# REPORT

# The Health Costs of Smoking in Albania

**PROJECT**

*Economic research to support tobacco tax reform in Albania*

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# 1. Introduction and Literature Review

Smoking is a major cause of death and health-related problems and has been causally linked to a number of diseases (He et al., 2022). Furthermore, smoking leads to substantial health care costs as well as losses in productivity.

In accordance with the traditional cost-of-illness methodology, the economic impact of smoking can be categorized into direct and indirect costs. Direct costs encapsulate the medical expenses linked to diseases attributed to smoking. Smoking imposes significant direct costs on global health care systems, covering expenditures related to hospitalization, ambulatory care, prescribed medications, and rehabilitation. Conversely, indirect costs pertain largely to the measurable value of productivity loss stemming from smoking-related diseases or fatalities. Globally, the amount of health care expenditure due to smoking-attributable diseases totaled $467 billion (in purchasing power parity, or PPP$) or 5.7 percent of global health expenditure, while the total economic cost of smoking (from health expenditures and productivity losses together) amounted to PPP$ 1,852 billion, corresponding to 1.8 percent of the world's annual GDP. Almost 40 percent of this cost occurred in low- and middle-income countries (LMICs), confirming the substantial burden these countries suffer due to smoking (Goodchild et al., 2018). Moreover, the share of this global burden of smoking is rapidly shifting toward LMICs.

Studies at the individual country level confirm that the costs of diseases caused by smoking represent a significant burden in health care costs. The costs of smoking in the workplace in the United States of America (US) is estimated to account for at least six to eight percent of annual personal health expenses, mainly for three categories of diseases: lung cancer, heart disease, and chronic obstructive pulmonary diseases (Warner et al., 1999). In the United States, Xu et al. (2021) found that cigarette smoking accounted for 11.7 percent of total health care spending during 2010–2014. Allender S.et al. (2009) reported that in the United Kingdom (UK), the cost of smoking-related ill health to the National Health Service (NHS) amounts to £5.2 billion annually, representing nearly 5.5 percent of the total NHS budget. About 6.8 percent of total health care costs for people older than age 35 in Taiwan is attributed to smoking (Yang et al. 2005), while another study in the same country shows that the direct costs of smoking account for 3.4 percent of total personal health care costs (Sung et al., 2014). John et al. (2009) estimated the total

economic cost of tobacco use in India at $1.7 billion, surpassing government spending on tobacco control activities and excise tax revenues.

For the primary diseases linked to smoking (mentioned above), the specific weight or burden is notably high. Shi et al. (2018) estimated that the direct costs of tobacco-attributed lung cancer in China account for 37 percent of the total costs for that disease. In Germany, the economic burden of health care costs for the cluster of diseases linked to smoking is estimated to be around 47 percent of their total costs (Ruff et al., 2000). Neubauer et al. (2006) reported that the direct cost of smoking represented 3.3 percent of the total health care expenditure in Germany in 2003, with hospitalization and acute outpatient care constituting the majority of direct costs at 71.9 percent.

Various studies have delved into the intricate facets of the economic impact of smoking, assessing costs associated with diseases closely linked to smoking habits, such as chronic obstructive pulmonary disease (COPD), cardiovascular diseases, lung cancer, and respiratory illnesses. In Vietnam, Ross et al. (2007) highlighted substantial expenses related to inpatient care for smoking-related illnesses, with COPD treatment constituting the majority of costs, followed by lung cancer and ischemic disease.

In Germany, Ruff et al. (2000) identified specific diseases with significant weight in health care costs compared to the total costs for those conditions, including lung cancer at 89 percent, COPD at 73 percent, and mouth and larynx cancer at 65 percent. Meanwhile, Tai et al. (2018) emphasized the considerable financial burden of tobacco-related cancer hospitalizations in the US in 2014, amounting to $8.2 billion and comprising 45 percent of total cancer hospitalizations and costs.

Recent studies from the Western Balkans demonstrate high mortality and health costs related to smoking. Smoking is found to cause about 24.4 to 42.8 percent of all deaths in Bosnia and Herzegovina while the toll of smoking was estimated to range between €367.5 million and €635.1 million, corresponding to 2.0 to 3.5 percent of the gross domestic product (GDP). Notably, the direct costs of smoking represented the most significant share, accounting for approximately 1.0 to 1.7 percent of the GDP (Gligorić et al., 2023). In the case of Montenegro, a substantial portion

of national health care expenditures, ranging from 4.0 to 6.2 percent, is allocated to the treatment of diseases directly linked to smoking (ISEA, 2022).

In Albania, there is a scarcity of data/information on tobacco-related health costs. Older studies predominantly focus on smoking prevalence and determinants of smoking (Ross et al., 2008; Shapo et al., 2003), while more recent studies focus on the impact of tobacco control policies on smoking behavior (Gjika et al., 2020; Merkaj et al., 2022). The overall objective of this study is to estimate the economic costs of smoking in Albania, focusing mainly on direct costs.

In our research we use two different approaches. The first approach is the econometric approach and the second is the epidemiological approach.

Through the first approach, we assess household smoking-attributable out-of-pocket health care spending (for example, expenditures for hospitals and medical visits, expenditures for drugs, total health expenditures) based on Household Budget Survey data (for more details on the nature of the data and analysis see the following section). Furthermore, we estimate the factors that influence out-of-pocket health care spending in households in Albania. For more details see section 2 of this report.

Through the second (epidemiological) approach, we estimate the direct costs (health care services) of several smoking-related diseases endured by the main state hospitals. This approach is conditioned by the level of detail of available data. The aim is to assess the smoking-attributable fraction (SAF) for each smoking-related disease by using the relative risk (RR) of each disease. The findings of the epidemiological approach are reflected in the third section.

# 2. Out-of-Pocket Health Expenditures of Households Attributable to Smoking

## 2.1. Methodology

In our investigation of out-of-pocket health expenditures attributable to smoking, we apply an econometric approach. Through the utilization of econometric techniques and a thorough analysis of extensive data, we seek to estimate the Smoking Attributable Fraction (SAF). The SAF serves as a crucial metric, helping to quantify the percentage of health care costs directly linked to smoking across a spectrum of health conditions and medical requirements.

The econometric methodology diverges from the traditional epidemiological approach, offering a more comprehensive evaluation of the economic impact associated with smoking. Unlike the narrow focus of the epidemiological approach on specific diseases, our econometric analysis takes into consideration total health care expenses.[1] This inclusive perspective allows for a holistic assessment of the economic burden imposed by smoking, offering insights into the broader landscape of health care costs affected by this behavior.

Various scholars have used econometric analysis to estimate SAF. Huang et al. (2021) shed light on the prevalence of smoking-attributable costs in China, indicating an overall SAF of 10.97 percent in 2005. The variation in SAF was notable, ranging from 5.77 percent for self-medication to 16.87 percent for inpatient visits. Building on this, Miller et al. (1999) estimated SAF for adults in the US, providing an overall weighted average of 6.54 percent. Their findings highlighted that SAFs were generally more significant for ambulatory expenses compared to hospital costs, with notable disparities based on gender and age categories. Expanding the scope to compare state-level SAF analysis, Armour et al. (2009) utilized econometric methods to estimate Medicaid expenditures attributable to smoking across different US states. Their investigation revealed a

[1] There is some debate in the literature about what comprises "total health care expenses," so we try several different possibilities by excluding/including more controversial categories. The results of the simulations vary little regardless of what comprise these expenses.

considerable variation in the smoking-attributable fraction, ranging from seven percent to 18 percent among states, with an average of around 11.0 percent for all states in 2004.

To estimate out-of-pocket health care expenditure, we use the Household Budget Survey (HBS), a nationally representative large-scale survey carried out at the household level that gives an overview of the socioeconomic situation of Albanian households.[2] The analysis is based on the latest available HBS implemented in 2017.

While the data do not permit individual-level analyses, the household focus enables us to consider the impact of second-hand smoke (SHS) within the household. This includes the impact on other family members due to the smoking habits of their relatives. The harmful effects of SHS exposure is proven to affect people of all ages, particularly children and adolescents exposed to parental smoking at home (Max et al., 2002). In countries like Albania, where smoking prevalence is high and elevated levels of SHS are common, the economic impact of SHS exposure is likely to be important. However, while our analyses capture this effect, we cannot estimate its impact separately due to a lack of detailed data.

Another limitation of our data lies in the lack of information regarding former smokers. Although our estimates consider the health care expenditures of former smokers residing in smoking households, we do not account for former smokers in non-smoking households. This omission may lead to underestimations in our calculations of relative risk (RR), SAF, and smoking-attributable health expenditures (SAHE). Incorporating this segment of former smokers could potentially slightly increase these estimates. However, given that only seven percent of the population in Albania are former smokers (Ross et al., 2008), we assume that neglecting this subset would not significantly bias the estimates.

## 2.2. Econometric model

In order to assess the impact of smoking on out-of-pocket health care expenses, we adopt the reduced econometric method that was originally developed by Duan et al. (1983) and has since become a widely accepted standard in the field of health research (Robinson et al., 1991; Miller et

[2] The results of this survey are also used to update the Consumer Price Index and Final Consumption as an important aggregate of GDP by the expenditure method.

al., 1999). This method focuses on analyzing health care spending related to all causes, as smoking has detrimental effects on every organ in the body and contributes to or worsens a wide range of health conditions. The reduced-form models aim to examine the overall influence of smoking on health care expenditures.

This approach involves estimating two equations using a two-part model, which is a flexible statistical approach specifically designed to handle limited dependent variables. It is particularly suitable for modeling individual annual health expenditures that are characterized by a censoring mechanism, which occurs when an event, such as a disease, may or may not occur. If the illness does not occur, the health expenditures would be zero, whereas if treatment is required positive expenses would be observed. The two-part model allows for the separate modeling of the censoring mechanism and the outcome, enabling a comprehensive analysis of the relationship between smoking and health care expenses.

The two-part model consists of the following equations:

$$D\_HExp_i = \alpha + \beta_1 SmokingStatus + \beta_2 SocialDemo_i + \beta_3 HealthBehav_i + \sum Reg + \varepsilon \quad (1)$$

$$ln\_HExp_i = \alpha + \beta_1 SmokingStatus + \beta_2 SocialDemo_i + \beta_3 HealthBehav_i + \sum Reg + \varepsilon \quad (2)$$

where:

- *SmokingStatus* is a dummy indicating smoking family (positive tobacco spending).
- *SocialDemo* is a vector with sociodemographic variables of the family like:
  - *Age of the members*: number of household members older than 65 years old, number of household members younger than 14 years old, and number of household members 15–64 years old;
  - *Education*: the ratio between the number of members with high school or university-level education and the total number of household members;
  - *Income*: Total household income per capita calculated as household's total declared income divided by the number of household members;

    - *Urban/rural*: if the family interviewed is in rural or urban areas; and
    - *Gender composition*: the ratio between females and males in the household.
- $HealthBehav$ is the per capita alcohol expenditure to account for other detrimental health-related behaviors.
- $Reg$ is a region-fixed effect that controls for differences in health care across regions.

We do not include in the model variables related to health care access and financial protection, since all individuals in Albania benefit from universal coverage under public health insurance. However, we recognize that geographical factors, such as location, may influence access in practice. Therefore, our model includes regional and rural versus urban dummies to capture any disparities in access based on location.

Equation 1 in the two-part model focuses on the probability of having positive annual expenditures in a given year. Equation 2, on the other hand, pertains to the dependent variable, which is the logarithm of the annual expenditures for households with positive expenditures. Both equations incorporate the same independent variables commonly found in the literature, such as smoking history, sociodemographic factors, and other risk behaviors. The first equation is estimated using the probit method, while the second equation employs ordinary least squares (OLS) estimation.

We estimate separate equations for various types of health expenditures, such as hospitalizations, outpatient visits, or medication costs. By doing so, we can calculate the RR, SAF, and SAHE that is specific to each particular health expenditure. Regression analyses are performed excluding outliers beyond the 99th percentile.

Various checks are performed to control the robustness of the results. The age ranges are substituted by the age-population dependence ratio, which is the number of household members not in the labor force over those included in the labor force. Gender composition is incorporated through the ratio of females to the total number of household members. Total consumption expenditures are used as a proxy of income in logarithmic form. Alcohol expenditures are incorporated on a per capita basis in logarithmic form. Regressions are performed without outliers at the 95th percentile and with outliers. Other measures of education in the household are used. Robustness checks are also done using HBS 2015 data, and the results of the SAFs do not differ considerably.

## 2.3. Estimating RR and SAF for out-of-pocket health care expenditures

We adhere to the guidelines provided by the World Health Organization (2011) to calculate the relative risk (RR) and smoking-attributable fraction (SAF) for out-of-pocket expenses.

Using the estimated models, we can predict the annual health care expenditures for both current smokers and non-smoker households. Additionally, we can estimate health care costs for a hypothetical group called "non-smoking current smokers/counterfactual group," who share all characteristics with current smokers except for their smoking status, assuming they are never smokers. By comparing the predicted annual expenditures between smokers and the hypothetical group of "non-smoking smokers," we can determine the excess costs incurred by smokers.

Additionally, we take into account the HBS weighting variables to ensure our estimates are representative of the entire country's population. This methodology allows us to isolate and quantify the impact of smoking on annual medical expenditures while keeping constant any other demographic or health-related characteristics that might also contribute to higher medical costs among smokers.

Finally, the SAF is computed by dividing the excess costs for all smokers by the total predicted costs of all individuals (smokers and never smokers), using the mathematical formula below:

$$SAF = \frac{\sum_{c=1}^{Nc}(EXP_c - EXP_{c\rightarrow n})}{\sum_{n=1}^{Nn}(EXP_n) + \sum_{c=1}^{Nc}(EXP_c)}$$

where:

- *EXPn*: Predicted expenditures for a non-smoker household n;
- *EXPc*: Predicted expenditures for a current smoker c;
- *EXPc→n*: Predicted expenditures for a hypothetical "non-smoking current smoker" c, assuming they are a never smoker;
- *Nn*: Total number of non-smokers;
- *Nc*: Total number of current smokers;

- excess costs for current smokers: ($EXPc - EXPc \rightarrow n$).

We define non-smoking households as households that do not report spending money on tobacco products. Since these households do not have recorded expenses on tobacco, it is reasonable to assume no household member smokes. While never-smoking households would be the ideal comparison group, data on them are not available in the data set. Using current non-smoker households still allows for a meaningful comparison between smokers and non-smokers regarding health care expenditures. However, that implies that part of the tobacco-related health cost emerging from former smokers may be embedded in the group of non-smokers, and, therefore, our calculations likely underestimate the impact of smoking on health-related expenditures. Nevertheless, given that the number of former smokers (both in absolute and relative terms) is not that high, this underestimate does not substantially bias core results.

Furthermore, using these projections, it is possible to estimate the overall RR for smoker families. The RR is calculated as the medical cost ratio between the mean predicted expenditures for smokers and non-smokers. This allows for a comparison of the average health care costs between these two groups, providing insights into the increased risk associated with smoking in terms of medical expenses. By comparing the mean predicted expenditures, researchers can quantify the difference in health care costs and determine the relative impact of smoking on health care expenditures for smoker families compared to those who do not currently smoke (Barnet et al., 2014):

$$RR = \frac{mean\ (EXP_c)}{mean\ (EXP_n)}$$

In order to calculate the smoking-attributable health expenditures (SAHE), we utilize the estimates of the smoking-attributable fraction (SAF). The SAHE is determined by multiplying the SAF by the total health expenditures (THE) for a particular medical service ($i$) or the geographic position of the household. This equation is represented as:

$$SAHE = SAF_i * THE_i$$

By applying the appropriate SAF estimates to the corresponding categories of health expenditures, we can calculate the smoking-attributable health expenditures for various segments of the

population and different types of medical services. This approach enables us to quantify the financial burden attributable to smoking and assess its impact on health care costs while considering specific factors that influence SAHE.

The current study represents the initial attempt to measure SAF and RR in Albania within certain limitations associated with the econometric model and data availability constraints from the Household Budget Survey (HBS) questionnaire.

## 2.4. Results of smoking-related out-of-pocket health expenditures

### 2.4.1. Factor influencing out-of-pocket total health expenditures

The first model, presented in Table 1, examines the factors that influence overall health care spending likelihood. The second model focuses on health care spending amounts for those households based on current/factual/existing expenses (Table 1). Table 2 reports the average marginal effects of both equations in the two-part model.

Results indicate that both health care spending probability and amounts are higher in smoker households compared to non-smoker households. On average, smoker households spend nearly 440 Albanian Lek (ALL) more per month on out-of-pocket health care expenses than non-smoker households (Table 2).

Family composition significantly influences health care spending probability and amounts. Households with a higher number of elderly members have a higher spending probability. The elderly category also incurs higher health care expenditures, with approximately 700 ALL more spending (Table 2). Living in urban areas is associated with a higher probability of health care spending, with no significant effect on households already incurring health care expenditures.

The educational level of adults in households is negatively associated with health care spending probability. This implies that households with higher-educated adults are less likely to incur health care expenses, possibly due to better preventive measures. However, for households already spending on health care, education does not exhibit a significant impact. The impact of alcohol

consumption on health care expenditures is found to be negligible and does not significantly influence spending patterns.

Overall, these findings provide insights into the factors associated with health care spending, highlighting the higher expenditure levels among smoker households, the influence of family composition, and the relationship between education and health care spending probabilities.

**Table 1.** Two-part model results

| | Monthly health care expenditures | Coef. | Bootstrap std. error | P>\|z\| | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| Probit | | | | | | |
| | Smoker HH | 0.213*** | 0.043 | 0.000 | 0.128 | 0.297 |
| | Alcohol expenditures per adult | 0.000*** | 0.000 | 0.000 | 0.000 | 0.000 |
| | Urban dummy | 0.139*** | 0.046 | 0.002 | 0.049 | 0.228 |
| | HH members older than 65 years old | 0.245*** | 0.035 | 0.000 | 0.176 | 0.313 |
| | HH members younger than 14 years old | -0.02 | 0.025 | 0.411 | -0.071 | 0.029 |
| | HH members 15–65 years old | 0.042** | 0.019 | 0.027 | 0.005 | 0.079 |
| | HH members with high school and university degree (older than 18 years old) | -0.16*** | 0.059 | 0.008 | -0.271 | -0.041 |
| | Gender composition (females/males) | -0.009 | 0.098 | 0.772 | -0.067 | -0.049 |
| | Income per capita | -0.000 | 0.000 | 0.727 | -0.000 | -0.000 |
| OLS (log) | | | | | | |
| | Smoker HH | 0.136*** | 0.046 | 0.003 | 0.045 | 0.227 |
| | Alcohol expenditures per adult | 0.000** | 0.000 | 0.010 | 0.000 | 0.000 |
| | Urban dummy | 0.042 | 0.052 | 0.419 | -0.059 | 0.143 |
| | HH members older than 65 years old | 0.280*** | 0.036 | 0.000 | 0.209 | 0.352 |
| | HH members younger than 14 years old | 0.004 | 0.026 | 0.879 | -0.048 | 0.056 |
| | HH members 15–65 years old | 0.019 | 0.021 | 0.359 | -0.022 | 0.061 |
| | HH members with high school and university degree (older than 18 years old) | 0.033 | 0.068 | 0.627 | -0.101 | 0.167 |
| | Gender composition (females/males) | 0.002 | 0.033 | 0.960 | -0.063 | 0.067 |
| | Income per capita | 0.000 | 0.000 | 0.259 | 0.000 | 0.000 |
| | Observations | 5,211 | | | | |
| | Population size | 521,444 | | | | |

Source: Authors' calculations

Note: Regional dummies are included but not presented in the table; weights and stratification of the survey are taken into consideration in the analyses; standard errors are bootstrapped in 1000 replications. Outliers are not considered in the analyses.

**Table 2.** Average marginal effects of households' monthly out-of-pocket health expenditures of the two-part model

| | Coef. | Bootstrap std. error | P>\|z\| | [95% Normal-based conf. | interval] |
|---|---|---|---|---|---|
| Smokers | 438.93*** | 93.14 | 0.00 | 256.36 | 621.49 |
| Alcohol expenditures per adult | 0.04*** | 0.00 | 0.00 | 0.03 | 0.06 |
| Urban dummy | 199.56** | 97.75 | 0.04 | 7.96 | 391.15 |
| HH members older than 65 years old | 708.98*** | 73.66 | 0.00 | 564.60 | 853.36 |
| HH members younger than 14 years old | -12.46 | 50.59 | 0.81 | -111.63 | 86.70 |
| HH members 15–65 years old | 72.57* | 41.40 | 0.08 | -8.57 | 153.72 |
| HH members with high school and university degree (older than 18 years old) | -87.52 | 128.19 | 0.50 | -338.77 | 163.72 |
| Gender composition (females/males) | -5.15 | 62.26 | 0.93 | -127.18 | 116.87 |
| Income per capita | 0.00 | 0.00 | 0.41 | 0.00 | 0.00 |
| Observations | 5,211 | | | | |
| Population size | 525,444 | | | | |

Note: Regional dummies are included but not presented in the table; weights and stratification of the survey are taken into consideration in the analyses; standard errors are bootstrapped in 1000 replications. Outliers are not considered in the analyses.

### 2.4.2. Estimating RR, SAF, and SAHE of out-of-pocket total health expenditures

In our econometric analysis of the smoking-attributable fraction (SAF), we utilize the relative risk (RR) as a key metric representing the ratio of mean predicted expenditures between smokers and non-smokers, as outlined in the preceding section. Our findings indicate **an overall estimated relative risk of 1.31**. This signifies that health care costs for households with smokers are 1.3 times higher compared to those without any smoking history, holding all other characteristics constant. Furthermore, the SAF, calculated as the ratio of total predicted expenditures between smokers and non-smokers (as detailed in the methodology section), **is determined to be about 10**

**percent**. This implies that 10 percent of all health expenditures of households can be attributed to the excess health costs associated with smoking.

Breaking down the analysis further, we estimate the SAHE for different types of care, macro regions, and urban and rural areas, as summarized in Table 3. Our results show that the annual smoking health care expenditure for the population amounts to almost USD 26 million, with the majority allocated to drug-related expenses (USD 20 million). A smaller portion includes hospital and health visits costs.

Notably, households situated in the northern region exhibit lower health care spending attributable to smoking compared to those in the central and southern regions. Additionally, urban households tend to incur slightly higher health costs attributable to smoking compared to their rural counterparts. These findings underscore the regional and urban-rural variations in the economic impact of smoking on health care expenditures.

**Table 3.** Health care costs attributable to smoking in Albania, 2017

| Category | SAF per household | SAHE for the population (monthly data, in ALL) | SAHE for the population (yearly data, in USD) |
|---|---|---|---|
| **Type of care** | | | |
| Total health expenditures | 10.06% | 223,294,461 | 26,795,335 |
| Hospitals and visits | 2.40% | 53,269,307 | 6,392,317 |
| Total expenditures for drugs | 7.63% | 169,342,387 | 20,321,086 |
| **Macro regions** | | | |
| North | 2.33% | 51,778,426 | 6,213,411 |
| Center | 4.57% | 101,399,417 | 12,167,930 |
| South | 3.16% | 70,116,618 | 8,413,994 |
| **Urban/rural** | | | |
| Rural | 4.18% | 92,814,779 | 11,137,773 |
| Urban | 5.88% | 130,588,235 | 15,670,588 |

Source: Authors' calculations

# 3. Cost of Public Health Care Financed by the Government – Epidemiological Approach

## 3.1. Calculating direct cost SAF and SAHE for smoking-related disease, using the epidemiological method

Smoking not only leads to substantial out-of-pocket expenses (analyzed in the previous section), but also results in significant financial burdens on the public health system, which includes the cost of public hospitals (covered by public funding) and is the focus of this subsection.

Estimating health expenditures related to smoking-related diseases necessitates determining the smoking-attributable fraction (SAF) based on the estimate of relative risk (RR) and smoking prevalence specific to each disease. Smoking prevalence indicates the ratio of smokers per disease, while RR expresses the likelihood of mortality and/or morbidity among individuals who have smoked compared to those who have never smoked with a specific disease—both of these critical estimates are not available for Albania. Although hospitals track costs for each treated patient, they do not link cost data with individual patient information. Consequently, while we can obtain the total costs incurred by state hospitals for specific tobacco-related diseases, we cannot differentiate these costs between smokers and non-smokers—an essential distinction for calculating RR and SAF.

To tackle the absence of country-specific RR data some researchers adopt estimates from other countries, but that can only be suitable if the countries are similar. In this context, we opt to use estimates from the Global Burden of Disease for Albania to calculate SAF. The SAF is computed, following the methodology of Farcher et al. (2023) and Tachfouti et al. (2014), as the ratio of attributed mortality (AM) to observed mortality (OM) for a specific disease:

$$SAF = \frac{AM}{OM}$$

Based on the literature, the primary group of frequently studied diseases encompasses four main categories: neoplasms (including lip, oral cavity, pharynx, esophagus, trachea, bronchus, and lung), cardiovascular diseases (encompassing ischemic heart disease, cerebrovascular disease, atherosclerosis, and other arterial disease), respiratory diseases (including asthma, pneumonia, and chronic obstructive pulmonary influenza), and diabetes mellitus type 2 (Neubauer et al., 2006; Ross et al., 2007; WHO, 2011; Sung et al., 2014; Ruff et al., 2000).

Table 4 reveals SAF values for these diseases in Albania, offering insights into the impact of smoking on mortality. Smoking is responsible for almost 22 percent of overall deaths. As expected, findings include high SAFs for laryngeal cancer (82.6 percent), lung cancer (77.4 percent), and respiratory infections (66 percent). Males consistently exhibit a higher SAF across diseases, underscoring the gender disparity in smoking-related health consequences. Asthma, tracheal and lung cancers, and chronic obstructive pulmonary disease (COPD) demonstrate substantial SAFs, emphasizing the pervasive influence of smoking on respiratory health. Cardiovascular diseases like coronary heart disease and stroke also show considerable SAFs, further highlighting the significant role of smoking in heart-related mortality.

**Table 4.** SAF for tobacco-related diseases, GBD, 2019

| Category | Smoking mortality/diseases AM (frequency/no.) | | | Diseases mortality OM (frequency/no.) | | | SAF AM/OM (percentage) | | |
|---|---|---|---|---|---|---|---|---|---|
| **RESPIRATORY DISEASES** | **Male** | **Female** | **Total** | **Male** | **Female** | **Total** | **Male** | **Female** | **Total** |
| Asthma | 34 | 3 | 37 | 104 | 39 | 143 | 32.5 | 7.1 | **25.6** |
| Trancheal, bronchus, and lung cancer | 791 | 106 | 897 | 924 | 234 | 1158 | 85.6 | 45.2 | **77.4** |
| Chronic obstructive pulmonary disease (COPD) | 310 | 88 | 398 | 390 | 213 | 603 | 79.5 | 41.3 | **66** |
| Respiratory infections and tuberculosis | 112 | 45 | 158 | 269 | 210 | 478 | 41.9 | 21.7 | **33** |
| **HEART DISEASES** | | | | | | | | | |
| Coronary heart disease | 1925 | 733 | 2657 | 6840 | 6064 | 12904 | 28.1 | 12.1 | **20.6** |
| Stroke | 696 | 299 | 996 | 2782 | 2823 | 5605 | 25.0 | 10.6 | **17.8** |
| **DIABETES MELITUS** | | | | | | | | | |
| Diabetes mellitus type 2 (E10–E14) | 22 | 13 | 35 | 73 | 76 | 149 | 30.7 | 16.4 | **23.4** |
| **OTHER CANCERS** | | | | | | | | | |
| Esophagus cancer | 30 | 3 | 33 | 46 | 15 | 61 | 65.2 | 18.2 | **53.8** |
| Larynx | 68 | 5 | 73 | 77 | 11 | 88 | 88.1 | 42.3 | **82.6** |
| Stomach | 102 | 9 | 110 | 316 | 137 | 453 | 32.2 | 6.3 | **24.3** |
| Bladder | 17 | 3 | 20 | 28 | 18 | 46 | 59.5 | 16.9 | **43.1** |
| Liver | 1 | 0 | 2 | 5 | 4 | 10 | 26.8 | 5.3 | **17.1** |
| **IMMUNE SYSTEM DISEASES** | | | | | | | | | |
| Rheumatoid arthritis | 1 | 0 | 1 | 4 | 5 | 9 | 28.2 | 6.5 | **16.2** |
| **ALL CAUSES** | **3,844** | **1,124** | **4,969** | **12,789** | **9,880** | **22,670** | **30.1** | **11.4** | **21.9** |

Source: Global Burden of Disease https://vizhub.healthdata.org/gbd-results/

**Table 5.** Smoking-attributable hospitalization costs by type of disease

| Category | SAF=AM/OM | Number of hospitalizations | Total hospitalization costs (HC) | Unit cost per hospitalization | Unit smoking-attributable cost | Total smoking-attributable costs |
|---|---|---|---|---|---|---|
| | Percentage (%) | No. of patients | (ALL) | (ALL) | | SAF* hospitalization costs (ALL) |
| **RESPIRATORY DISEASES** | | | | | | **203,397,065** |
| Asthma | 25.6 | 3,457 | 124,729,368 | 36,080 | 9,237 | 31,937,473 |
| **Tracheal, bronchus and lung cancer** | 77.4 | 2,342 | 51,843,926 | 22,137 | 17,134 | 40,148,612 |
| **COPD** | 66 | 1,179 | 105,702,225 | 89,654 | 59,172 | 69,809,705 |
| **Respiratory infections and tuberculosis** | 33 | 2,300 | 186,251,992 | 80,979 | 26,723 | 61,501,274.42 |
| **HEART DISEASES** | 0 | | | | | **125,881,436** |
| **Coronary heart disease** | 20.6 | 8,670 | 531,906,876 | 61,350 | 12,638 | 109,536,596 |
| **Stroke** | 17.8 | 3,710 | 92,019,130 | 24,803 | 4,415 | 16,344,840 |
| **DIABETES MELLITUS** | 0 | | | | | **33,505,449** |
| **Diabetes mellitus type 2 (E10–E14)** | 23.4 | 1,671 | 143,278,240 | 85,744 | 20,064 | 33,505,449 |
| **OTHER CANCERS** | 0 | | | | | **39,914,448** |
| **Esophagus cancer** | 53.8 | 229 | 13,766,813 | 60,117 | -- | 7,411,861 |
| **Larynx** | 82.6 | 530 | 18,914,574 | 35,688 | 29,478 | 15,624,709 |
| **Stomach** | 24.3 | 1,632 | 69,391,600 | 42,519 | 10,332 | 16,877,878 |

Source: Global Burden of Disease https://vizhub.healthdata.org/gbd-results/, https://fsdksh.gov.al/raporti-vjetor-2022/

We calculate SAHE for each disease based on government-incurred hospitalization costs, the sole available health cost across all diseases. Hospitalization costs include the costs of drugs and medical materials, laboratory examinations, food, wages, and other indirect expenses. Table 5 outlines the total hospitalization costs and smoking-attributable hospitalization costs for various diseases in Albania.

Overall, smoking-attributable cost for hospitalization varies by disease but is significant, underscoring the considerable economic impact of smoking on Albanian expenditures for hospitalization. Respiratory diseases, which are among the main diseases driven by smoking, impose a substantial economic burden: smoking-attributable costs constitute 15 percent of the total cost for this disease, or ALL 203.4 million. Heart-related smoking-attributable costs make up ALL 125.88 million.

## 3.2. Calculating SAHE

As highlighted earlier, smoking not only leads to substantial out-of-pocket expenses but also results in significant financial burdens on the public health system, which includes both public hospital expenditures as well as other expenditures (such as medication or services that may be obtained outside public hospitals but are funded/financed by the government). The public institution responsible for administering and advancing the mandatory health care insurance scheme in the Republic of Albania is the Mandatory Health Insurance Fund (Fondi Shëndetësor i Detyrueshëm i Sigurimeve të Shëndetit (FSDKSH)). Endowed with substantial legal authority, FSDKSH effectively oversees the health insurance program, with a primary objective to prudently manage financial resources derived from both the public and private sectors. The institution's mandate involves the management of the compulsory health insurance scheme, aligning with the national health care policies set forth by the Ministry of Health and Social Protection.

The insurance fund plays a pivotal role in the health care landscape of Albania, overseeing the costs of various health services within its structure. These costs encompass primary care, including the funding of the National Health Service and basic medical check-ups, as well as secondary care

which involves hospital services. Additionally, the institution covers the costs associated with the reimbursement of drugs and medical equipment.

In the fiscal year 2022, the total health care costs managed by FSDKSH amounted to ALL 51.564 billion or approximately USD 548 million. A detailed breakdown of these costs reveals that hospital services constitute the largest share, accounting for 56 percent of the total. Following closely, costs associated with the reimbursement of drugs and medical equipment occupy 22 percent of the total expenditure, emphasizing the importance of pharmaceutical and medical technology support. Finally, primary care costs, encompassing the funding of the National Health Service and basic medical check-ups, represent 20 percent of the total.

Our calculation of smoking-attributable costs is done by multiplying health costs by item/category with average SAF (average for all disease categories, based on GDN (SAF = 0.219)). Smoking-attributable costs within these expenses are estimated at ALL 11.2 billion (or about USD 119 million). This implies that a substantial portion, approximately 22 percent of the total expenses, is directly related to smoking-attributable health issues.

**Table 6.** Annual smoking-attributable costs in 2022 in Albania, reported by FSDKSH, in million ALL

| Expenses items | Total cost | Smoking-attributable |
|---|---|---|
| Hospitalization | 29,358 | 6,429 |
| Primary health care | 10,398 | 2,277 |
| Reimbursement of drugs | 11,808 | 2,586 |
| Total | 51,564 | 11,293 |

Source: Authors' calculations based on FSDKSH (2022)

## 4. Policy Implications

Albania grapples with a notably high prevalence of smoking, particularly among adult males. Tobacco consumption stands as a primary risk factor for numerous major diseases, contributing significantly to premature deaths. Smoking imposes a significant economic burden on society, affecting both smokers and non-smokers exposed to second-hand smoke and the economic and health effects of households that spend scarce resources on tobacco. The resulting smoking-related illnesses lead to increased health care service utilization and incurred costs. Furthermore, smoking-related issues cause individuals to lose productive time and can result in premature deaths. Understanding the economic impact of smoking, encompassing monetary costs, lost time, and lives, is crucial for devising strategies to minimize its harmful societal consequences.

This study reveals that the annual health care expenditure related to smoking in the population is approximately ALL 223.3 million (or around USD 26 million), with the majority spent on drug-related expenses. There are regional and urban-rural variations, as households in the northern region have lower health care spending on smoking compared to central and southern regions, and urban households tend to incur slightly higher costs than rural ones.

Respiratory diseases pose a significant economic burden, with smoking-attributable costs accounting for 15 percent of total hospitalization costs. Heart diseases also contribute to hospitalization costs, with smoking-attributable costs representing nearly 30 percent of the total. This emphasizes the need for targeted measures to address the economic consequences of smoking-related diseases.

Finally, primary care costs, encompassing the funding of the National Health Service and basic medical check-ups, represent 20 percent of the total. Smoking-attributable costs within these expenses are estimated at ALL 11.2 billion (or about USD 119 million). This implies that a substantial portion, approximately 22 percent of the total expenses, is directly related to smoking-attributable health issues.

Understanding these costs is crucial for health care planning and underscores the economic impact of smoking on the organization's budget. The concept of indirect morbidity costs related to smoking focuses on the economic impact of reduced productivity among individuals affected by smoking-related diseases. To gain insights into these indirect costs, a survey was conducted by authors of this report during 2023 targeting the largest hospital in Albania. The findings show that tobacco-related diseases are a key factor in the number of days missing from work, and thus, lower productivity for the economy.

Furthermore, the costs associated with purchasing tobacco and related health expenses diminish the portion of income available for other essential needs, a critical concern given Albania's status as one of the poorest countries in Europe (Merkaj et al., 2023).

This study unequivocally communicates to policy makers and the broader public the urgency of implementing policies aimed at reducing tobacco consumption. Notably, among these policies, consistently increasing tobacco excise taxes proves effective in curbing both smoking prevalence and consumption. This impact is significantly more pronounced among lower-income households, who exhibit greater sensitivity to price changes and are consequently more likely to quit smoking in response to elevated taxes and prices. A reduction in tobacco consumption among lower-income households implies a decrease in poverty. Consequently, households with lower incomes stand to gain the most significant benefits from a reduction in tobacco consumption (Gjika et al., 2020; Merkaj et al., 2023). Lastly, recent studies demonstrate how tobacco control policies, both fiscal ones (higher excise taxes) and non-fiscal ones (forbidding smoking in bars/restaurants) result in significantly lower smoking initiation levels among youth (Merkaj et al., 2022).

## 5. References


Allender, S., Balakrishnan, R., Scarborough, P., Webster, P., & Rayner, M. (2009). The burden of smoking-related ill health in the UK. Tobacco control, 18(4), 262-267.

Armour, B. S., Finkelstein, E. A., & Fiebelkorn, I. C. (2009). State-level Medicaid expenditures attributable to smoking. Preventing Chronic Disease, 6(3).

Barnett, P. G., Hamlett-Berry, K., Sung, H. Y., & Max, W. (2014). Health care expenditures attributable to smoking in military veterans. Nicotine & Tobacco Research, 17(5), 586-591.

Duan, N. (1983). Smearing estimate: A nonparametric retransformation method. Journal of the American Statistical Association 78, 605±610.

FSDKSH. (2023). Annual report for 2022. https://fsdksh.gov.al/raporti-vjetor-2022/

Gjika, A., Zhllima, E., Rama, K., & Imami, D. (2020). Analysis of tobacco price elasticity in Albania using household level data. International Journal of Environmental Research and Public Health, 17(2), 432.

Gligorić, D., Kulovac, D. P., Micic, L., & Vulovic, V. (2023). Economic cost of cigarette smoking in Bosnia and Herzegovina. Tobacco Control.

Goodchild, M., Nargis, N., & d'Espaignet, E. T. (2018). Global economic cost of smoking-attributable diseases. Tobacco Control, 27(1), 58-64.

He, H., Pan, Z., Wu, J., Hu, C., Bai, L., & Lyu, J. (2022). Health effects of tobacco at the global, regional, and national levels: Results from the 2019 global burden of disease study. Nicotine and Tobacco Research, 24(6), 864-870.

Huang, S., Wei, H., Yao, T., Mao, Z., Sun, Q., & Yang, L. (2021). The impact of smoking on annual healthcare cost: An econometric model analysis in China, 2015. BMC Health Services Research, 21(1), 1-9.

ISEA. (2022). Distributional impacts of tobacco tax in Montenegro. Technical report. https://tobacconomics.org/research/#t=Distributional%20Impacts%20of%20Tobacco%20Tax%20in%20Montenegro

John, R. M., Sung, H. Y., & Max, W. (2009). Economic cost of tobacco use in India, 2004. Tobacco control, 18(2), 138-143.

Max, W., Rice, D. P., Zhang, X., Sung, H. Y., & Miller, L. (2002). The cost of smoking in California, 1999. Sacramento, CA: California State Department of Health Services. http://www.cdph.ca.gov/programs/tobacco/Documents/CTCPCo stOfSmoking1999.pdf

Merkaj, E., Imami, D., & Zhllima, E. (2023). The impoverishing effect of tobacco use in Albania [Working Paper Series]. DSA. https://www.tobacconomics.org/research/the-impoverishing-effect-of-tobacco-use-in-albania-working-paper-series/

Merkaj, E., Zhllima, E., Imami, D., Gjika, I., Manuel, C., & Guerrero-López, J. D. (2022). Impact of cigarette prices and tobacco control policies on smoking onset among young people in Albania. Tobacconomics Working Paper No. 22/9/1. University of Illinois, Chicago.

Miller VP, Ernst C, Collin F (1999). Smoking-attributable medical care costs in the USA. Social Science and Medicine, 48:375–91.

Neubauer, S., Welte, R., Beiche, A., Koenig, H. H., Buesch, K., & Leidl, R. (2006). Mortality, morbidity and costs attributable to smoking in Germany: update and a 10-year comparison. Tobacco control, 15(6), 464-471.

Robinson, J., Luft, H. P., Gardner, L. B., & Morrison, E. M. (1991). A method for risk adjusting employer contributions to competing health insurance plans. Inquiry 28, 107±116.

Ross H, Trung DV, Phu VX. The costs of smoking in Vietnam: the case of inpatient care. Tob Control. 2007 Dec;16(6):405-9. doi: 10.1136/tc.2007.020396. PMID: 18048618; PMCID: PMC2807195.

Ross, H., Zaloshnja, E., Levy, D. T., & Tole, D. (2008). Results from the Albanian Adult Tobacco Survey. Central European Journal of Public Health, 16(4). doi: 10.21101/cejph.a3487. PMID: 19256287

Ruff, L. K., Volmer, T., Nowak, D., & Meyer, A. (2000). The economic impact of smoking in Germany. European Respiratory Journal, 16(3), 385-390.

Shapo, L., Gilmore, A. B., Coker, R., McKee, M., & Shapo, E. (2003). Prevalence and determinants of smoking in Tirana city, Albania: A population-based survey. Public Health, 117(4), 228-236.

Shi, J., Liu, C., Ren, J., Huang, H., Wang, L., Parascandola, M., ... & Dai, M. (2018). Economic burden of lung cancer attributable to smoking in China in 2015. Value in Health, 21, S3.

Sung, H. Y., Chang, L. C., Wen, Y. W., & Tsai, Y. W. (2014). The costs of smoking and secondhand smoke exposure in Taiwan: A prevalence-based annual cost approach. BMJ Open, 4(7), e005199.

Tachfouti, N., Raherison, C., Obtel, M., & Nejjari, C. (2014). Mortality attributable to tobacco: review of different methods. Archives of public health, 72, 1-7.

Tai, E. W., Guy Jr, G. P., Steele, C. B., Henley, S. J., Gallaway, M. S., & Richardson, L. C. (2018). Cost of Tobacco-related Cancer Hospitalizations in the US, 2014. American Journal of Preventive Medicine, 54(4), 591-595.

Warner, K. E., Hodgson, T. A., & Carroll, C. E. (1999). Medical costs of smoking in the United States: Estimates, their validity, and their implications. Tobacco Control, 8(3), 290-300.

World Health Organization. (2011). Economics of tobacco toolkit: Assessment of the economic costs of smoking. World Health Organization.

Xu, X., Shrestha, S. S., Trivers, K. F., Neff, L., Armour, B. S., & King, B. A. (2021). US healthcare spending attributable to cigarette smoking in 2014. Preventive medicine, 150, 106529.

Yang, M. C., Fann, C. Y., Wen, C. P., & Cheng, T. Y. (2005). Smoking attributable medical expenditures, years of potential life lost, and the cost of premature death in Taiwan. Tobacco Control, 14(suppl 1), i62-i70.

Farcher, R., Syleouni, M. E., Vinci, L., & Mattli, R. (2023). Burden of smoking on disease-specific mortality, DALYs, costs: the case of a high-income European country. BMC Public Health, 23(1), 698.