the data are available on an aggregate level. Data by age, gender, and disease for these territorial units are estimated according to their portion in the total health care costs in RS.
Out-of-pocket medical costs	OOP	Total	World Bank <sup>44</sup>	World Bank and WHO publish data for out-of-pocket costs as % of current health expenditure (the latest data are for 2018).
Non-medical costs (caregivers and transportation costs)	NMC	Total	Similar studies	As primary data are not available for BiH, these costs are estimated as a % of total costs of smoking, which is available in similar studies.

Source: Authors' compilation

**Table A3.** Data description for estimation of the indirect morbidity costs of tobacco use

Data	Code	Stratification	Source	Notes
Total yearly work-loss days in 2019 due to disease <i>i</i> among population subgroup <i>j</i> and for all tobacco-related diseases	TWLD <sub>ij</sub>	total for all tobacco-related diseases and for selected smoking-related diseases, age group, gender	HIF of RS	As described above, disaggregated data are available for only one entity of BiH (RS). For the second entity—FBiH and BD—the data are available on an aggregate level. Total yearly work-loss days for FBiH and BD are estimated using work-loss days obtained for RS and corrected for difference in number of employees.
Employment rate	EMPL	age group, gender	Institute for Statistics of FBiH <sup>45</sup> Republic of Srpska Institute for Statistics <sup>46</sup> International Labour Organization <sup>47</sup>	
Mean daily salary by population subgroup	ERN <sub>j</sub>	age group, gender	Tax Administration of RS Republic of Srpska Institute for Statistics <sup>48</sup> FIN PROFI, Ltd. <sup>49</sup>	

**Table A4.** Data description for estimation of the indirect mortality costs of tobacco use (SAMC)

Data	Code	Stratification	Source	Notes
Total number of deaths by population subgroup and the number of total deaths from all tobacco-related diseases	THDEATH <sub>ija</sub>	age group, gender, total for all diseases and for selected smoking-related diseases	Agency for Statistics of BiH, RS, FBiH	
Population	POP	gender, age group, entity of BiH	Agencies for statistics in BiH <sup>50</sup>	
Total number of employed persons	POPe	gender, age group, entity of BiH	Agencies for statistics in BiH	
Total number of unemployed persons	POPue	gender, age group, entity of BiH	Agencies for statistics in BiH	
Person-years lived between ages $x$ and $x+n$	nLx	gender	WHO	
Number of people surviving to age $x$	(lx)	gender	WHO	
Probability that a person of age $a$ and gender $g$ will survive to age $n$	SURV <sub>ag</sub>	age group, gender	WHO	The probability would be calculated based on "nqx - probability of dying between ages $x$ and $x+n$ "
Mean annual earnings of an employed person of gender $g$ and age $n$	Y <sub>g</sub> (n)	age group, gender	Tax Administration of RS Republic of Srpska Institute for Statistics <sup>51</sup> FIN PROFI, Ltd. <sup>52</sup>	
Proportion of the population of gender $g$ and age $n$ that are employed in the labor market	E <sub>g</sub> (n)	age group, gender	Official statistics Tax Administration Office of RS	World Bank -WDI; Agency for Statistic of BiH, RS, FBiH; TT project database
Growth rate of labor productivity	V		World Bank <sup>53</sup>	Proxy: GDP per capita annual growth rate for the period 2011–2019. Similar studies used rate of 1%. <sup>54</sup>
Discount rate	R		Literature review	Similar studies used rate of 3%. <sup>55 56 57</sup>

Source: Authors' compilation

**Table A5.** RRs by disease used in the tobacco-related cost estimation, by USA RR

Smoking-related diseases	Relative risk of current smokers				Relative risk of former smokers			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Males</b>								
Lung cancer	14.33	19.03	28.29	22.51	4.4	4.57	7.79	6.46
Other cancers	1.74	1.86	2.35	2.18	1.36	1.131	1.49	1.46
Coronary heart disease	3.88	2.99	2.76	1.98	1.83	1.52	1.58	1.32
Other heart disease	2.4	2.51	2.22	1.66	1.07	1.51	1.32	1.15
Cerebrovascular disease	2.4	2.51	2.17	1.48	1.07	1.51	1.23	1.12
Other vascular disease	2.4	2.51	7.25	4.93	1.07	1.51	2.2	1.72
Diabetes mellitus	2.4	2.51	1.5	1	1.07	1.51	1.53	1.06
Influenza, pneumonia, tuberculosis	4.47	15.17	2.58	1.62	2.22	3.98	1.62	1.42
Chronic obstructive pulmonary disease	4.47	15.17	29.69	23.01	2.22	3.98	8.13	6.55
<b>Females</b>								
Lung cancer	13.3	18.95	23.65	23.08	2.64	5	6.8	6.38
Other cancers	1.28	2.08	2.06	1.93	1.24	1.28	1.26	1.27
Coronary heart disease	4.98	3.25	3.29	2.25	2.23	1.21	1.6	1.42
Other heart disease	2.44	1.98	1.85	1.75	1	1.1	1.29	1.32
Cerebrovascular disease	2.44	1.98	2.27	1.7	1	1.1	1.24	1.1
Other vascular disease	2.44	1.98	6.81	5.77	1	1.1	2.26	2.02
Diabetes mellitus	2.44	1.98	1.54	101	1	1.1	1.29	1.06
Influenza, pneumonia, tuberculosis	6.43	9	1.75	2.06	1.85	4.48	1.28	1.21
Chronic obstructive pulmonary disease	6.43	9	38.89	20.96	1.85	4.48	15.72	7.06

Source: (United States Surgeon General 2014) p.697-698

**Table A6.** RRs, all causes, for Russia and Hungary

	Relative risk of current smokers				Relative risk of former smokers			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Male</b>								
Russia RR	1.97	1.97	1.97	1.97	1.03	1.00	1.02	1.16
Hungary RR	2.05	2.05	2.05	2.05	1.07	1.01	1.07	1.20
<b>Female</b>								
Russia RR	1.71	1.71	1.71	1.71	1.17	1.00	1.00	1.00
Hungary RR	2.15	2.15	2.15	2.15	1.47	1.10	1.15	1.24

Source: United States Department of Health and Human Services, 2014, p. 772, Stefler et al. 2018, p. 24

**Table A7.** SAF for all causes in RS, by gender, age, and smoking status, based on Russia and Hungary RRs, 2019 (%)

	SAF for current smokers				SAF for former smokers				Total SAF			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Males</b>												
Russia RR	40.31	34.33	36.68	19.52	0.13	0.00	0.12	1.00	40.44	34.33	36.80	20.52
Hungary RR	42.15	36.11	38.46	20.73	0.32	0.07	0.32	1.28	42.47	36.19	38.78	22.01
<b>Females</b>												
Russia RR	20.61	19.00	14.99	12.29	2.31	0.00	0.00	0.00	22.93	19.00	14.99	12.29
Hungary RR	28.55	27.19	21.77	17.85	5.56	1.24	2.02	3.49	34.11	28.43	23.79	21.34

Source: Authors' calculations

**Table A8.** SAF for all causes in FBiH and BD, by gender, age, and smoking status, based on Russia and Hungary RRs, 2019 (%)

	SAF for current smokers				SAF for former smokers				SAF			
	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75	35-54	55-64	65-74	>=75
<b>Males</b>												
Russia RR	35.29	30.46	31.36	4.93	0.29	0.00	0.27	2.36	35.58	30.46	31.62	7.29
Hungary RR	36.97	32.11	32.94	5.28	0.70	0.16	0.71	3.03	37.67	32.27	33.65	8.31
<b>Females</b>												
Russia RR	24.82	17.67	14.99	3.75	0.71	0.00	0.00	0.00	25.53	17.67	14.99	3.75
Hungary RR	34.46	25.69	22.07	5.85	1.72	0.41	0.65	1.31	36.17	26.09	22.72	7.16

Source: Authors' calculations

**Table A9.** Ratio of employed persons by territorial unit

Gender	35+	35-54	55-64	65-74	75+
Total	1.80	2.00	1.82	1.52	1.49
Male	1.81	1.98	1.83	1.51	1.51
Female	1.79	2.03	1.81	1.52	1.48

Source: Authors' calculations

**Direct costs**
**Table A10.** Direct cost estimates in BiH, all cause, by gender, age, and cost component, by Russia and Hungary RR, 2019 (in million BAM)

No	According to Russia all-cause RRs	35+			35-54			55-64			65-74			>=75		
		Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male	Total	Female	Male
1	Direct medical cost (without OOP and CDS)	150.86	239.55	390.41	139.44	63.04	76.40	105.33	38.57	66.76	115.06	36.69	78.38	30.57	12.56	18.02
2	Costs of dispensing and shaking drugs (CDS)	1.71	2.70	4.41	1.58	0.71	0.86	1.19	0.44	0.75	1.30	0.42	0.88	0.35	0.14	0.20
3	Out-of-pocket costs (OOP)	63.32	100.54	163.86	58.52	26.46	32.06	44.21	16.19	28.02	48.29	15.40	32.90	12.83	5.27	7.56
4	Caregivers and transportation costs (CTC)	24.31	38.60	62.92	22.47	10.16	12.31	16.98	6.22	10.76	18.54	5.91	12.63	4.93	2.02	2.90
5.	<b>Total</b>	<b>240.20</b>	<b>381.41</b>	<b>621.60</b>	<b>222.01</b>	<b>100.38</b>	<b>121.63</b>	<b>167.71</b>	<b>61.42</b>	<b>106.29</b>	<b>183.20</b>	<b>58.41</b>	<b>124.79</b>	<b>48.68</b>	<b>19.99</b>	<b>28.69</b>
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost	215.88	342.80	558.69	199.54	90.22	109.32	150.74	55.20	95.53	164.66	52.50	112.16	43.75	17.97	25.79
2	Direct non-medical cost	24.31	38.60	62.92	22.47	10.16	12.31	16.98	6.22	10.76	18.54	5.91	12.63	4.93	2.02	2.90
No	According to Hungary all-cause RRs															
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost (without OOP and CDS)	227.07	254.03	481.10	171.32	90.69	80.64	127.85	57.25	70.59	139.69	56.64	83.04	42.24	22.49	19.75
2	Costs of dispensing and shaking drugs (CDS)	2.57	2.87	5.44	1.94	1.03	0.91	1.45	0.65	0.80	1.58	0.64	0.94	0.48	0.25	0.22
3	Out-of-pocket costs (OOP)	95.31	106.62	201.93	71.91	38.06	33.84	53.66	24.03	29.63	58.63	23.77	34.85	17.73	9.44	8.29
4	Caregivers and transportation costs (CTC)	36.59	40.94	77.53	27.61	14.62	12.99	20.60	9.23	11.38	22.51	9.13	13.38	6.81	3.62	3.18
5.	<b>Total</b>	<b>361.55</b>	<b>404.45</b>	<b>765.99</b>	<b>272.78</b>	<b>144.39</b>	<b>128.39</b>	<b>203.55</b>	<b>91.16</b>	<b>112.40</b>	<b>222.41</b>	<b>90.19</b>	<b>132.22</b>	<b>67.25</b>	<b>35.81</b>	<b>31.45</b>
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost	324.95	363.51	688.46	245.17	129.78	115.39	182.95	81.93	101.02	199.90	81.06	118.84	60.45	32.18	28.26
2	Direct non-medical cost	36.59	40.94	77.53	27.61	14.62	12.99	20.60	9.23	11.38	22.51	9.13	13.38	6.81	3.62	3.18
No	Average according to RBH all-cause RRs															
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost (without OOP and CDS)	172.03	235.15	407.18	145.59	70.50	75.09	109.32	43.74	65.57	119.31	42.30	77.01	32.96	15.49	17.47
2	Costs of dispensing and shaking drugs (CDS)	1.95	2.65	4.60	1.65	0.80	0.85	1.24	0.50	0.74	1.35	0.48	0.87	0.37	0.18	0.20
3	Out-of-pocket costs (OOP)	72.21	98.69	170.90	61.11	29.59	31.52	45.88	18.36	27.52	50.08	17.75	32.32	13.83	6.50	7.33
4	Caregivers and transportation costs (CTC)	27.72	37.89	65.62	23.46	11.36	12.10	17.62	7.05	10.57	19.23	6.82	12.41	5.31	2.50	2.81
5.	<b>Total</b>	<b>273.91</b>	<b>374.39</b>	<b>648.30</b>	<b>231.81</b>	<b>112.25</b>	<b>119.56</b>	<b>174.05</b>	<b>69.65</b>	<b>104.40</b>	<b>189.96</b>	<b>67.35</b>	<b>122.62</b>	<b>52.47</b>	<b>24.66</b>	<b>27.81</b>
	Type of smoking-attributable cost (in million BAM)															
1	Direct medical cost	246.18	336.50	582.68	208.35	100.89	107.46	156.44	62.60	93.84	170.74	60.53	110.21	47.16	22.17	24.99
2	Direct non-medical cost	27.72	37.89	65.62	23.46	11.36	12.10	17.62	7.05	10.57	19.23	6.82	12.41	5.31	2.50	2.81

Source: Authors' calculations

**Table A11.** Comparison of all-cause smoking-attributable direct medical cost in entity RS, by USA and Belarus RRs, 2019 (in million BAM)

All-cause RR	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
USA RR	142.60	36.26	38.81	51.58	15.95
Belarus RR	88.37	25.10	22.71	30.52	10.04
<b>Females</b>					
USA RR	103.48	21.28	28.39	34.86	18.95
Belarus RR	51.95	17.53	13.21	13.31	7.90

Source: Authors' calculations

**Table A12.** Comparison of all-cause smoking-attributable direct medical cost in entity RS, by Russia and Hungary RRs, 2019 (in million BAM)

All-cause RR	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Russia RR	99.18	27.90	25.44	34.12	11.72
Hungary RR	104.64	29.29	26.82	35.96	12.57
<b>Females</b>					
Russia RR	56.92	19.33	14.38	14.55	8.66
Hungary RR	88.40	28.76	21.52	23.09	15.03

Source: Authors' calculations

**Table A13.** Total direct medical cost, by gender, ages 35+, robustness validation, entity RS, 2019 (BAM)

Cost description		Male and Female	Female	Male
1	Total medical cost for all diseases in 2019 (35+)	620.45	327.52	292.93
2	Total medical cost for all smoking-related diseases in 2019 (35+)	131.18	56.93	74.25
3	Total smoking-attributable direct medical cost (without costs of dispensing and shaking drugs)	55.19	20.34	34.81
4	Cost of dispensing and shaking drugs which is not recorded by diseases	7.02	3.70	3.31
5	Average total SAF		31.59%	48.68%
6	Estimated amount of smoking-attributable costs of dispensing and shaking drugs (4x5)	2.78	1.17	1.61
7	Total smoking attributable direct medical cost financed by state HIFs (3+6)	57.93	21.51	36.43
8	Out-of-pocket expenditure (% of current health expenditure) in 2019	29.33%	29.33%	29.33%
9	1-share of OOP costs	70.67%	70.67%	70.67%
10	Direct medical smoking-attributable costs	81.97	30.43	51.54
11	Share of caregivers and transportation costs in direct medical smoking-attributable costs	11.26%	11.26%	11.26%
12	Caregivers and transportation costs in direct medical smoking-attributable costs (10)/(11)	9.23	3.43	5.80
13	Direct smoking-attributable cost (10)+(12)	91.21	33.86	57.35

Source: Authors' calculations

**Table A14.** Smoking-attributable direct medical costs by diseases estimation, entity RS, 2019, (in thousands of BAM)

Smoking-related diseases	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	3,974.64	301.78	1,466.90	1,856.68	349.29
Other cancers	5,446.33	783.53	1,509.30	2,570.97	582.52
Coronary heart disease	5,337.86	1,124.03	1,803.73	1,973.23	436.87
Other heart disease	4,580.92	754.09	1,230.57	1,985.47	610.80
Cerebrovascular disease	1,611.02	231.54	441.39	743.47	194.61
Other vascular disease	2,606.59	190.93	571.01	1,346.99	497.66
Diabetes mellitus	4,526.28	1,205.30	2,129.35	1,183.23	8.40
Influenza, pneumonia, tuberculosis	1,668.43	532.90	576.70	433.10	125.73
Chronic obstructive pulmonary disease	5,061.08	247.92	960.27	2118.44	1,734.46
Sum of all smoking-related causes	34,813.15	5,372.02	10,689.22	14,211.56	4,540.34
<b>Females</b>					
Lung cancer	1,408.16	233.88	545.30	523.38	105.61
Other cancers	2,132.27	297.53	904.01	658.05	272.68
Coronary heart disease	2,437.60	314.38	591.99	1,045.71	485.52
Other heart disease	2,497.11	351.81	408.57	867.18	869.55
Cerebrovascular disease	1,007.34	162.91	165.75	358.47	320.21
Other vascular disease	992.97	54.55	119.46	441.52	377.44
Diabetes mellitus	5,441.47	523.20	962.05	852.69	3,103.53
Influenza, pneumonia, tuberculosis	1,091.28	391.31	410.32	129.35	160.31
Chronic obstructive pulmonary disease	3,327.29	208.04	616.43	1,232.49	1,270.33
Sum of all smoking-related causes	20,335.48	2,537.61	4,723.88	6,108.83	6,965.17

Source: Authors' calculations

**Table A15.** Comparison of all-cause smoking-attributable direct medical cost in entity FBiH and BD, by USA and Belarus RRs, 2019 (in thousands of BAM)

All-cause RRs	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
USA RR	214,692.67	65,643.82	66,640.84	71,595.81	1,812.21
Belarus RR	123,494.43	43,148.34	36,654.78	39,099.75	4,591.57
<b>Females</b>					
USA RR	152,669.51	47,461.81	46,389.84	48,895.36	9,922.51
Belarus RR	86,212.96	40,237.54	22,196.18	20,252.61	3,526.63

Source: Authors' calculations

**Table A16.** Comparison of all-cause smoking-attributable direct medical cost in entity FBiH and BD, by Russia and Hungary RRs, 2019 (in thousands of BAM)

All-cause RRs	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Russia RR	140,374.24	48,500.18	41,317.65	44,259.88	6,296.52
Hungary RR	149,386.81	51,343.33	43,777.16	47,089.24	7,177.08
<b>Females</b>					
Russia RR	93,939.60	43,711.05	24,194.97	22,135.68	3,897.91
Hungary RR	138,673.80	61,928.50	35,735.58	33,555.06	7,454.66

Source: Authors' calculations

**Table A17.** Total direct medical cost, by gender, ages 35+, robustness validation, entity FBiH and BD, 2019 (BAM)

Cost description		Male and Female	Female	Male
1	Total medical cost for all diseases in 2019 (35+)	1,126.72	587.33	529.39
2	Total medical cost for all smoking-related diseases in 2019 (35+)	236.28	102.10	134.18
3	Total smoking-attributable direct medical cost (without costs of dispensing and shaking drugs)	81.54	28.88	52.66
4	Cost of dispensing and shaking drugs which is not recorded by diseases	12.63	6.67	5.96
5	Average total SAF	-	25.99%	40.55%
6	Estimated amount of smoking-attributable costs of dispensing and shaking drugs (4x5)	4.15	1.73	2.42
7	Total smoking-attributable direct medical cost financed by state HIFs (3+6)	85.69	30.61	55.08
8	Out-of-pocket expenditure (% of current health expenditure) in 2019	29.33%	29.33%	29.33%
9	1-share of OOP costs	70.67%	70.67%	70.67%
10	Direct medical smoking-attributable costs	121.25	43.31	77.94
11	Share of caregivers and transportation costs in direct medical smoking-attributable costs	11.26%	11.26%	11.26%
12	Caregivers and transportation costs in direct medical smoking-attributable costs	13.65	4.87	8.78
13	Direct smoking-attributable cost	134.91	48.19	86.71

Source: Authors' calculations



**Table A18.** Smoking-attributable direct medical costs by diseases estimation, entity FBiH and BD, 2019 (in thousands of BAM)

Smoking-related diseases	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	6,422.81	586.11	2,649.67	2,770.98	416.06
Other cancers	7,876.12	1,415.85	2,496.19	3,535.95	428.13
Coronary heart disease	8,232.59	2,099.23	3,105.31	2,734.72	293.33
Other heart disease	6,490.63	1,338.38	2,117.72	2,687.97	346.57
Cerebrovascular disease	2,278.08	410.95	759.60	996.54	110.99
Other vascular disease	3,632.82	338.86	982.68	1,945.66	365.62
Diabetes mellitus	7,538.81	2,139.19	3,664.46	1,709.60	25.56
Influenza, pneumonia, tuberculosis	2,755.14	1,005.24	1,038.71	601.30	109.89
Chronic obstructive pulmonary disease	7,433.35	467.66	1,729.58	3,163.28	2,072.82
Sum of all smoking-related causes	52,660.33	9,801.45	18,543.92	20,145.99	4,168.97
<b>Females</b>					
Lung cancer	2,348.21	488.05	964.43	783.99	111.74
Other cancers	3,085.97	591.07	1,441.52	920.11	133.27
Coronary heart disease	3,396.46	665.73	998.88	1,482.38	249.47
Other heart disease	3,088.39	819.26	672.98	1,173.33	422.81
Cerebrovascular disease	1,311.83	379.36	273.02	511.49	147.96
Other vascular disease	1,226.02	127.04	196.77	646.87	255.35
Diabetes mellitus	7,956.87	1,218.38	1,584.66	1,080.95	4,072.88
Influenza, pneumonia, tuberculosis	1,787.23	834.55	701.40	172.90	78.38
Chronic obstructive pulmonary disease	4,675.96	443.69	1,053.73	1,850.05	1,328.49
Sum of all smoking-related causes	28,876.93	5,567.12	7,887.39	8,622.07	6,800.34

Source: Authors' calculations

**Table A19.** Caregivers and transportation share of costs (%) by five smoking-attributable cost estimation studies

Source:	Country	Year of estimation	Percent share	Amount of costs
John et al. 2009	India	2004	0.076523587	Direct costs 1.192.482.000. Transportation and caregivers 91.253.000 (non-medical direct). Absence from work 1.695.087.000
Shi et al. 2020	China	2015	0.107489994	Direct costs 1.749. Non-medical direct 188
Kang et al. 2003	Korea	1998	0.139871300	Direct medical costs: 194.25. Transportation 4.17. Caregivers 23.00
Bundhamcharoen et al. 2016	Thailand	2009	0.081059880	Direct medical cost 11.473. Indirect medical costs: Transportation 637. Out-of-pocket 531. Non-medical cost: loss of income for caregivers 293
Max et al. 2004	California	1999	0.158137609	Direct total costs 8.564.623. Nursing home care 1.267.232. Home health 87.157
Average			0.112616474	

Source: Authors' literature search

**Morbidity**
**Table A20.** Morbidity costs in BiH for all causes, by gender and age, Russia and Hungary RRs, 2019 (in thousands of BAM)

Gender ↓ Age group →	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Russia RR	37,957.16	23,963.69	13,356.50	621.65	15.32
Hungary RR	40,084.33	25,287.70	14,120.57	659.16	16.90
<b>Females</b>					
Russia RR	18,260.19	13,046.94	4,916.03	288.03	9.18
Hungary RR	26,583.73	18,826.09	7,301.12	439.25	17.26
<b>Total</b>					
Russia RR	56,217.35	37,010.63	18,272.53	909.69	24.50
Hungary RR	66,668.06	44,113.79	21,421.69	1,098.41	34.16

Source: Authors' calculations

**Table A21.** Morbidity cost BiH, all causes, by Russia and Hungary RRs, by gender and age, by entities, 2019 (in thousands of BAM)

All-cause RRs ↓ Age group →	TOTAL for 35+	35-54	55-64	65-74	>=75
<b>RS</b>					
<b>Males</b>					
Russia RR	15,406.41	9,506.94	5,670.35	220.79	8.34
Hungary RR	16,201.98	9,983.47	5,976.89	232.67	8.95
<b>Females</b>					
Russia RR	6,938.74	4,821.30	2,078.67	37.06	1.71
Hungary RR	10,344.41	7,172.25	3,110.39	58.81	2.96
<b>Total</b>					
Russia RR	22,345.15	14,328.23	7,749.02	257.85	10.05
Hungary RR	26,546.39	17,155.72	9,087.28	291.48	11.91
<b>FBiH</b>					
<b>Males</b>					
Russia RR	22,550.74	14,456.75	7,686.15	400.87	6.98
Hungary RR	23,882.35	15,304.23	8,143.68	426.49	7.95
<b>Females</b>					
Russia RR	11,321.45	8,225.64	2,837.36	250.97	7.48
Hungary RR	16,239.32	11,653.84	4,190.74	380.44	14.30
<b>Total</b>					
Russia RR	33,872.20	22,682.39	10,523.51	651.84	14.45
Hungary RR	40,121.67	22,682.39	10,523.51	651.84	14.45

Source: Authors' calculations

**Table A22.** Indirect morbidity cost for RS based on all-cause USA and Belarus RRs (in thousands of BAM)

All-cause RRs↓ Age group →	TOTAL for 35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Belarus RR	13,822.10	8,555.25	5,062.24	197.47	7.14
USA RR	21,350.21	12,355.83	8,649.23	333.81	11.35
<b>Females</b>					
Belarus RR	6,316.66	4,371.70	1,909.50	33.91	1.56
USA RR	9,502.20	5,306.30	4,103.36	88.80	3.73

Source: Authors' calculations

**Table A23.** Indirect morbidity cost for RS based on all-cause Russia and Hungary RRs (in thousands of BAM)

All-cause RRs↓ Age group →	TOTAL for 35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Russia RR	15,406.41	9,506.94	5,670.35	220.79	8.34
Hungary RR	16,201.98	9,983.47	5,976.89	232.67	8.95
<b>Females</b>					
Russia RR	6,938.74	4,821.30	2,078.67	37.06	1.71
Hungary RR	10,344.41	7,172.25	3,110.39	58.81	2.96

Source: Authors' calculations

**Table A24.** Indirect morbidity cost for RS based on USA RRs (in thousands of BAM)

Smoking-related diseases	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	482.07	148.83	323.31	9.45	0.48
Other cancers	763.40	298.13	420.93	43.83	0.52
Coronary heart disease	1,021.61	610.96	398.54	11.78	0.32
Other heart disease	624.22	272.21	334.40	17.18	0.43
Cerebrovascular disease	464.94	189.67	269.74	5.28	0.26
Other vascular disease	223.42	88.00	131.70	3.30	0.41
Diabetes mellitus	311.35	161.83	149.48	0.03	0.00
Influenza, pneumonia, tuberculosis	409.82	214.76	191.78	3.11	0.18
Chronic obstructive pulmonary disease	227.37	41.08	163.53	21.98	0.78
Sum of all smoking-related causes	4,528.20	2,025.48	2,383.42	115.93	3.37
<b>Females</b>					
Lung cancer	225.02	76.56	147.81	0.58	0.07
Other cancers	300.82	112.23	181.13	7.40	0.07
Coronary heart disease	176.64	76.86	98.94	0.70	0.14
Other heart disease	142.49	87.26	54.36	0.62	0.25
Cerebrovascular disease	118.99	72.52	37.01	9.31	0.14
Other vascular disease	29.71	12.94	16.44	0.27	0.06
Diabetes mellitus	48.84	22.82	26.00	0.01	0.00
Influenza, pneumonia, tuberculosis	172.87	99.57	72.95	0.27	0.08
Chronic obstructive pulmonary disease	61.07	16.68	43.67	0.54	0.18
Sum of all smoking-related causes	1,276.44	577.44	678.31	19.70	0.99

Source: Authors' calculations

**Table A25.** Indirect morbidity cost for FBiH and BD based on all-cause USA and Belarus RRs (in thousands of BAM)

All-cause RRs↓ Age group →	TOTAL 35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Belarus RR	20,039.45	12,861.50	6,818.73	354.13	5.09
USA RR	32,624.21	19,566.87	12,396.91	648.45	11.98
<b>Females</b>					
Belarus RR	10,411.34	7,571.99	2,602.96	229.62	6.77
USA RR	14,945.04	8,931.47	5,440.17	554.37	19.04

Source: Authors' calculations

**Table A26.** Indirect morbidity cost for FBiH and BD based on all-cause Russia and Hungary RRs (in thousands of BAM)

All-cause RRs↓ Age group →	TOTAL 35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Russia RR	22,550.74	14,456.75	7,686.15	400.87	6.98
Hungary RR	23,882.35	15,304.23	8,143.68	426.49	7.95
<b>Females</b>					
Belarus RR	10,411.34	7,571.99	2,602.96	229.62	6.77
USA RR	14,945.04	8,931.47	5,440.17	554.37	19.04

Source: Authors' calculations

**Table A27.** Smoking-attributable indirect morbidity cost for FBiH and BD based on US-specific diseases RRs (in thousands of BAM)

Smoking-related diseases	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	683.34	222.79	443.57	16.21	0.77
Other cancers	1,138.60	472.48	584.60	80.91	0.60
Coronary heart disease	1,601.70	1,004.69	573.79	22.88	0.35
Other heart disease	935.50	422.05	480.76	32.30	0.39
Cerebrovascular disease	696.17	295.99	389.37	10.58	0.23
Other vascular disease	335.17	137.42	189.67	7.60	0.48
Diabetes mellitus	473.50	254.49	218.95	0.07	0.00
Influenza, pneumonia, tuberculosis	633.73	345.92	280.68	6.88	0.25
Chronic obstructive pulmonary disease	358.54	67.70	245.07	44.29	1.48
Sum of all smoking-related causes	6,856.25	3,223.53	3,406.46	221.71	4.55
<b>Females</b>					
		0.00	0.00	0.00	0.00
Lung cancer	310.56	119.18	185.30	5.62	0.46
Other cancers	442.22	170.25	235.31	36.34	0.32
Coronary heart disease	268.51	123.08	135.37	9.38	0.69
Other heart disease	234.92	153.70	72.11	7.95	1.16
Cerebrovascular disease	224.34	128.05	49.08	46.56	0.65
Other vascular disease	48.84	22.68	22.01	3.72	0.43
Diabetes mellitus	76.20	40.69	35.35	0.12	0.04
Influenza, pneumonia, tuberculosis	256.20	154.47	97.97	3.40	0.36
Chronic obstructive pulmonary disease	96.01	26.34	60.20	7.61	1.87
Sum of all smoking-related causes	1,957.80	938.43	892.70	120.70	5.98

Source: Authors' calculations

**Table A28.** Total disability days for RS, based on all-cause RR

Gender ↓	Age group →	35-54	55-64	65-74	>=75
Males		518,583.20	348,479.70	11,319.79	1,479.15
Females		512,295.20	240,521.30	4,871.45	419.96

Source: Authors' calculations

**Table A29.** Total disability days for RS, based on USA RRs for specific diseases calculation

Smoking-related diseases	35-54	55-64	65-74	>=75
<b>Males</b>				
Lung cancer	3,626.17	7,503.29	188.84	20.27
Other cancers	18,640.60	27,617.86	1,803.37	74.76
Coronary heart disease	19,969.97	15,955.98	424.51	54.79
Other heart disease	12,117.27	15,310.62	753.13	103.24
Cerebrovascular disease	8,442.75	12,350.11	238.15	80.91
Other vascular disease	3,917.33	6,030.09	78.42	29.36
Diabetes mellitus	7,203.85	6,844.20	2.09	1.42
Influenza, pneumonia, tuberculosis	6,618.31	4,560.19	117.48	40.33
Chronic obstructive pulmonary disease	1,266.06	3,888.29	438.16	32.91
Sum of all smoking-related causes	81,802.32	100,060.63	4,044.17	437.99
All causes (calculation is based on total SAF)	518,583.20	348,479.70	11,319.79	1,479.15
<b>Females</b>				
Lung cancer	2,243.21	3,737.63	13.20	2.50
Other cancers	21,084.98	13,751.88	615.16	10.93
Coronary heart disease	2,959.47	4,958.88	34.13	17.02
Other heart disease	6,044.39	4,690.54	58.71	43.56
Cerebrovascular disease	5,023.37	3,193.63	694.83	32.19
Other vascular disease	896.38	1,418.60	8.46	3.70
Diabetes mellitus	1,580.70	2,243.68	1.26	0.10
Influenza, pneumonia, tuberculosis	3,528.51	2,093.47	27.63	11.66
Chronic obstructive pulmonary disease	591.17	1,253.34	11.44	6.65
Sum of all smoking-related causes	43,952.17	37,341.67	1,464.83	128.31
All causes (calculation is based on total SAF)	512,295.20	240,521.30	4,871.45	419.96

Source: Authors' calculations

**Table A30.** Total disability days attributed to tobacco for RS, based on all-cause USA and Belarus RRs

All-cause RRs ↓	Age group →	35-54	55-64	65-74	>=75
<b>Males</b>					
Belarus RR entity RS		220,230.93	126,104.48	4,389.94	325.54
USA RR entity RS		272,563.94	182,487.22	6,298.15	412.91
<b>Females</b>					
Belarus RR entity RS		1064,98.04	41,978.66	668.14	47.08
USA RR entity RS		129,265.81	90,208.62	1,749.80	112.96

Source: Authors' calculations

**Table A31.** Total disability days attributed to tobacco for RS, based on all-cause Russia and Hungary RRs

All-cause RRs ↓	Age group →	35-54	55-64	65-74	>=75
<b>Males</b>					
	Russia RR entity RS	188,724.85	106,806.62	3,725.73	259.88
	Hungary RR entity RS	209,718.71	119,636.88	4,165.73	303.52
<b>Females</b>					
	Russia RR entity RS	117,450.74	45,697.73	730.26	51.60
	Hungary RR entity RS	174,721.79	68,379.01	1,158.80	89.61

Source: Authors' calculations

**Table A32.** Total disability days attributed to tobacco for RS, based on USA RRs

Smoking-related diseases	35-54	55-64	65-74	>=75
<b>Males</b>				
Lung cancer	3,283.20	6,821.38	178.28	17.33
Other cancers	6,576.55	8,881.07	826.96	18.78
Coronary heart disease	13,477.57	8,408.75	222.31	11.77
Other heart disease	6,004.93	7,055.36	324.13	15.68
Cerebrovascular disease	4,183.95	5,691.12	99.56	9.38
Other vascular disease	1,941.30	2,778.76	62.20	15.06
Diabetes mellitus	3,569.99	3,153.91	0.53	0.01
Influenza, pneumonia, tuberculosis	4,737.45	4,046.40	58.59	6.46
Chronic obstructive pulmonary disease	906.26	3,450.20	414.78	28.22
Sum of all smoking-related causes	44,681.22	50,286.94	2,187.34	122.68
<b>Females</b>				
Lung cancer	1,864.98	3,249.39	11.48	2.10
Other cancers	2,734.10	3,981.87	145.72	2.06
Coronary heart disease	1,872.34	2,175.18	13.79	4.15
Other heart disease	2,125.70	1,195.07	12.25	7.44
Cerebrovascular disease	1,766.63	813.68	183.53	4.35
Other vascular disease	315.24	361.43	5.29	1.96
Diabetes mellitus	555.90	571.65	0.20	0.09
Influenza, pneumonia, tuberculosis	2,425.71	1,603.64	5.29	2.31
Chronic obstructive pulmonary disease	406.41	960.08	10.57	5.55
Sum of all smoking-related causes	14,067.02	14,911.99	388.12	30.03

Source: Authors' calculations

**Table A33.** Daily wage (BAM) in RS by age and gender

Gender ↓	Age group →	35-54	55-64	65-74	>=75
Male		45.33	47.40	53.00	27.48
Female		41.05	45.49	50.75	33.05

Source: Authors' calculations

**Table A34.** Total disability days for FBiH and BD, based on all-cause RR

Gender ↓	Age group →	35-54	55-64	65-74	>=75
Males		511,199.60	341,380.60	12,207.81	1,776.90
Females		500,512.20	236,072.30	6,877.95	1,259.42

Source: Authors' calculations

**Table A35.** Total disability days for FBiH and BD, based on USA RRs for specific diseases

Smoking-related diseases	35-54	55-64	65-74	>=75
<b>Males</b>				
Lung cancer	3,149.96	6,688.83	167.22	21.13
Other cancers	18,426.07	27,219.56	1,865.01	91.94
Coronary heart disease	19,817.97	15,660.69	458.27	67.38
Other heart disease	11,930.30	15,012.10	805.87	126.98
Cerebrovascular disease	8,366.84	12,158.27	274.38	99.51
Other vascular disease	3,884.54	5,922.46	96.45	36.11
Diabetes mellitus	7,193.76	6,836.80	2.57	1.75
Influenza, pneumonia, tuberculosis	6,369.41	4,348.88	144.49	49.61
Chronic obstructive pulmonary disease	1,246.59	3,797.14	455.54	40.47
Sum of all smoking-related causes	80,385.45	97,644.73	4,269.82	534.90
All causes (calculation is based on total SAF)	511,199.60	341,380.60	12,207.81	1,776.90
<b>Females</b>				
Lung cancer	2,166.91	3,205.50	26.96	4.81
Other cancers	20,848.00	13,555.70	685.72	32.77
Coronary heart disease	2,897.93	4,864.67	102.36	51.04
Other heart disease	5,920.02	4,570.06	176.08	130.63
Cerebrovascular disease	4,932.28	3,110.78	772.21	96.52
Other vascular disease	873.61	1,395.19	25.36	11.10
Diabetes mellitus	1,567.12	2,240.60	3.77	0.30
Influenza, pneumonia, tuberculosis	3,323.45	1,989.96	82.87	34.97
Chronic obstructive pulmonary disease	566.62	1,222.73	34.32	19.96
Sum of all smoking-related causes	43,095.95	36,155.19	1,909.65	382.10
All causes (calculation is based on total SAF)	500,512.20	236,072.30	6,877.95	1,259.42

Source: Authors' calculations

**Table A36.** Total disability days attributed to tobacco by specific diseases for FBiH and BD, based on all-cause USA and Belarus RRs

All-cause RRs ↓	Age group →	35-54	55-64	65-74	>=75
<b>Males</b>					
Belarus RR entity RS		279,840.86	141,899.81	6,590.35	182.57
USA RR entity RS		425,736.53	257,983.35	12,067.64	429.93
<b>Females</b>					
Belarus RR entity RS		181,938.60	56,441.56	4,462.67	201.91
USA RR entity RS		214,603.94	117,962.41	10,774.10	568.09

Source: Authors' calculations

**Table A37.** Total disability days attributed to tobacco by specific diseases for FBiH and BD, based on all-cause Russia and Hungary RRs

All-cause RRs ↓	Age group →	35-54	55-64	65-74	≥75
<b>Males</b>					
Russia RR entity RS		314,550.50	159,950.97	7,460.10	250.37
Hungary RR entity RS		332,989.90	169,472.33	7,937.00	285.38
<b>Females</b>					
Belarus RR entity RS		181,938.60	56,441.56	4,462.67	201.91
USA RR entity RS		214,603.94	117,962.41	10,774.10	568.09

Source: Authors' calculations

**Table A38.** Total disability days attributed to tobacco by specific diseases for FBiH and BD, based on specific diseases RRs from USA

Smoking-related diseases	35-54	55-64	65-74	≥75
<b>Males</b>				
Lung cancer	4,847.52	9,230.83	301.60	27.50
Other cancers	10,280.31	12,165.70	15,05.69	21.71
Coronary heart disease	21,859.99	11,940.75	425.77	12.43
Other heart disease	9,182.98	10,004.84	601.07	13.99
Cerebrovascular disease	6,440.12	8,102.90	196.82	8.41
Other vascular disease	2,990.00	3,947.04	141.46	17.39
Diabetes mellitus	5,537.18	4,556.39	1.21	0.03
Influenza, pneumonia, tuberculosis	7,526.56	5,841.03	128.08	8.87
Chronic obstructive pulmonary disease	1,473.07	5,099.99	824.28	53.03
Sum of all smoking-related causes	7,0137.71	70,889.48	4,125.97	163.37
<b>Females</b>				
Lung cancer	2,863.55	4,018.06	109.22	13.72
Other cancers	4,090.73	5,102.37	706.21	9.68
Coronary heart disease	2,957.26	2,935.23	182.23	20.50
Other heart disease	3,693.02	1,563.53	154.58	34.75
Cerebrovascular disease	3,076.85	1,064.27	904.94	19.30
Other vascular disease	544.97	477.33	72.28	12.75
Diabetes mellitus	977.60	766.56	2.34	1.20
Influenza, pneumonia, tuberculosis	3,711.66	2,124.26	66.00	10.86
Chronic obstructive pulmonary disease	632.80	1,305.25	147.94	55.78
Sum of all smoking-related causes	22,548.44	19,356.84	2,345.74	178.52

Source: Authors' calculations

**Table A39.** Daily gross wage in FBiH and BD (BAM)

Gender ↓	Age group →	35-54	55-64	65-74	≥75
Male		45.96	48.05	53.73	27.86
Female		41.62	46.12	51.45	33.51

Source: Authors' calculations



**Mortality**
**Table A40.** Deaths by diseases, all-cause, gender, and age groups in Bosnia and Herzegovina, 2019

Deaths, 2019	35+	35-54	55-64	65-74	>=75
<b>Males</b>					
Lung cancer	1,388.00	93.00	452.00	545.00	298.00
Other cancers	1,814.00	151.00	446.00	587.00	630.00
Coronary heart disease	2,548.00	232.00	521.00	618.00	1,177.00
Other heart disease	2,913.00	150.00	375.00	593.00	1,795.00
Cerebrovascular disease	2,075.00	85.00	259.00	504.00	1,227.00
Other vascular disease	283.00	20.00	39.00	79.00	145.00
Diabetes mellitus	777.00	32.00	122.00	257.00	366.00
Influenza, pneumonia, tuberculosis	375.00	37.00	53.00	91.00	194.00
Chronic obstructive pulmonary disease	397.00	7.00	48.00	108.00	234.00
<b>Sum of all smoking-related causes</b>	<b>12,570.00</b>	<b>807.00</b>	<b>2,315.00</b>	<b>3,382.00</b>	<b>6,066.00</b>
All causes	19,379.00	1,552.00	3,566.00	5,131.00	9,130.00
<b>Females</b>					
Lung cancer	499.00	47.00	143.00	179.00	130.00
Other cancers	1,241.00	130.00	229.00	353.00	529.00
Coronary heart disease	2,129.00	60.00	172.00	388.00	1,509.00
Other heart disease	3,680.00	65.00	168.00	485.00	2,962.00
Cerebrovascular disease	2,530.00	51.00	135.00	410.00	1,934.00
Other vascular disease	275.00	6.00	20.00	41.00	208.00
Diabetes mellitus	1,072.00	13.00	71.00	246.00	742.00
Influenza, pneumonia, tuberculosis	296.00	13.00	24.00	54.00	205.00
Chronic obstructive pulmonary disease	272.00	3.00	28.00	52.00	189.00
<b>Sum of all smoking-related causes</b>	<b>11,994.00</b>	<b>388.00</b>	<b>990.00</b>	<b>2,208.00</b>	<b>8,408.00</b>
All causes	18,804.00	780.00	1,791.00	3,624.00	12,609.00

Source: Official Statistics Agency of Bosnia and Herzegovina

**Table A41.** Average annual salaries by entities, used in PVLE estimation (BAM)

	Average net salaries in RS (monthly)		Average annual gross salaries in RS*		Average annual gross salaries in FBiH and BD	
	Male	Female	Male	Female	Male	Female
15-19	326.40	324.57	5,845.97	5,813.19	5,926.98	5,893.75
20-24	537.02	492.36	9,618.27	8,818.39	9,751.56	8,940.59
25-29	658.01	607.02	11,785.25	10,872.00	11,948.57	11,022.66
30-34	798.78	762.94	14,306.51	13,664.60	14,504.76	13,853.96
35-39	887.59	832.25	15,897.13	14,905.97	16,117.43	15,112.53
40-44	931.54	857.15	16,684.30	15,351.94	16,915.50	15,564.68
45-49	957.53	843.43	17,149.79	15,106.21	17,387.45	15,315.55
50-54	921.14	804.00	16,498.03	14,400.00	16,726.65	14,599.55
55-59	931.19	861.55	16,678.03	15,430.75	16,909.15	15,644.58
60-64	1,009.53	1,013.89	18,081.13	18,159.22	18,331.70	18,410.87
65-69	1,098.42	1,041.53	19,673.19	18,654.27	19,945.82	18,912.77
70-74	885.21	850.03	15,854.51	15,224.42	16,074.21	15,435.39
75-79	560.05	673.55	10,030.75	12,063.58	10,169.75	12,230.75

Source: Institute of Statistics of Republic of Srpska, Official Gazette of Federation Bosnia and Herzegovina

\* Avg. gross salaries in RS = avg. net salaries in RS/0.67\*12, Institute of Statistics of Republic of Srpska.

\*\* Avg. gross salaries in FBiH and BD = gross salaries \* 1,013858, Source: Official Gazette of Federation Bosnia and Herzegovina no. 17, 26, 33, 43, 51, 60, 68, 78, 88, and 95/2019, 5 and 13/2020.

**Table A42.** Employed people according to official statistics and after adding ILO informal employment, employment rates, by entities, 2019

Entity Description	RS						FBIH and BD					
	Employed people		Real emp. No. Of people		Total employment rates		Employed people		Real emp. No. Of people		Total employment rates	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
do 18	81.00	19.00	116.50	27.30	0.00	0.00	361.00	298.00	519.40	428.80	0.01	0.01
19-24	7,609.00	5,190.00	10,948.20	7,467.60	0.26	0.19	15,617.00	9,263.00	22,470.50	13,328.10	0.27	0.17
25-29	12,642.00	10,633.00	18,189.90	15,299.30	0.54	0.49	24,333.00	17,139.00	35,011.50	24,660.40	0.48	0.35
30-34	16,964.00	15,153.00	24,408.60	21,802.90	0.64	0.59	30,995.00	22,871.00	44,597.10	32,907.90	0.55	0.42
35-39	19,241.00	17,030.00	27,684.90	24,503.60	0.68	0.62	32,827.00	24,515.00	47,233.10	35,273.40	0.58	0.45
40-44	18,185.00	14,883.00	26,165.50	21,414.40	0.64	0.54	29,155.00	21,937.00	41,949.60	31,564.00	0.54	0.41
45-49	15,981.00	12,077.00	22,994.20	17,377.00	0.60	0.47	25,756.00	18,062.00	37,059.00	25,988.50	0.50	0.34
50-54	14,822.00	10,874.00	21,326.60	15,646.00	0.53	0.39	24,711.00	16,625.00	35,555.40	23,920.90	0.45	0.29
55-59	14,006.00	10,699.00	20,152.50	15,394.20	0.48	0.34	21,580.00	15,875.00	31,050.40	22,841.70	0.38	0.27
60-64	7,667.00	5,716.00	11,031.70	8,224.50	0.26	0.18	10,193.00	7,278.00	14,666.20	10,471.90	0.20	0.13
65+	789.00	277.00	1,135.30	398.60	0.03	0.01	1,453.00	1,253.00	2,090.60	1,802.90	0.04	0.03

Source: ILO, Labor force survey, 2019

**Table A43.** Mortality SAF, all causes, by gender, age, smoking status, by Russia, Belarus, Hungary, and USA RR, entity RS, 2019 (%)

	Current smokers				Former smokers			
	USA RR	RUSSIA RR	BELARUS RR	HUNGARY RR	USA RR	RUSSIA RR	BELARUS RR	HUNGARY RR
<b>Male</b>								
35-39	52.79	41.17	37.17	43.10	5.07	0.44	0.00	1.11
40-44	48.92	37.47	33.63	39.35	5.07	0.44	0.00	1.11
45-49	50.35	38.82	34.91	40.72	5.07	0.44	0.00	1.11
50-54	55.94	44.28	40.18	46.24	5.07	0.44	0.00	1.11
55-59	34.79	20.80	18.17	22.14	7.07	0.00	0.00	0.24
60-64	60.06	42.55	38.50	44.49	7.07	0.00	0.00	0.24
65-69	58.12	39.99	36.04	41.91	8.45	0.39	0.00	1.05
70-74	48.75	31.36	27.86	33.09	8.45	0.39	0.00	1.05
75-79	32.84	25.30	22.26	26.83	6.23	2.49	1.11	3.20
80-84	0.00	0.00	0.00	0.00	6.23	2.49	1.11	3.20
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Female</b>								
35-39	21.43	19.69	18.10	28.43	1.25	0.95	0.68	2.62
40-44	21.42	19.67	18.09	28.40	1.25	0.95	0.68	2.62
45-49	23.35	21.50	19.80	30.73	1.25	0.95	0.68	2.62
50-54	26.42	24.39	22.53	34.32	1.25	0.95	0.68	2.62
55-59	28.72	14.93	13.66	22.13	1.93	0.00	0.00	0.08
60-64	53.72	33.58	31.31	45.03	1.93	0.00	0.00	0.08
65-69	56.23	32.79	30.54	44.14	2.97	0.00	0.00	0.84
70-74	46.83	25.06	23.16	35.13	2.97	0.00	0.00	0.84
75-79	59.51	41.52	39.02	53.49	2.42	0.00	0.00	1.39
80-84	0.00	0.00	0.00	0.00	2.42	0.00	0.00	1.39
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculations

**Table A44.** Mortality SAF, by disease, by USA RR, by gender, age, and smoking status, entity RS, 2019 (%)

	Current smokers SAF									Former smokers SAF								
	Lung cancer	Other cancers	Coronary heart disease	Other heart disease	Cerebrovascular disease	Other vascular disease	Diabetes mellitus	Influenza, pneumonia, tuberculosis	Chronic obstructive pulmonary disease	Lung cancer	Other cancers	Coronary heart disease	Other heart disease	Cerebrovascular disease	Other vascular disease	Diabetes mellitus	Influenza, pneumonia, tuberculosis	Chronic obstructive pulmonary disease
<b>Males</b>																		
35-39	90.58	34.80	67.51	50.25	50.25	50.25	50.25	71.45	71.45	35.51	5.51	11.85	1.12	1.12	1.12	1.12	16.50	16.50
40-44	89.17	31.38	64.02	46.38	46.38	46.38	46.38	68.19	68.19	35.51	5.51	11.85	1.12	1.12	1.12	1.12	16.50	16.50
45-49	89.71	32.62	65.33	47.80	47.80	47.80	47.80	69.42	69.42	35.51	5.51	11.85	1.12	1.12	1.12	1.12	16.50	16.50
50-54	91.61	37.74	70.23	53.42	53.42	53.42	53.42	73.97	73.97	35.51	5.51	11.85	0.94	1.12	1.12	1.12	16.50	16.50
55-59	83.00	18.89	35.02	29.02	29.02	29.02	29.02	79.33	79.33	36.63	2.08	7.77	7.63	7.63	7.63	7.63	32.55	32.55
60-64	93.23	39.63	60.31	53.55	53.55	53.55	53.55	91.54	91.54	36.63	2.08	7.77	7.63	7.63	7.63	7.63	32.55	32.55
65-69	94.94	48.12	54.74	45.60	44.56	81.11	25.57	52.05	95.17	52.37	7.35	8.59	4.93	3.59	16.27	7.90	9.12	53.59
70-74	92.78	38.86	45.32	36.49	35.52	74.64	19.06	42.66	93.11	52.37	7.35	8.59	4.93	3.59	16.27	7.90	9.12	53.59
75-79	88.25	29.18	25.50	18.73	14.36	57.85	0.00	17.80	88.49	46.93	6.93	4.93	2.37	1.91	10.44	0.96	6.37	47.34
80-84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.93	6.93	4.93	2.37	1.91	10.44	0.96	6.37	47.34
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Females</b>																		
35-39	80.94	8.82	57.89	33.21	33.21	33.21	33.21	65.22	65.22	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
40-44	80.93	8.81	57.86	33.19	33.19	33.19	33.19	65.20	65.20	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
45-49	82.59	9.75	60.55	35.71	35.71	35.71	35.71	67.68	67.68	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
50-54	84.82	11.29	64.40	39.55	39.55	39.55	39.55	71.16	71.16	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
55-59	81.61	21.07	35.74	19.50	19.50	19.50	19.50	66.41	66.41	18.76	1.59	1.20	0.57	0.57	0.57	0.57	18.15	18.15
60-64	92.75	43.48	61.58	41.11	41.11	41.11	41.11	85.07	85.07	18.76	1.59	1.20	0.57	0.57	0.57	0.57	18.15	18.15
65-69	93.96	42.14	61.14	36.87	46.60	79.97	27.06	34.01	96.30	25.09	1.48	3.35	1.65	1.37	6.78	1.65	1.59	45.95
70-74	91.43	33.30	51.89	28.59	37.42	73.23	20.27	26.10	94.69	25.09	1.48	3.35	1.65	1.37	6.78	1.65	1.59	45.95
75-79	95.67	48.19	55.56	42.86	41.18	82.67	0.99	51.46	95.23	23.70	1.54	2.37	1.81	0.57	5.56	0.35	1.20	25.92
80-84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.70	1.54	2.37	1.81	0.57	5.56	0.35	1.20	25.92
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculations

**Table A45.** Mortality SAF, all causes, by gender, age, smoking status, by Russia, Belarus, Hungary, and USA RR, entity FBiH and BD, 2019 (%)

	Current smokers				Former smokers			
	USA RR	RUSSIA RR	BELARUS RR	HUNGARY RR	USA RR	RUSSIA RR	BELARUS RR	HUNGARY RR
<b>Male</b>								
35-39	53.45	41.81	37.79	43.75	5.07	0.44	0.00	1.11
40-44	40.00	29.44	26.07	31.11	5.07	0.44	0.00	1.11
45-49	42.94	32.02	28.47	33.76	5.07	0.44	0.00	1.11
50-54	45.33	34.17	30.49	35.97	5.07	0.44	0.00	1.11
55-59	56.48	38.99	35.07	40.89	7.07	0.00	0.00	0.24
60-64	34.95	20.92	18.27	22.26	7.07	0.00	0.00	0.24
65-69	53.23	35.33	31.60	37.17	8.45	0.39	0.00	1.05
70-74	40.40	24.56	21.58	26.06	8.45	0.39	0.00	1.05
75-79	7.84	5.57	4.75	6.00	6.23	2.49	1.11	3.20
80-84	0.00	0.00	0.00	0.00	6.23	2.49	1.11	3.20
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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	Current smokers				Former smokers			
	USA RR	RUSSIA RR	BELARUS RR	HUNGARY RR	USA RR	RUSSIA RR	BELARUS RR	HUNGARY RR
<b>Female</b>								
35-39	17.00	15.54	14.23	22.97	1.25	0.95	0.68	2.62
40-44	33.73	31.39	29.20	42.56	1.25	0.95	0.68	2.62
45-49	28.30	26.18	24.22	36.49	1.25	0.95	0.68	2.62
50-54	30.73	28.50	26.43	39.24	1.25	0.95	0.68	2.62
55-59	37.80	20.93	19.26	30.01	1.93	0.00	0.00	0.55
60-64	25.12	12.75	11.64	19.14	1.93	0.00	0.00	0.55
65-69	24.54	10.99	10.01	16.66	2.97	0.00	0.00	0.84
70-74	43.78	22.82	21.04	32.38	2.97	0.00	0.00	0.84
75-79	8.20	4.14	3.74	6.53	2.42	0.00	0.00	1.39
80-84	0.00	0.00	0.00	0.00	2.42	0.00	0.00	1.39
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: Authors' calculations

**Table A46.** Mortality SAF, current and former smokers, by diseases, indirect mortality cost estimation, entity FBiH and BD, 2019

	Current smokers SAF									Former smokers SAF								
	Lung cancer	Other cancers	Coronary heart disease	Other heart disease	Cerebrovascular disease	Other vascular disease	Diabetes mellitus	Influenza, pneumonia, tuberculosis	Chronic obstructive pulmonary disease	Lung cancer	Other cancers	Coronary heart disease	Other heart disease	Cerebrovascular disease	Other vascular disease	Diabetes mellitus	Influenza, pneumonia, tuberculosis	Chronic obstructive pulmonary disease
<b>Male</b>																		
35-39	90.80	35.41	68.09	50.91	50.91	50.91	50.91	71.99	71.99	35.51	5.51	11.85	1.12	1.12	1.12	1.12	16.50	16.50
40-44	85.15	24.14	55.33	37.58	37.58	37.58	37.58	59.88	59.88	35.51	5.51	11.85	1.12	1.12	1.12	1.12	16.50	16.50
45-49	86.62	26.43	58.30	40.46	40.46	40.46	40.46	62.75	62.75	35.51	5.51	11.85	1.12	1.12	1.12	1.12	16.50	16.50
50-54	87.70	28.36	60.64	42.82	42.82	42.82	42.82	64.99	64.99	35.51	5.51	11.85	1.12	1.12	1.12	1.12	16.50	16.50
55-59	92.23	36.17	56.73	49.87	49.87	49.87	49.87	90.32	90.32	36.63	2.08	7.77	7.63	7.63	7.63	7.63	32.55	32.55
60-64	83.10	19.00	35.18	29.17	29.17	29.17	29.17	79.44	79.44	36.63	2.08	7.77	7.63	7.63	7.63	7.63	32.55	32.55
65-69	93.89	43.20	49.79	40.73	39.73	77.88	21.98	47.09	94.17	52.37	7.35	8.59	4.93	3.59	16.27	7.90	9.12	53.59
70-74	90.16	31.18	37.13	29.05	28.19	67.71	14.37	34.65	90.59	52.37	7.35	8.59	4.93	3.59	16.27	7.90	9.12	53.59
75-79	56.65	6.69	5.62	3.86	2.83	19.28	0.00	3.63	57.22	46.93	6.93	4.93	2.37	1.91	10.44	0.96	6.37	47.34
80-84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.93	6.93	4.93	2.37	1.91	10.44	0.96	6.37	47.34
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	46.93	6.93	4.93	2.37	1.91	10.44	0.96	6.37	47.34
<b>Female</b>																		
35-39	76.13	6.77	50.78	27.18	27.18	27.18	27.18	58.47	58.47	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
40-44	88.80	15.28	71.95	48.13	48.13	48.13	48.13	77.77	77.77	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
45-49	86.00	12.27	66.53	41.84	41.84	41.84	41.84	73.06	73.06	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
50-54	87.35	13.59	69.08	44.71	44.71	44.71	44.71	75.30	75.30	8.65	1.37	6.63	0.00	0.00	0.00	0.00	4.68	4.68
55-59	87.00	28.70	45.62	26.76	26.76	26.76	26.76	74.89	74.89	18.76	1.59	1.20	0.57	0.57	0.57	0.57	18.15	18.15
60-64	78.70	18.19	31.66	16.79	16.79	16.79	16.79	62.22	62.22	18.76	1.59	1.20	0.57	0.57	0.57	0.57	18.15	18.15
65-69	79.75	15.56	28.48	12.88	18.09	50.25	8.58	11.54	86.82	25.09	1.48	3.35	1.65	1.37	6.78	1.65	1.59	45.95
70-74	90.41	30.62	48.81	26.14	34.59	70.76	18.36	23.80	94.04	25.09	1.48	3.35	1.65	1.37	6.78	1.65	1.59	45.95
75-79	57.29	5.35	7.06	4.36	4.08	22.47	0.06	6.05	54.81	23.70	1.54	2.37	1.81	0.57	5.56	0.35	1.20	25.92
80-84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.70	1.54	2.37	1.81	0.57	5.56	0.35	1.20	25.92
85+	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.70	1.54	2.37	1.81	0.57	5.56	0.35	1.20	25.92

Source: Authors' calculations

**Table A47.** Mortality costs, all-cause Russia and Hungary RRs, by gender, age, and total, by smoking status in Bosnia and Herzegovina, 2019 (in million BAM)

All-cause RR↓	Total (current + former smokers)					
	Age group →	35+	35-55	55-65	65-75	>=76
<b>Men</b>						
Russia		101.57	66.59	28.25	6.41	0.33
Hungary		108.26	71.06	29.97	6.87	0.36
<b>Women</b>						
Russia		22.51	14.89	5.90	1.54	0.18
Hungary		32.76	21.62	8.58	2.29	0.27
<b>Total (men &amp; women)</b>						
Russia		124.09	81.48	34.15	7.96	0.50
Hungary		141.01	92.68	38.55	9.16	0.63

Source: Authors' calculations

**Table A48.** SAMC estimation, all-cause USA and Belarus RRs, for entity RS, 2019 (in thousands)

All-cause RRs	Total current smokers					Total former smokers					Total				
	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+
<b>Males</b>															
USA	40,180.92	16,614.77	3,673.80	245.00	60,714.48	3,904.16	2,658.35	565.26	46.46	7,174.23	44,085.07	19,273.12	4,239.06	291.46	67,888.70
Belarus	28,224.52	9,676.42	2,223.78	166.09	40,290.81	0.00	0.00	0.00	8.28	8.28	28,224.52	9,676.42	2,223.78	174.37	40,299.09
<b>Females</b>															
USA	5,374.24	3,903.67	759.61	171.74	10,209.26	285.94	198.09	42.93	6.99	533.95	5,660.19	4,101.76	802.54	178.73	10,743.21
Belarus	4,559.75	2,075.21	399.70	112.61	7,147.26	153.96	0.00	0.00	0.00	153.96	4,713.71	2,075.21	399.70	112.61	7,301.22

Source: Authors' calculations

**Table A49.** SAMC estimation, all-cause Russia and Hungary RRs, for entity RS, 2019 (in thousands)

All-cause RRs	Total current smokers					Total former smokers					Total				
	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+
<b>Males</b>															
Russia	31,278.86	10,863.81	2,477.93	188.79	44,809.38	341.09	0.00	26.05	18.54	385.68	31,619.95	10,863.81	2,503.98	207.33	45,195.07
Hungary	32,755.72	11,451.57	2,601.85	200.18	47,009.32	853.08	88.94	70.45	23.91	1,036.37	33,608.79	11,540.51	2,672.30	224.09	48,045.69
<b>Females</b>															
Russia	4,949.20	2,244.05	430.19	119.81	7,743.25	215.75	0.00	0.00	0.00	215.75	5,164.95	2,244.05	430.19	119.81	7,958.99
Hungary	7,059.08	3,146.04	587.03	154.35	10,946.50	596.51	8.69	12.10	4.02	621.32	7,655.59	3,154.74	599.13	158.37	11,567.82

Source: Authors' calculations

**Table A50. SAMC by diseases estimation, entity RS, 2019 (in thousands)**

	Total current smokers					Total former smokers					Total				
	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+
<b>Males</b>															
Lung cancer	2,163.35	3,523.50	603.22	25.74	6,315.82	846.82	1,478.80	335.24	13.69	2,674.55	3,010.17	5,002.31	938.46	39.43	8,990.37
Other cancers	2,164.37	1,300.17	365.40	23.27	3,853.20	344.33	105.13	59.09	5.53	514.08	2,508.70	1,405.30	424.49	28.80	4,367.28
Coronary heart disease	4,309.29	1,593.14	273.17	17.19	6,192.80	766.17	277.05	45.47	3.32	1,092.01	5,075.47	1,870.19	318.64	20.51	7,284.81
Other heart disease	5,789.46	2,404.54	498.00	30.11	8,722.11	121.74	479.09	57.74	3.81	662.38	5,911.19	2,883.63	555.73	33.93	9,384.48
Cerebrovascular disease	2,077.84	768.92	217.74	13.31	3,077.80	46.96	152.91	19.18	1.77	220.82	2,124.80	921.83	236.91	15.08	3,298.61
Other vascular disease	209.53	84.45	43.23	4.13	341.33	4.55	16.85	9.00	0.75	31.15	214.09	101.30	52.23	4.87	372.48
Diabetes mellitus	353.13	435.55	73.81	0.00	862.49	7.72	84.54	24.88	0.27	117.41	360.85	520.09	98.69	0.27	979.91
Influenza, pneumonia, tuberculosis	1,374.86	616.74	42.26	1.27	2,035.13	321.66	237.28	7.76	0.45	567.15	1,696.52	854.02	50.01	1.72	2,602.28
Chronic obstructive pulmonary disease	126.20	179.24	118.38	12.05	435.87	28.15	67.73	67.28	6.44	169.60	154.35	246.98	185.65	18.49	605.47
<b>Total</b>	<b>18,568.04</b>	<b>10,906.26</b>	<b>2,235.19</b>	<b>127.06</b>	<b>31,836.55</b>	<b>2,488.10</b>	<b>2,899.37</b>	<b>625.62</b>	<b>36.04</b>	<b>6,049.14</b>	<b>21,056.14</b>	<b>13,805.63</b>	<b>2,860.82</b>	<b>163.10</b>	<b>37,885.69</b>
<b>Females</b>															
Lung cancer	950.70	693.92	58.87	3.25	1,706.74	98.96	151.23	15.85	0.80	266.85	1,049.67	845.15	74.72	4.05	1,973.58
Other cancers	375.83	297.29	54.33	7.59	735.04	51.25	16.30	2.05	0.24	69.85	427.08	313.59	56.38	7.83	804.88
Coronary heart disease	532.97	219.27	59.89	12.65	824.78	57.57	5.78	3.51	0.54	67.40	590.54	225.05	63.40	13.19	892.18
Other heart disease	959.58	388.13	97.32	33.75	1,478.77	0.00	7.96	4.78	1.43	14.17	959.58	396.09	102.10	35.18	1,492.94
Cerebrovascular disease	449.66	162.87	59.30	15.76	687.58	0.00	2.91	1.90	0.22	5.03	449.66	165.78	61.19	15.98	692.61
Other vascular disease	31.35	7.86	6.12	1.80	47.14	0.00	0.11	0.54	0.12	0.77	31.35	7.97	6.66	1.92	47.91
Diabetes mellitus	101.35	115.49	17.75	0.18	234.77	0.00	2.79	1.20	0.06	4.06	101.35	118.28	18.95	0.25	238.82
Influenza, pneumonia, tuberculosis	262.49	133.09	6.07	2.00	403.64	17.95	31.98	0.31	0.05	50.29	280.44	165.07	6.38	2.04	453.93
Chronic obstructive pulmonary disease	40.24	100.55	20.78	3.69	165.26	2.65	25.04	9.99	1.01	38.69	42.88	125.59	30.77	4.70	203.94
<b>Total</b>	<b>3,704.15</b>	<b>2,118.47</b>	<b>380.42</b>	<b>80.67</b>	<b>6,283.70</b>	<b>228.39</b>	<b>244.10</b>	<b>40.13</b>	<b>4.47</b>	<b>517.09</b>	<b>3,932.54</b>	<b>2,362.57</b>	<b>420.55</b>	<b>85.14</b>	<b>6,800.80</b>

Source: Authors' calculations

**Table A51. SAMC estimation, all-cause Belarus and USA RRs, for entity FBiH and BD, 2019 (in thousands)**

All-cause RRs	Total current smokers					Total former smokers					Total				
	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+
<b>Males</b>															
USA	45,727.81	26,162.98	5,947.43	115.09	77,953.31	5,137.06	3,843.09	1,024.36	91.40	10,095.90	50,864.87	30,006.07	6,971.79	206.49	<b>88,049.21</b>
Belarus	30,830.12	15,526.82	3,436.15	69.67	49,862.76	0.00	0.00	0.00	16.28	16.28	30,830.12	15,526.82	3,436.15	85.95	<b>49,879.04</b>
<b>Females</b>															
USA	6,771.59	2,290.80	115.07	19,312.13	451.48	397.67	213.02	34.00	1,096.17	10,586.16	7,169.27	2,503.82	149.07	20,408.31	<b>6,771.59</b>
Belarus	3,356.08	1,022.50	52.53	13,125.30	243.09	0.00	0.00	0.00	243.09	8,937.28	3,356.08	1,022.50	52.53	13,368.39	<b>3,356.08</b>

Source: Authors' calculations

**Table A52. SAMC estimation, all causes, by Russia and Hungary RRs, for entity FBiH and BD, 2019 (in thousands)**

All-cause RRs	Total current smokers					Total former smokers					Total				
	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+
<b>Males</b>															
Russia	34,518.03	17,386.65	3,859.34	81.71	55,845.72	448.81	0.00	47.20	36.48	532.49	34,966.84	17,386.65	3,906.54	118.19	<b>56,378.21</b>
Hungary	36,329.30	18,301.80	4,068.18	88.04	58,787.32	1,122.47	128.57	127.67	47.03	1,425.74	37,451.77	18,430.37	4,195.85	135.07	<b>60,213.06</b>
<b>Females</b>															
Russia	3,654.83	1,114.54	58.04	14,214.17	340.65	0.00	0.00	0.00	340.65	9,727.41	3,654.83	1,114.54	58.04	14,554.82	<b>3,654.83</b>
Hungary	5,310.24	1,628.84	91.65	20,052.72	941.84	113.19	60.04	19.56	1,134.63	13,963.82	5,423.44	1,688.88	111.21	21,187.34	<b>5,310.24</b>

Source: Authors' calculations

**Table A53. SAMC by diseases estimation, entity FBiH and BD, 2019 (in thousands)**

	Total current smokers					Total former smokers					Total				
	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75	35+
<b>Males</b>															
Lung cancer	5,684.35	6,330.24	1,313.65	52.21	13,380.44	2,310.89	2,622.20	741.51	43.25	5,717.84	7,995.23	8,952.44	2,055.16	95.45	<b>19,098.28</b>
Other cancers	2,511.82	2,032.39	555.03	9.63	5,108.86	496.84	141.48	103.12	9.98	751.42	3,008.66	2,173.87	658.15	19.60	<b>5,860.28</b>
Coronary heart disease	10,991.24	4,941.93	847.03	11.72	16,791.91	2,158.88	778.53	158.23	10.28	3,105.92	13,150.12	5,720.46	1,005.26	22.00	<b>19,897.83</b>
Other heart disease	2,242.46	1,398.26	332.26	6.92	3,979.90	60.21	261.97	44.29	4.26	370.73	2,302.67	1,660.23	376.55	11.18	<b>4,350.63</b>
Cerebrovascular disease	2,556.58	1,859.15	447.55	5.82	4,869.09	66.25	342.29	45.34	3.91	457.80	2,622.84	2,201.44	492.89	9.73	<b>5,326.89</b>
Other vascular disease	821.55	334.84	163.84	4.99	1,325.21	20.72	60.05	36.27	2.70	119.74	842.26	394.89	200.11	7.69	<b>1,444.95</b>
Diabetes mellitus	1,022.59	825.90	116.26	0.00	1,964.75	27.46	150.38	48.23	0.70	226.77	1,050.04	976.28	164.49	0.70	<b>2,191.52</b>
Influenza, pneumonia, tuberculosis	1,521.93	560.79	101.71	1.32	2,185.75	390.39	210.60	22.28	2.32	625.58	1,912.32	771.39	123.99	3.64	<b>2,811.33</b>
Chronic obstructive pulmonary disease	279.86	756.02	228.65	26.83	1,291.37	73.05	288.85	132.23	22.19	516.33	352.91	1,044.88	360.88	49.02	<b>1,807.69</b>
<b>Total</b>	<b>27,632.37</b>	<b>19,039.51</b>	<b>4,105.98</b>	<b>119.43</b>	<b>50,897.27</b>	<b>5,604.68</b>	<b>4,856.37</b>	<b>1,331.49</b>	<b>99.58</b>	<b>11,892.12</b>	<b>33,237.05</b>	<b>23,895.87</b>	<b>5,437.46</b>	<b>219.00</b>	<b>62,789.39</b>
<b>Females</b>															
Lung cancer	1,618.55	1,407.08	353.17	13.08	3,391.89	161.30	314.44	107.53	5.41	588.67	1,779.84	1,721.52	460.70	18.50	<b>3,980.56</b>
Other cancers	736.38	752.09	153.41	5.56	1,647.42	80.45	48.23	10.91	1.60	141.18	816.82	800.32	164.31	7.15	<b>1,788.60</b>
Coronary heart disease	2,050.66	955.74	330.97	14.14	3,351.50	196.85	28.97	30.61	4.74	261.16	2,247.50	984.71	361.57	18.89	<b>3,612.67</b>
Other heart disease	983.46	308.99	118.99	6.81	1,418.24	0.00	7.96	10.40	2.83	21.20	983.46	316.95	129.40	9.64	<b>1,439.44</b>
Cerebrovascular disease	1,063.20	378.78	215.13	10.22	1,667.33	0.00	9.61	11.33	1.44	22.37	1,063.20	388.39	226.46	11.66	<b>1,689.71</b>
Other vascular disease	165.43	61.23	63.47	4.97	295.10	0.00	1.63	7.69	1.23	10.55	165.43	62.86	71.16	6.20	<b>305.64</b>
Diabetes mellitus	257.56	188.44	70.09	0.07	516.16	0.00	4.77	8.85	0.38	14.00	257.56	193.21	78.94	0.45	<b>530.16</b>
Influenza, pneumonia, tuberculosis	445.81	151.49	18.78	1.47	617.55	32.08	39.15	1.78	0.29	73.30	477.88	190.64	20.56	1.76	<b>690.85</b>
Chronic obstructive pulmonary disease	113.88	248.03	81.57	16.15	459.63	8.47	64.29	41.52	7.64	121.91	122.35	312.31	123.09	23.79	<b>581.54</b>
<b>Total</b>	<b>7,434.92</b>	<b>4,451.85</b>	<b>1,405.58</b>	<b>72.46</b>	<b>13,364.82</b>	<b>479.13</b>	<b>519.05</b>	<b>230.60</b>	<b>25.57</b>	<b>1,254.35</b>	<b>7,914.05</b>	<b>4,970.90</b>	<b>1,636.19</b>	<b>98.03</b>	<b>14,619.17</b>

Source: Authors' calculations

**Table A54.** Mortality costs, all-cause USA and Belarus RRs, by gender, age, and smoking status in Bosnia and Herzegovina, 2019 (in thousands of BAM)

All-cause RR↓ Age group →	Total current smokers					Total former smokers				
	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75
USA	138,667.78	85,908.73	42,777.75	9,621.22	360.08	17,270.13	9,041.21	6,501.44	1,589.62	137.86
Belarus	90,153.57	59,054.63	25,203.24	5,659.93	235.76	24.56	-	-	-	24.56
USA	29,521.39	15,508.92	10,675.26	3,050.41	286.80	1,630.12	737.43	595.76	255.94	40.99
Belarus	20,272.56	13,253.93	5,431.29	1,422.20	165.14	397.06	397.06	-	-	-
Hungary	30,999.22	20,081.06	8,456.29	2,215.87	246.00	1,755.95	1,538.34	121.89	72.14	23.58

Source: Authors' calculations

**Table A55.** Mortality costs, all-cause Russia and Hungary RRs, by gender, age, and smoking status in Bosnia and Herzegovina, 2019 (in thousands of BAM)

All-cause RR↓ Age group →	Total current smokers					Total former smokers				
	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75
Russia	100,655.10	65,796.89	28,250.45	6,337.27	270.49	918.18	789.90	-	73.25	55.03
Hungary	105,796.65	69,085.02	29,753.37	6,670.03	288.22	2,462.11	1,975.55	217.51	198.12	70.94
Russia	21,957.42	14,335.97	5,898.87	1,544.73	177.85	556.39	556.39	-	-	-
Hungary	30,999.22	20,081.06	8,456.29	2,215.87	246.00	1,755.95	1,538.34	121.89	72.14	23.58

Source: Authors' calculations

**Table A56.** Mortality costs, by diseases, USA RR, by gender, age, and smoking status, Bosnia and Herzegovina, 2019 (in thousands of BAM)

Smoking-related diseases	Current smokers					Former smokers				
	35+	35-54	55-64	65-74	>=75	35+	35-54	55-64	65-74	>=75
<b>Male</b>										
Lung cancer	19,696.26	7,847.70	9,853.74	1,916.87	77.95	8,392.39	3,157.71	4,101.00	1,076.74	56.94
Other cancers	8,962.06	4,676.18	3,332.55	920.43	32.89	1,265.50	841.18	246.62	162.21	15.50
Coronary heart disease	22,984.71	15,300.53	6,535.07	1,120.20	28.91	4,197.93	2,925.05	1,055.58	203.70	13.60
Other heart disease	12,702.00	8,031.92	3,802.80	830.26	37.03	1,033.10	181.94	741.06	102.03	8.07
Cerebrovascular disease	7,946.89	4,634.42	2,628.07	665.28	19.13	678.61	113.21	495.20	64.52	5.68
Other vascular disease	1,666.54	1,031.08	419.29	207.06	9.11	150.89	25.27	76.90	45.27	3.45
Diabetes mellitus	2,827.24	1,375.72	1,261.46	190.07	0.00	344.18	35.18	234.92	73.11	0.98
Influenza, pneumonia, tuberculosis	4,220.88	2,896.79	1,177.53	143.97	2.59	1,192.73	712.05	447.88	30.03	2.77
COPD	1,727.24	406.07	935.27	347.03	38.87	685.92	101.19	356.59	199.51	28.64
<b>Sum of all smoking-related causes</b>	<b>82,733.83</b>	<b>46,200.41</b>	<b>29,945.77</b>	<b>6,341.17</b>	<b>246.49</b>	<b>17,941.25</b>	<b>8,092.78</b>	<b>7,755.74</b>	<b>1,957.11</b>	<b>135.62</b>
<b>Female</b>										
Lung cancer	5,098.62	2,569.25	2,101.00	412.04	16.33	855.52	260.26	465.67	123.38	6.22
Other cancers	2,382.46	1,112.21	1,049.37	207.73	13.14	211.03	131.70	64.53	12.96	1.84
Coronary heart disease	4,176.29	2,583.62	1,175.01	390.85	26.80	328.57	254.42	34.75	34.12	5.28
Other heart disease	2,897.01	1,943.03	697.12	216.31	40.55	35.37	0.00	15.92	15.18	4.26
Cerebrovascular disease	2,354.91	1,512.86	541.65	274.43	25.98	27.40	0.00	12.52	13.22	1.66
Other vascular disease	342.23	196.78	69.09	69.59	6.77	11.32	0.00	1.74	8.23	1.35
Diabetes mellitus	750.93	358.91	303.93	87.84	0.25	18.06	0.00	7.56	10.05	0.45
Influenza, pneumonia, tuberculosis	1,021.19	708.29	284.58	24.85	3.47	123.60	50.03	71.13	2.09	0.34
COPD	624.89	154.12	348.58	102.35	19.84	160.60	11.12	89.33	51.51	8.64
<b>Sum of all smoking-related causes</b>	<b>19,648.52</b>	<b>11,139.07</b>	<b>6,570.32</b>	<b>1,786.00</b>	<b>153.13</b>	<b>1,771.44</b>	<b>707.52</b>	<b>763.15</b>	<b>270.74</b>	<b>30.04</b>
<b>Total (male and female)</b>	<b>102,382.34</b>	<b>57,339.47</b>	<b>36,516.09</b>	<b>8,127.17</b>	<b>399.62</b>	<b>19,712.69</b>	<b>8,800.30</b>	<b>8,518.89</b>	<b>2,227.85</b>	<b>165.65</b>

Source: Authors' calculations



## Summary

**Table A57.** Total tobacco-attributable cost based on the specific country's RR: Russia (in million BAM)

COST OF SMOKING IN 2019	Republic of Srpska			Federation of BiH and Brčko District			Bosnia and Herzegovina		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Direct costs	157.91	90.62	248.54	223.49	149.57	373.07	381.41	240.20	621.60
Indirect morbidity cost	15.41	6.94	22.35	22.55	11.32	33.87	37.96	18.26	56.22
Indirect mortality cost	45.20	7.96	53.15	56.38	14.55	70.93	101.57	22.51	124.09
<b>TOTAL</b>	<b>218.51</b>	<b>105.52</b>	<b>324.03</b>	<b>302.42</b>	<b>175.45</b>	<b>477.87</b>	<b>520.94</b>	<b>280.97</b>	<b>801.91</b>

Source: Authors' calculations

**Table A58.** Total tobacco-attributable cost based on the specific country's RR: Hungary (in million BAM)

COST OF SMOKING IN 2019	Republic of Srpska			Federation of BiH and Brčko District			Bosnia and Herzegovina		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
Direct costs	166.61	140.74	307.35	237.84	220.80	458.64	404.45	361.55	765.99
Indirect morbidity cost	16.20	10.34	26.55	23.88	16.24	40.12	40.08	26.58	66.67
Indirect mortality cost	48.05	11.57	59.61	60.21	21.19	81.40	108.26	32.76	141.01
<b>TOTAL</b>	<b>230.85</b>	<b>162.65</b>	<b>393.51</b>	<b>321.94</b>	<b>258.23</b>	<b>580.17</b>	<b>552.79</b>	<b>420.88</b>	<b>973.68</b>

Source: Authors' calculations

**Table A59.** Specific cost types' participation in total cost, GDP, and total medical cost by Russia, Hungary, and RBH average RRs

Based on all-cause RRs of the country	COST OF SMOKING IN 2019	% of total cost	% of GDP	% of medical cost
RUSSIA	Direct costs	77.52%	1.76%	28.52%
	Indirect morbidity cost	7.01%	0.16%	
	Indirect mortality cost	15.47%	0.35%	
	TOTAL	100.0%	2.28%	
HUNGARY	Direct costs	78.68%	2.17%	35.14%
	Indirect morbidity cost	6.85%	0.19%	
	Indirect mortality cost	14.48%	0.40%	
	TOTAL	100.0%	2.76%	
AVERAGE RBH RR	Direct costs	77.97%	1.84%	29.74%
	Indirect morbidity cost	6.95%	0.16%	
	Indirect mortality cost	15.07%	0.36%	
	TOTAL	100,00%	2.36%	

Source: Authors' calculations

**Table A60.** Literature used to compare the authors' research with other authors regarding the share of costs in total costs and in GDP

Country	Source	% of direct cost in total share	% of morbidity share in total cost	% of mortality share in total cost	GDP's share
China	Sung and Wang et al., 2006	34%	8%	58%	
Africa, Europe, Mediterranean, etc.	Goodchild et al., 2018	23% (for Europe) 21.3% (for UMI countries)	21.8% (for Europe) 20.9% (UMI countries)	55.2% (for Europe) 57.8% (UMI countries)	2.5% (For Europe) 1.2% (for Upper-Middle-Income countries)
South Africa	Boachie et al., 2021	34.00%	0.87%	64.93%	0.97% of the South African GDP in 2016
Germany	Ruff et al., 2008	51.10%	Working days losses, premature retirement and premature death are broadly equal factors, making up 28%, 33%, and 39% respectively of the indirect costs.		
Taiwan	Yang et al., 2005	23% medical		77%	0.5% of gross domestic product.
Hong Kong	McGhee et al., 2006	7.4% direct and productivity loss		92.60%	
Vietnam	Hoang et al., 2016	50.60%	10.70%	38.70%	0.97% of the 2011 gross domestic product
Spain	Moreno et al., 2019		1541 mil EUR (2002)	2269 mil EUR (2002)	

## References and Notes

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