

# The impact of tobacco consumption on household catastrophic health expenditure in Türkiye

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## Abstract

**Background:** Understanding the financial burden of smoking on households is crucial for developing effective strategies and policies to reduce smoking and mitigate its impact on household health.

**Aim:** To investigate the relationship between smoking and catastrophic health expenditure in Türkiye.

**Methods:** This cross-sectional study used microdata from household budget surveys conducted by the Turkish Statistical Institute in 2015 and 2019. The data included the socioeconomic characteristics, income levels and consumption patterns of various goods and services by individuals and households. We used the pooled logit model to analyse the factors influencing household catastrophic health expenditure, focusing on the smoking status of households.

**Results:** The presence of a smoker in a household, an uninsured person, a disabled or ill member, and members with higher education were significant positive predictors of catastrophic health expenditure, while being poor, working and having school-aged children were significant negative predictors. Smokers within the household were the foremost contributors to the probability of catastrophic health expenditure, with a coefficient of 0.4101 and marginal effect of 7.94%.

**Conclusion:** This study highlights the need for comprehensive tobacco control measures that analyse and use critical information from the interactions between public health and economic stability to reduce tobacco consumption and the associated financial burdens on households.

Keywords: tobacco consumption, health expenditure, smoking prevention, healthcare economics, Türkiye

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## Introduction

Türkiye is a major tobacco producer and has seen significant changes post-1980. The first tobacco control law in 1996 banned smoking in public places, sales to minors and tobacco advertising. Türkiye joined the WHO Framework Convention on Tobacco Control (FCTC) in 2004, amended its law in 2008 and started implementing the MPOWER tobacco control policies in 2013. Smoking prevalence in Türkiye decreased from 31.2% in 2008 to 27.1% in 2012, then increased by 4.5% between 2012 and 2016. The Türkiye Health Survey 2022 reported prevalence of 28.3%, indicating that smoking remains prevalent in Türkiye (1–6).

Despite improvements in tobacco control since the late 2000s, smoking remains a global epidemic, affecting health and economies. Smoking costs around 1.8% of the global Gross Domestic Product (GDP), or US\$1.85 trillion, with the highest impact in the Americas and Europe at 2.4% and 2.5% of GDP, respectively. These costs include direct healthcare and non-healthcare expenses, as well as indirect costs such as productivity loss and premature deaths (7, 8).

In Türkiye, the cost of 100 cigarette packs as a percentage of GDP increased from 3.0% to 3.8% between 2012 and 2016, indicating higher direct costs (5).

Smoking-related expenses reduce disposable income and productivity, making individuals and households vulnerable to catastrophic events such as hospitalization. In such cases, smokers are more likely to sell assets and borrow money, leading to impoverishment.

Catastrophic health expenditure (CHE) represents out-of-pocket expenditure that exceeds a determined threshold level and threatens a household's financial ability to preserve its living standards (9). CHE may arise as a consequence of low household capacity to pay, lack of prepayment schemes for risk pooling, and the presence of health services that need out-of-pocket payments (10). Wagstaff et al. reported that the global incidence of CHE at the 10% threshold increased from 9.7% to 11.7% between 2000 and 2010, and globally, 808 million people experienced CHE in 2010 (11). Türkiye began implementing the Health Transformation Programme in 2003, including a wide range of health system reforms to achieve universal health coverage that improves access to health care, health outcomes and financial risk protection for all citizens, particularly for poor people (12). In Türkiye, the share of out-of-pocket expenditure in total health expenditure decreased from 19.8% in 2002 to 15.9% in 2021, and the ratio of households with CHE (rate of health expenditure to payment capacity > 40%) decreased from 0.81% in 2002 to 0.43% in 2019 (13).

The incidence, determinants and impoverishing effect of CHE have been investigated for developing countries and Türkiye (14–19). Focusing on Türkiye, Tırgil et al. reported that expansion of noncontributory health insurance (Green Card Scheme) between 2003 and 2006 led to financial protection for poor people by reducing CHE (20). The impact of smoking on the probability of incurring CHE has not been investigated in Türkiye.

The objective of this study was to investigate the impact of smoking on the probability of CHE in Türkiye, using more recent data sets than in previous studies. Understanding the financial burden of smoking on households is crucial for several reasons. Firstly, smoking-related health issues can lead to significant medical expenses, which may push households into financial distress. By identifying the extent to which smoking increases the likelihood of CHE, policy-makers can better design targeted interventions to support affected households and reduce health disparities. Secondly, this study highlights the broader economic implications of smoking. The financial strain from smoking-related health costs can reduce disposable income, affect household stability and lead to impoverishment. By focusing on Türkiye, a country with a high prevalence of smoking and significant economic challenges, this research provides valuable insights into the relationship between public health and economic stability. Comparison of smoking and nonsmoking households allows for a deeper understanding of the specific factors that contribute to CHE, and can inform more-effective public health strategies and policies to reduce smoking and mitigate its financial impact on households. The use of a recent data set enhances the relevance and accuracy of the findings, ensuring that the conclusions drawn reflect the current economic and health situation in Türkiye.

## Methods

Data were obtained from household budget surveys collected by the Turkish Statistical Institute. This data set compiled information about individual and household consumption patterns, income levels and socioeconomic groups. It examined consumption habits, types of consumption-related expenditure, and the diversity of expenditure on goods and services. It gathered data on the socioeconomic characteristics of households, such as employment status, total household income and income sources. We used the surveys from 2015 and 2019 to identify the effects of smoking on CHE.

The Household Budget Survey was implemented to sample households, selected by a stratified 2-stage cluster sampling method, changing every month during one year. Microdata sets of the 2015 Household Budget Survey were applied on an effective sample size of 11 491 households (21), and the 2019 microdata set was applied on an effective sample size of 11 521 households (22).

The surveys contained monthly expenditure information for ~200 products. Under the health

category, the available information pertained to out-of-pocket healthcare expenditure, which included costs related to medicines and pharmacy products, therapeutic equipment, dentistry services, laboratory and X-ray services, nursing care services and hospitalization. CHE was categorized into 5 threshold levels, 2.5%, 5%, 10%, 15% and 20% of total household expenditure.

There was an increasing trend in the incidence of CHE in Türkiye from 2015 to 2019 at all threshold levels, which indicated a worsening financial burden of healthcare costs on households (Table 1). The most notable increases were at the 10% and 15% thresholds, where the percentage of households experiencing CHE increased by 1.26% and 0.89%, respectively. Even at the lower 2.5% threshold, there was a small increase, suggesting that a consistent proportion of households faced significant health expenditure challenges. These findings highlight the need for continued and enhanced health policy interventions to alleviate the financial impact of health expenditures on Turkish households.

We used a pooled logit model to analyse the factors influencing CHE of households, with a focus on the smoking status of the household. The pooled logit model allowed us to account for variations over time and among different households, providing a comprehensive understanding of how smoking influenced the likelihood of CHE. The pooled logit model was particularly well-suited for this analysis because it allowed for examination of multiple variables simultaneously, identified the direct impact of smoking and how other socioeconomic and demographic factors interacted with smoking to influence CHE. This approach offered a nuanced view of the problem, highlighting potential areas where interventions could be most effective.

Focusing on household smoking status is crucial because smoking is a modifiable risk factor that significantly affects health outcomes and healthcare costs. By isolating the impact of smoking, this study provided clear evidence of the financial risks associated with tobacco use. This information is vital for public health officials and policy-makers aiming to reduce smoking rates and alleviate its economic burden. Additionally, the study methodology allowed for exploration of various determinants of CHE, such as income levels,

**Table 1 Incidence of catastrophic health expenditure in Türkiye**

Threshold (% of total household expenditure)	2015		2019	
	No	%	No	%
2.5	2330	25.8	2322	25.9
5	1254	13.9	1306	14.6
10	476	5.27	584	6.5
15	229	2.5	307	3.4
20	131	1.5	172	1.9
<b>Total</b>	<b>9024</b>		<b>8950</b>	

healthcare access, education and geographic location. Understanding how these factors interact with smoking can help in designing targeted policies that address the causes of financial vulnerability among smoking households.

The use of a recent data set ensured that the findings would be relevant to current policy debates and public health strategies. The data set reflected the latest trends and changes in smoking behaviour and healthcare costs, making the conclusions timely and applicable to ongoing efforts to control tobacco use and manage its economic impacts.

The model used in the study is given in equation (1) where odds =  $P(Y=1)/P(Y=0)$  and  $X_j$  are other variables.

$$\log(\text{odds}) = \beta_0 + \beta_1 \text{smoking}_i + \sum \beta_j X_j \quad (1)$$

Y was a binary variable for CHE at the household level. If a household incurred CHE, Y took the value of 1; otherwise, 0. Smoking was also a binary variable signalling the presence of a smoker within the household. X consisted of control variables.

Table 2 presents the variable description and descriptive statistics for smoking status and other controls. The controls included poverty, insurance, health, education and employment status of the households, and the gender of the household head. Household size (total number of individuals living in the household) and number of preschool children (age < 5 years), school children (age 5–14 years) and older people in the household (> 65 years) were also used in the analysis. STATA version 14 was used for data analysis.

All data used in this study are publicly available and have been obtained in accordance with relevant laws and

regulations. Confidentiality and privacy considerations have been carefully addressed to protect the integrity of the data and any potential participants mentioned in the research.

## Results

The pooled logit model estimation analysed factors influencing the likelihood of CHE at the 2.5% threshold level (Table 3). The results included the estimated coefficients and the marginal effects for various household characteristics. All other threshold levels were used as part of a robustness check, and the findings demonstrated a high degree of consistency. Variables such as the presence of a smoker, uninsured status, presence of a disabled or ill household member, and higher education were significant positive predictors, while being poor, working, and having school-aged children were significant negative predictors. Households with a smoker were significantly more likely to incur CHE, with a positive effect size of 0.4101 in the logit model. The marginal effect indicated that a smoker in the household increased the probability of CHE by ~7.94%. Poor households were less likely to incur CHE, with a coefficient of -0.1594. The marginal effect showed a reduction in probability by 2.95%. Households without insurance were more likely to incur CHE, with a coefficient of 0.2937. The marginal effect was 5.97%. Households with a disabled or ill member were significantly more likely to incur CHE, with a coefficient of 0.3737 and a marginal effect of 7.63%. Higher education of the household head increased the likelihood of CHE, with a coefficient of 0.2564 and marginal effect of 5.01%. Household heads who were working (not self-employed)

**Table 2 Descriptive statistics for the study**

Variable information		Description	2015 N (%)	2019 N (%)
Smoking status	Smoker in the household	1 if there is positive tobacco expenditure for the household	5978 (52.0)	5946 (51.6)
Poverty status	Poor household	1 if household consumption is < 60% or median equivalized consumption	1832 (15.9)	1897 (16.5)
Insurance status	Uninsured household	1 if the household has no health insurance	515 (4.5)	42 (0.4)
Health status	Presence of disabled or ill member in the household	1 if there is at least one ill or disabled member in the household	667 (5.8)	680 (5.9)
Education status	Primary education	1 if the household head has primary school certificate	5326 (46.4)	4984 (43.3)
	Secondary education	1 if the household head has secondary school certificate	3036 (26.4)	3004 (26.1)
	Higher education	1 if the household head has higher education degree	1645 (14.3)	2012 (17.5)
Employment status	Not employed	1 if the household head is not currently employed	3762 (32.7)	4573 (39.7)
	Working (not self-employed)	1 if the household head is currently working but not self employed	4903 (42.7)	4546 (39.5)
	Self employed	1 if household head is self employed	2826 (24.6)	2402 (20.9)
Gender	Male	1 if the household head is male	9888 (86.1)	8841 (76.7)
<b>Total</b>			<b>11491</b>	<b>11521</b>

Table 3 Pooled logit estimation for 2.5%

Variable	Coefficients	Marginal effects
Smoker in the household	0.4101*** (0.036)	0.0794*** (0.007)
Poor household	-0.1594*** (0.047)	-0.0295*** (0.008)
Uninsured household	0.2937** (0.117)	0.0597** (0.025)
Presence of disabled or ill member in the household	0.3737*** (0.068)	0.0763*** (0.014)
Primary education	Base category	Base category
Secondary education	0.0448 (0.043)	0.0085 (0.008)
Higher education	0.2564*** (0.050)	0.0506*** (0.010)
Not employed	Base category	Base category
Working (not self-employed)	-0.0916* (0.047)	-0.0173* (0.008)
Self-employed	-0.1598*** (0.050)	-0.0296*** (0.009)
Male	0.0582 (0.047)	0.0109 (0.008)
Household size	0.002 (0.019)	0.0005 (0.0003)
No. of preschool children in the household (< 5 yr)	0.1777*** (0.028)	0.0337*** (0.005)
No. of school aged children in the household (5–14 yr)	-0.1187*** (0.022)	-0.0225*** (0.004)
No. of older members in the household (> 65 years)	0.2068*** (0.029)	0.0392*** (0.005)

Standard errors in parentheses, \*\*\* $P < 0.01$ , \*\* $P < 0.05$  and \* $P < 0.1$ .

were less likely to incur CHE, with a coefficient of -0.0916 and a marginal effect of -1.73%. Self-employed household heads were significantly less likely to incur CHE, with a coefficient of -0.1598 and a marginal effect of -2.96%. Households with preschool children were more likely to incur CHE, with a coefficient of 0.1777 and a marginal effect of 3.37%. Households with school-aged children were less likely to incur CHE, with a coefficient of -0.1187 and a marginal effect of -2.25%. Households with older members were more likely to incur CHE, with a coefficient of 0.2068 and a marginal effect of 3.92%.

The pooled logit estimation revealed a positive association between the likelihood of CHE and households characterized by smoking. In contrast, households with limited economic resources had a reduced likelihood of incurring CHE; possibly attributable to the extensive coverage offered by the healthcare insurance system in Türkiye. Similarly, households lacking insurance coverage had an elevated probability of incurring CHE.

The presence of a disabled or ill member within the household contributed to increased probability of CHE. Households where the head had achieved higher levels of education had a higher probability of CHE than those where the head of the household only attained primary education. Households in which the head was employed or self-employed had a decreased likelihood of CHE in

comparison with households headed by unemployed individuals. The gender of the household head, household composition, and the measurement of the household size had no significant impact on the incidence of CHE. The presence of preschool children and older members within the household corresponded with the expected increase in the probability of CHE, due to their increased healthcare needs. In contrast, households with older children aged 5–14 years had a decreased probability of CHE.

Marginal effects analysis underlined the presence of smokers within the household as the foremost contributor to the likelihood of CHE. This is an important finding that implies that combating smoking could potentially mitigate the prevalence of CHE.

## Discussion

The aim of this study was to examine the relationship between tobacco consumption and CHE in Türkiye, while controlling for other determinants. Our results showed that households with tobacco consumption were more likely to incur CHE than non-tobacco-consuming households in Türkiye. This was consistent with previous studies (23, 24). The marginal effects indicated that tobacco consumption was the factor that most

significantly increased the likelihood of CHE among the determinants considered. Given the well-documented correlation in the literature between tobacco use and increased medical expenditure, our results aligned with expectations.

In contrast to previous research suggesting a positive relationship between lower-income households and higher likelihood of CHE (24, 26), our study revealed that households with limited economic resources in Türkiye were less likely to incur CHE. This can be attributed to the extended health insurance coverage implemented since 2008. Turgil et al. (20) reported that the expanded insurance coverage has played a crucial role in safeguarding the economically disadvantaged against the financial burden of illness in Türkiye. This has resulted in a 33% reduction in their medical expenditure and nearly 50% decrease in the incidence of CHE among those with the highest annual out-of-pocket costs. Consistent with these results, households without health insurance coverage and unemployed members were more likely to incur CHE.

One of the surprising findings of our study was the positive association between higher levels of educational attainment and increased likelihood of CHE. This can be explained in 2 ways. Firstly, individuals with higher educational achievement often demonstrate increased health literacy and allocate a larger proportion of their resources to health care services. Secondly, these individuals are more likely to have higher incomes, making them to choose private health care services over public alternatives. As a result, this preference contributes to an escalation in their out-of-pocket health expenditure. This is supported by previous studies conducted in Türkiye indicating that, as income increases, patients tend to prefer private over public hospitals (27–29).

This paper suggests some policy recommendations. Robust policies for curbing the smoking epidemic should be implemented to mitigate the incidence of health-related issues due to smoking and to curtail the associated financial burdens causing CHE. Despite the quantitative and qualitative growth in policies aimed at preventing and reducing tobacco consumption in Türkiye, the increasing prevalence of tobacco use, particularly among women (31), indicates that there is still progress to be made. Implementation that focuses on aspects of the MPOWER package, such as "protect people from tobacco smoke", "offer help to quit tobacco use", "warn about the dangers of tobacco" and "raise taxes on tobacco" (4), could contribute to this progress. For example, smoke-free areas could be expanded to include outdoor public places such as public parks. The visibility of tobacco cessation initiatives could be enhanced, including incorporating

tobacco cessation services into primary care, providing easily accessible and free quit lines (e.g. ALO 171) and maintaining information websites (e.g. <https://www.birakabilirsin.org/>). To increase public awareness of the health risks of tobacco consumption, informative campaigns could be organized across the country. Tax increases should be at a rate that does not lead smokers to illicit consumption. Creation of policies specifically targeting households that are unemployed and unable to benefit from health insurance is of particular importance to reduce vulnerability to CHE. Policies such as strengthening the reimbursement system to be more inclusive for economically disadvantaged segments could be implemented. This is crucial for reducing inequality in society, due to the pronounced impact of increased tobacco consumption on health status and healthcare expenditure, aligning with the objectives of the Sustainable Development Goals.

This study had some limitations. First, the calculation of CHE possibly underestimated the complete financial burden of healthcare, encompassing both direct (such as medical costs) and indirect (such as lost working time) costs, along with nonmedical costs such as transportation, accommodation and special food. Unfortunately, the exclusion of nonmedical and indirect costs from the analysis was a limitation imposed by the unavailability of relevant data. Second, using longitudinal data, which are not currently available, would be preferable to cross-sectional data for assessing changes over time and analysing the dynamic and intertemporal dimensions. Given that survey data were used in the analysis, it is essential to consider response and recall biases when evaluating the findings.

Future studies could enhance the analysis by incorporating tobacco consumption intensity (e.g. number of cigarettes smoked per day) and propensity. Disaggregation of total healthcare expenditure into categories and exploring the determinants for each component could provide a more comprehensive understanding of the relationship between tobacco consumption and CHE.

In summary, this study not only fills a gap in the literature but also provides critical information for policy-makers, healthcare providers and public health advocates. By elucidating the economic consequences of smoking, this research emphasizes the importance of comprehensive tobacco control measures and supports the development of strategies to alleviate the financial burden on households.

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**Competing interests:** None declared.

## Impact de la consommation de tabac sur les dépenses de santé catastrophiques des ménages en Türkiye

### Résumé

**Contexte :** Comprendre la charge financière que représente le tabagisme pour les ménages est essentiel pour élaborer des stratégies et des politiques efficaces en vue de réduire la consommation du tabac et d'atténuer son impact sur leur santé.

**Objectif :** Étudier la relation entre le tabagisme et les dépenses de santé catastrophiques en Türkiye.

**Méthodes :** La présente étude transversale a utilisé des microdonnées provenant d'enquêtes sur le budget des ménages menées par l'Institut de la statistique turc en 2015 et 2019. Ces données incluaient les caractéristiques socio-économiques, les niveaux de revenus et les tendances de consommation de divers biens et services par les individus et les ménages. Nous avons utilisé le modèle logit cumulé dans le but d'analyser les facteurs influençant les dépenses de santé catastrophiques des ménages, en mettant l'accent sur leur statut tabagique.

**Résultats :** La présence d'un fumeur, d'une personne non assurée, malade ou en situation de handicap, ainsi que de personnes ayant un niveau d'éducation supérieur au sein d'un ménage constituait un facteur prédictif positif important de dépenses de santé catastrophiques, tandis que la pauvreté, le travail et le fait d'avoir des enfants d'âge scolaire représentaient des facteurs prédictifs négatifs importants. La présence de fumeurs dans un ménage constituait la première cause d'augmentation de la probabilité de telles dépenses, avec un coefficient de 0,4101 et un effet marginal de 7,94 %.

**Conclusion :** La présente étude souligne la nécessité de mettre en place des mesures de lutte antitabac globales qui analysent et intègrent les informations essentielles sur les interactions entre la santé publique et la stabilité économique en vue de réduire la consommation de tabac et la charge financière associée qui pèse sur les ménages.

### أثر استهلاك التبغ على النفقات الصحية الباهظة للأسر في تركيا

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#### الخلاصة

الخلفية: فهم العبء المالي الذي يسببه التدخين للأسر أمر في غاية الأهمية لوضع استراتيجيات وسياسات فعالة للحد من التدخين والتخفيف من آثاره على صحة الأسر.

الهدف: هدفت هذه الدراسة الى بحث العلاقة بين التدخين والنفقات الصحية الباهظة في تركيا.

طرق البحث: استخدمت هذه الدراسة المقطعية بيانات جزئية من مسح لميزانيات الأسر أجراها معهد الإحصاء التركي في عامي 2015 و 2019. وشملت البيانات السمات الاجتماعية الاقتصادية، ومستويات الدخل، وأنماط استهلاك الأفراد والأسر لمختلف السلع والخدمات. وقد استخدمنا نموذج نسبة الاحتمالية المجمع لتحليل العوامل التي تؤثر في النفقات الصحية الباهظة للأسر، مع التركيز على حالة التدخين بها.

النتائج: كان وجود مدخن أو شخص غير مؤمن عليه أو فرد معاق أو مريض في الأسرة، وحصول أفراد الأسرة على تعليم عال، من عوامل التنبؤ الإيجابية المهمة بوجود نفقات صحية باهظة، في حين كان الفقر والعمل ووجود أطفال في سن المدرسة من عوامل التنبؤ السلبية المهمة. وكان وجود مدخنين في الأسرة في مقدمة العوامل التي تسهم في احتمال وجود نفقات صحية باهظة، بمعامل بلغ 0.4101، وأثر هامشي بلغ 7.94٪.

الاستنتاجات: تبرز هذه الدراسة الحاجة إلى اتخاذ تدابير شاملة لمكافحة التبغ تقوم على تحليل المعلومات البالغة الأهمية المستمدة من العلاقة بين الصحة العامة والاستقرار الاقتصادي، ثم توظيفها للحد من استهلاك التبغ، وما يرتبط به من أعباء مالية تتحملها الأسر.

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