

Short Report

Going up in ashes? Smoking-attributable morbidity, hospital admissions and expenditure in Greece

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Our aim was to calculate the morbidity, hospitalizations and subsequent hospital costs for the treatment of the smoking-attributable fraction of diseases in Greece using a prevalence-based annual cost approach. In 2011, smoking accounted for 199,028 hospital admissions (8.9% of the national total), with attributable hospital treatment costs calculated at more than €554 million, which represents 10.7% of the national hospital budget. These results pose a compelling reason for the European Union to champion tobacco control as a means of reducing the financial and social burden of disease in Greece and other countries currently facing a financial maelstrom.

Introduction

Smoking within the European Union (EU) is estimated to cause 650,000 deaths annually, half of which are among 35–69-year-olds.¹ This extensive morbidity is expected to have a significant impact on the provision of health care and pose an additional burden to economies within the Eurozone, many of which are already under significant financial constraints. Currently, Greece has one of the highest smoking prevalences among members of the EU.² This tobacco epidemic poses a challenge not only to public health, but also to the health-care system. The diagnosis and treatment of smoking-attributable diseases may require a long, specialized and costly treatment as well as intensive inpatient hospitalization, which may result in the multiplication of costs for the health-care system.³ In times of economic recession, such as that facing the Eurozone, and Greece in particular, it is imperative to assess the relative impact of preventable health-related behaviours so as to be able to strategically plan public health actions.

Our hypothesis was that Greece's tobacco epidemic may compound the Greek economy, and as such we aimed to calculate smoking-attributable fractions of disease (SAFs), hospitalizations and subsequent hospitalization costs for the treatment of smoking-attributable diseases in Greece using the most recent available data.

Methods

An annual cost approach (prevalence-based) was applied. This top-down approach estimates the costs of smoking-related diseases for new cases diagnosed, for patients in advanced stages and for patients who died of smoking-related illness in the year.

The International Classification of Diseases (ICD-10) of the World Health Organization was used to select conditions

identified as casually related to cigarette smoking. These SAFs of disease in Greece—the proportion health outcomes by disease category that can be attributable to tobacco use—were based on the American Cancer Society's Prevention Study due to a lack of national risk estimates. This 6-year follow-up study of 1.2 million adults in the United States provided the estimated relative risk of mortality for current and former cigarette smokers compared with never smokers for persons aged 35 and older.⁴ From these relative risks, weighted relative risks for current and former smokers were derived, taking into account the percentage of women and men in the total Greek population. Smoking prevalence for Greece was noted at 40% for current smokers, 16% for former smokers and 44% for never smokers, based on the official Eurobarometer data.¹

Subsequently, smoking-attributable morbidity was derived from applying the SAFs to hospital diagnoses for the year 2011. Hospital admission records were provided from the Hellenic Ministry of Health and Social Solidarity for each disease category.⁵

The total hospital related costs attributable to smoking were calculated by applying the smoking-attributable admissions to the diagnosis-related group (DRG) rate. The DRG rate is an instrument that gives us the economic value/cost of a single hospital admission or medical care treatment using as key variable the ICD-10 code. This is performed through the statistical evaluation of hospital records that include the consumed resources for each diagnosis (ICD-10 code) and thus enable the calculation of an average patient's case-cost. This approach has been previously used to calculate smoking-attributable costs in other contexts (i.e. Sweden, Italy and China).^{6–8} Within this study, two DRG costs were extrapolated. One from the online database of the Hellenic Ministry of Health and Social Solidarity that did not include hospital salaries,

Table 1 Smoking-attributable hospital treatment costs, not adjusted for hospital salaries, Greece 2011

Diseases based on ICD-10	Smoking-attributable hospital treatment costs in Greece
Ischaemic heart disease (I20–I25)	€90,373,825
Other circulatory disease (I00–I09, I26–I51)	€55,856,541
Pneumonia/influenza (J10–J18)	€52,597,085
Cerebrovascular disease (I60–I69)	€38,729,443
Trachea, lung and bronchus (C33–C34)	€38,276,759
Bronchitis, emphysema (J40–J42, J43)	€35,900,538
Chronic airway obstruction (J44)	€32,575,979
Urinary bladder cancer (C67)	€15,956,599
Lip, oral cavity and pharynx (C00–C14)	€6,751,099
Other arterial disease (I72–I78)	€6,492,234
Acute myeloid leukaemia (C92.0)	€4,444,272
Aortic aneurysm (I71)	€3,866,016
Cervix, uterus (C53)	€3,294,228
Larynx (C32)	€2,975,537
Atherosclerosis (I70)	€2,650,082
Kidney and renal pelvis (C64–C65)	€2,297,272
Pancreas (C25)	€2,159,717
Stomach (C16)	€1,809,555
Other respiratory conditions in newborns (P23–P28)	€1,714,778
Oesophagus (C15)	€954,346
Respiratory distress syndrome (P22)	€335,896
Grand total	€400,011,801

and second, in-house DRG rate that included hospital salaries.^{9,10} These in-house rates were previously developed in cooperation with the Ministry of Health and Social Solidarity in Greece, in the context of improving the existing prospective payment system for public hospitals in Greece, the National School of Public Health in Athens.

Results

Lung cancer (C33–C34) and bronchitis and emphysema (J40–J42, J43) presented the highest disease-specific SAFs with 88.4 and 88.1%, respectively, followed by cancer of the larynx (C32) with 85.4% and chronic airway obstruction (J44) with 84%. SAFs of malignant neoplasms of the lip, oral cavity and pharynx (SAF 75.3%); oesophagus (74.6%); and urinary bladder (45.5%) were also notably elevated (Supplementary Table S1).

In 2011, smoking was accountable for 199,028 hospital admissions, representing 8.9% of the total number of hospital admissions in Greece (Supplementary Table S2). The most common conditions of smoking-related hospitalizations were ischaemic heart disease (I20–I25), with an estimated 51,232 admissions, and other circulatory diseases (I00–I09, I26–I51), with approximately 26,400 admissions. Pulmonary-related outcomes followed in the form of pneumonia and influenza (J10–J18), with 24,599 admissions, followed by bronchitis and emphysema (J40–J42), with 21,148 admissions, and lung cancer cases (C33–C34), with 19,645 admissions.

Smoking-attributable annual hospital treatment costs were calculated at €400,011,801, which represents 7.7% of the total hospital budget in Greece, on a 2011 base rate (Table 1). Ischaemic heart disease (I20–I25) was responsible for the largest financial burden on the Greek health-care system, with an annual cost of €90.3 million, followed by other circulatory diseases (I00–I09, I26–I51), with an annual cost of €55.8 million, and pneumonia/influenza (J10–J18), with an annual cost of €52.6 million. Cerebrovascular disease (I60–I69) costing €38.7 million and lung cancer (C33–C34) costing €38.2 million followed as the fourth and fifth most expensive smoking-attributable diseases, respectively, in

Greece in 2011. Finally, if one was to include the SAF of salaries of employees in Greek public hospitals, the total cost of smoking reached €554,123,300, representing 10.7% of the national budget allocated to hospitals in 2011.

Discussion

Owing to the increased prevalence of smoking in Greece, smoking was found to account for a substantial fraction of disease morbidity, resulting in 199,028 annual hospital admissions. The hospital treatment costs for these admissions were calculated at slightly more than €400 million annually, representing 7.7% of the total budget available for public hospitals in Greece. Adjustments for salaries lead to an overall cost of smoking of more than €500 million annually. These results indicate the significant impact of smoking on both the ailing Greek economy and the nation's health status.

In comparison with other countries, our estimates of the national SAFs were slightly higher, owing to the fact that smoking prevalence in Greece is considerably higher than most countries. In fact, similar estimations in Brazil, Canada, the United States and Nordic countries confirm that Greek disease-specific SAFs were higher for many diseases, including lung cancer (C33–C34) (88.4% vs. 81.4% in Brazil vs. 79.6% in Canada), bronchitis and emphysema (J40–J42, J43) (88.1% vs. 84.4% vs. 84%, respectively) and larynx cancer (C32) (85.4% vs. 79.5% vs. 80.2%, respectively).^{11,12} This elevated prevalence also significantly impacted the number of hospital admissions and thus the burden to the health-care system. This is elucidated when comparing smoking-attributable admissions rates between the UK and Greece, where the difference is almost double (4.7% in the UK vs. 8.9% within Greece).¹³

Our findings are conservative because the study focused solely on hospital-related costs; the costs of ambulatory care, pharmacotherapy as well as primary clinic costs are not covered within this approach owing to lack of available data. Moreover, indirect costs and non-medical costs, such as the costs for the transportation of health-care providers as well as outpatient visits, as well as intangible social costs such as pain, stress and suffering, were not included. Moreover, by using a population-based attributable fraction, we make the assumption that the percentage of smokers in the general population is the same as among the population admitted to hospitals. This assumption is likely to lead to an underestimation of the true cost of hospital-based care because smokers are usually overrepresented in hospital populations. However, this technique is commonly used because of the fewer assumptions and data required.

In conclusion, cigarette smoking imposes immense financial and social costs to Greece, which may significantly impede financial growth and development, especially in light of the existing austerity measures. Hence, using Greece as an example, these results pose a compelling reason for the EU to champion tobacco control, not only as a means to reduce cigarette use,^{14,15} but also as a means of reducing the financial and social burden of disease in Greece and other countries within the EU currently facing a financial maelstrom.

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Supplementary data

Supplementary data are available at *EURPUB* online.

Conflicts of interest: None declared.

Keypoints

- The Eurozone is currently under severe economic pressure, with significant ramifications on health-care provision and coverage.
- In Greece in 2011, smoking was responsible for 199,028 hospital admissions (8.9% of the national total), with attributable hospital treatment costs calculated at more than €554 million, which represents 10.7% of the annual national hospital budget, a significant drain of funds literally ‘gone up in ashes’.
- The EU should champion tobacco control as a means of reducing the financial and social burden of disease in Greece and other countries currently facing a financial maelstrom.

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