Cost of youth tobacco-control policies in seven European countries

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Background: Tobacco-control policies have been suggested to reduce smoking among adolescents. However, there is limited evidence on the real-world costs of implementation in different settings. In this study, we aimed at estimating the costs of school smoking bans, school prevention programmes and non-school bans (smoking bans in non-educational public settings, bans on sales to minors and bans on point-of-sale advertising), implemented in Finland, Ireland, the Netherlands, Belgium, Germany, Italy and Portugal, for 2016.
Methods: We retrospectively collected costs related to the inspection, monitoring and sanctioning activities related to bans and educational activities related to smoking prevention programmes. We used an 'ingredients-based' approach, identifying each resource used, quantity and unit value for one full year, under the state perspective. Costs were measured at national, regional, local and school-level and were informed by data on how these activities were performed in reality.
Results: Purchasing power parities adjusted-costs varied between €0.02 and €0.74 (average €0.24) per person (pp) for bans implemented outside schools. Mean costs of school smoking bans ranged from €3.31 to €34.76 (average €20.60), and mean costs of school educational programmes from €0.75 to €4.65 (average €2.92).
Conclusions: It is feasible to estimate costs of health policies as implemented in different settings. Costs of the tobacco control policies evaluated here depend mainly on the number of person-hours allocated to their implementation, and on the scale of intervention. Non-school bans presented the lowest costs, and the implementation of all policies cost up to €36 pp for 1 year.

Introduction

Minimizing the early exposure of adolescents to smoking as well as limiting their access to tobacco products are two main interventions supported by public health institutions to reduce smoking and its health consequences.[1–7] Bans on smoking in public places (including schools), bans on sales to minors, bans on points-of-sale advertising and school educational programmes are some of the strategies implemented at local and national levels that may reduce smoking among adolescents.[1,2,5–7]

Data on costs of tobacco-control policies (TCPs), especially on real-world and context-specific costs, is essential to support decision-making on health policies, as such information leads to a better evaluation of the resources to be allocated in order to implement a given public health policy. It is the first and indispensable step to identify the most adequate resources' allocation between competing policies within the health sector, or across sectors of public intervention. Accurate cost data are also fundamental to estimate and compare the cost-effectiveness of different policies.

A systematic review demonstrated that information on costs and cost-effectiveness of TCPs targeting adolescents is scarce.[8]

These policies are considered low-cost and highly cost-effective, but empirical data come mostly from the evaluation of media campaigns and school educational programmes, but not of smoking bans. Moreover, most economic evaluations have been performed using simulations, or assessing controlled trials, ignoring possible gaps between the adoption of the policies and their real-world implementation, in different settings. In addition, these studies did not take into account the variability of costs across different policies and different settings, nor how the costs may depend on the strength of implementation.

This study aimed at estimating the costs of implementation of school smoking bans, smoking bans in non-educational settings, bans on sales to minors, bans on point-of-sale advertising and school prevention programmes. We estimated the costs of the implementation of these policies in 2016, in seven European countries where these policies have been or were due to be implemented, namely Finland, Ireland, the Netherlands, Belgium, Germany, Italy and Portugal (their smoking and smoking prevention contexts are described in Supplementary Table S1). By doing so, we explored how costs of already implemented policies could be measured, and how to conduct similar measurement in several settings without compromising comparability.

Methods

We performed a cost-analysis study on policies preventing adolescent smoking, conducted for the year of 2016 (or 2015/2016 school-year). Cost data collection is summarized in Supplementary figure S1.

Study design—cost measurement

We retrospectively collected costs related to the implementation of these policies. Depending on the level of decentralization, costs were measured at national, regional, local and school levels. When implemented at a local level, we collected data from medium-sized cities with an average annual income close to the national average (Tampere/Finland, Dublin/Ireland, Amersfoort/the Netherlands, Namur/Belgium, Hanover/Germany, Latina/Italy and Coimbra/Portugal). To measure the implementation costs at school level, we selected three schools from each city, from high and low socioeconomic backgrounds. The selection of countries, cities and schools was justified elsewhere.[9]

We collected data on costs of (i) inspection activities and legal procedures related to non-school bans (i.e. smoking bans in non-educational public settings, as bars/cafes/restaurants, bans on sales to minors, bans on point-of-sale advertising); (ii) monitoring school smoking bans and sanctioning non-compliant students and (iii) smoking educational programmes (as activities improving awareness/literacy, or smoke-free classes). Costs were collected from the perspective of the decision-maker, which in most cases is the national, regional, or local authority, or the school management team.

We used an 'ingredients-based' approach, which had four steps: (i) identify each resource used; (ii) measure the quantity used in a full year; (iii) identify the unit cost of each resource and (iv) multiply the quantities of each resource by its unit value, in order to obtain the total cost. We collected costs related to human resources, transportation, communication, equipment, material and supplies and other costs relevant for the informant. This approach was in line with the WHO and the UK National Institute for Health and Care Excellence guidelines to cost-effectiveness analysis,[10,11] which have been followed by earlier studies.[8] Supplementary Table S3 presents the details on data collection.

Costs of agenda setting, design and voting of the legislation were not accounted for since, besides being extremely difficult to collect and quantify, these were expected to be temporal and residual in comparison with other costs.[8] Potential indirect economic costs for the state, subsequent to financial losses for retailers or bars, were not measured, as these tend to be residual[1] and ethically questionable to include. We did not consider isolated interventions following complaints, as these interventions are brief and irregular. We also excluded costs for other players, such as owners of bars or points-of-sale, as we adopted the perspective of the state as the main payer. For the same reason, individual savings of not smoking were not included, nor individual costs of being caught (e.g. fees or psychological damage).

Cost collection design

Costs were provided by informants from institutions responsible for the implementation of each policy. The institutions were part of the Health, Education, or Economy Ministries, of the Local Police or Municipalities, or schools. As few people had good knowledge of the implementation activities and financial data, further criteria to select informants in each institution were not applied. To facilitate and standardize the identification of institutions and informants, a common identification tool was used in all countries (Supplementary Material). A cost-reporting questionnaire assessing the quantity and value for each ingredient, per policy and level of decentralization, was designed following the WHO CHOICE methodology[12] (Supplementary Material).

We conducted a pilot test in Portugal. Informants reported difficulties at uncovering costs, mostly on the identification of resources related to the implementation of these policies, namely the number of human resources and hours exclusively devoted to these policies' implementation.

Considering these issues, we adjusted the cost-reporting questionnaire and developed a semi-structured interview guide to facilitate data collection (Supplementary Material). The questions were mostly on how the implementation process is held in different contexts (who monitored, how many people were involved, how monitoring was performed, what other activities coexisted, etc.) and on quantifying and valuing the ingredients. Though we favored an 'ingredient-based' approach, in some cases informants did not have these costs in detail and only total costs were provided.

Data collection

Each national team performed data collection by contacting the informants previously identified. We collected data from 9 institutions for non-school bans, 21 for school smoking bans and 19 for school educational programmes. One informant per institution filled in the cost-reporting questionnaire and, as we found some discrepancies in the number of person-hours, or costs included, the data were complemented with answers to semi-structured questions. By using this information, we double-checked and completed the answers to the cost-reporting questionnaire. Values that were not available at the time of the interview were provided later. When available, standard tables of values (e.g. gross salaries scales) were used. National teams provided contextual information when missing (e.g. minutes per break within a school day).

All interviews were voluntary. For the sake of confidentiality, neither the institution nor the position of the interviewee are disclosed, and, following the request of some informants, crude estimates are not presented in this paper. Teams were aware of the protocol, and in close contact with the authors during all process. All teams reviewed the final database, and inconsistencies were resolved in consultation with the authors.

Cost analysis

The total cost of each policy was calculated per country, local, or school-level and then divided by the number of inhabitants covered by the implementation of the non-school ban (whole population and 0–17-year-old subgroup), or students covered by the school policy. Costs were adjusted for purchasing power parities (PPP)[13] for international comparison. Data on population size, number of students per school or covered by the school programmes were collected using data from the cost-reporting questionnaires, school surveys[14] and statistics institutions.[9]

Results

Non-school bans

Smoking bans in non-educational public settings and bans on sales to minors were implemented in all countries, while bans on point-of-sale advertising were not implemented in Germany and Italy (Table 1). These three bans were implemented by different groups, or even by different institutions in Germany, the Netherlands and Italy. In Belgium, Finland, Ireland and Portugal they were implemented by the same teams and institutions. As such their implementation costs could not be estimated separately in these four countries. Institutions were responsible for monitoring these bans as well as food, water security, environmental and occupational health. These bans were monitored by local institutions in Finland (Tampere), Germany (Hanover) and Italy (Latina), while in the other countries they were monitored by national-level institutions.

The costs of monitoring and sanctioning these bans were considerably homogeneous. Considering a realist perspective (Table 1), the

Table 1 PPP-adjusted costs of non-school bans, in Euro, pp

	Netherlands	Germany	Portugal	Finland	Belgium	Italy	Ireland
Ban smoking non-school public places	0.14 (17 081 507)	0.02 (518 400)	0.11[a] (10 309 573)	0.74[a] (319 800)	0.17[a] (11 267 910)	0.05 (125 375)	0.20[a] (4 588 252)
Ban sales to minors	0.16 (17 081 507)	0.005 (518 400)				0.05 (125 375)	
Ban advertising POS	0.05 (17 081 507)	Not impl.				Not impl.	
TOTAL	0.35	0.02	0.11	0.74	0.17	0.10	0.20

Note: Population covered level and setting of intervention between parentheses.
[a]All the three bans were implemented together, by the same staff teams. Not impl. = Not implemented.

state invested less than 20 cents per person (pp) in 2016 in all countries, except in Finland and in the Netherlands (less than €1 pp if considering 0–17 years-old subgroup, as shown in Supplementary Table S2). In Tampere-Finland, the costs were of about €0.74 pp, since they invested nearly as many person-hours at local level as, for example, in Portugal (national level), with a higher salary per hour (Supplementary Table S3). Most costs of implementation were determined by human resources in all countries except Portugal, a highly centralized country where transportation accounted for 57.05% of the whole budget. Ireland and Belgium reported litigation costs, while in other countries these were either residual (as in Finland), and/or incorporated within human resources costs (as in Portugal). These costs accounted for less than 10% of total costs.

School smoking bans

School-level informants were not able to discriminate the costs of monitoring school smoking bans from other surveillance activities. Monitoring was done by ancillary staff and/or by teachers, and aimed at generally preventing misconduct or harmful behavior during breaks. Sanctions were usually applied by teachers and school principals, and involved educational talks with the students and their parents. Most person-hours were allocated to monitoring, as sanctions were rare. Higher costs per hour were reported when monitoring was done by teachers, as in the Finnish case.

If we assume that all person-hours devoted to monitoring school breaks would be needed to monitor this ban, the costs per student would range from €2.36 in Latina-Italy to €47.87 in Amersfoort–Netherlands. Under this 'conservative' approach, costs were mostly linked to human resources (Table 2): Latina's (Italy) schools reported allocating 45–90 person-hours per year, while in School A in Coimbra–Portugal it amounted to 4371 person-hours (Supplementary Table S4), as this school had a full-time staff element entirely responsible for preventing misconduct. The school size also influence costs: in Amersfoort–Netherlands, the total costs in school A and B were similar, but as school B had 75% fewer students than school A, the cost pp was 3-fold higher (Table 2).

However, school informants reported that monitoring during school breaks was not exclusively devoted to monitoring smoking, and that no staff was exclusively responsible for that activity. Based on this information, we assumed that the monitoring of school smoking bans does not significantly take any time or efforts away from other activities during school breaks and does not require the hiring of additional staff. Under this 'realistic' assumption, costs were mostly related to sanctions and communication and thus much smaller compared to the 'conservative' approach, with a maximum cost of €1.07 per student (Latina, Italy) (Supplementary Table S5). Schools A and C in Finland did not report any costs, as students comply with the rules and they did not report any monitoring or communication activities pertaining exclusively to smoking bans.

School educational programmes

School educational programmes were implemented at national or regional level in Hanover–Germany, national and school level in Amersfoort–Netherlands, regional and school level in Latina–Italy and at school level in Coimbra–Portugal, Tampere–Finland, Namur–Belgium and Dublin–Ireland. Forty percent of all schools did not implement any programme or activity devoted to smoking prevention, and most of the remaining schools did so in fewer than two sessions per year of 45–50 min. The total costs per student varied between €0.65 in one of the Irish schools, and €9.99 in one school from Latina–Italy (Table 3). The costs depended mostly on the number of person-hours and population covered (Supplementary Table S4). In Hanover–Germany about half of the costs were allocated to prizes and awards for classrooms, as well as dissemination events.

Discussion

Key findings

This study is the first that gathers and compares the costs of several TCPs implemented in the real-world, in different contexts and levels of implementation. The mean yearly costs of implementation of these policies varied from about €9 to about €36 pp covered. Bans in non-educational public settings, on sales to minors and on point-of-sale advertising have the lowest implementation costs in all seven countries, ranging from €0.02 to €0.74 pp covered. When we assume the 'realistic' approach, school smoking bans present costs similar to non-school bans, costing up to €1.07 per student. Using the 'conservative' perspective, in which all person-hours monitoring school breaks would be allocated to monitoring school smoking bans, the cost would range from €3.31 to €34.76 pp. Mean costs with school educational programmes ranged up to €5.12 pp but depended on the number of sessions and/or hours delivered.

Interpretation

The costs of implementation of non-school bans were close to those found in the literature: Ahmad[15] considered that enforcing the rise of the minimum age of sale to 21-years-old would cost about $0.16 pp, and DiFranza[16] estimated a cost of $0.59 pp. The variation of costs of school educational programmes is also observed in the literature,[17–23] but our cost estimates are substantially lower. While educational activities implemented in reality in these seven countries are brief, the programmes evaluated in the literature had more intensive and consistent implementation efforts—involving a higher number of person-hours.

The variation of costs was related to the scale of implementation. The policies' implementation in larger settings (such as larger municipalities or schools) result in lower costs pp, as we can observe by comparing schools A and B in Amersfoort–Netherlands, or schools C and B in Latina–Italy. Economies of

Table 2 PPP-adjusted costs of school smoking bans, 'conservative' estimate, in Euro, pp

	Netherlands	Germany	Portugal	Finland	Belgium	Italy	Ireland
School A	13.07 (1750)	19.42 (600)	54.10 (470)	'Residual'	10.78 (1500)	2.44 (577)	33.65 (870)
School B	47.87 (425)	21.40 (738)	13.88 (862)	23.40 (600)	22.42 (682)	5.13 (414)	35.86 (815)
School C	4.76 (1000)	16.83 (1811)	12.95 (733)	'Residual'	15.27 (1000)	2.36 (1388)	N/A
School D (Germany only)	–	13.18 (353)	–	–	–	–	–
MEAN	21.90	17.71	26.97	23.40	16.15	3.31	34.76

Notes: Number of students covered for each level and setting of intervention between parentheses.
N/A = data not available.

Table 3 PPP-adjusted costs of school educational programmes, in Euro, pp

	Netherlands	Germany	Portugal	Finland	Belgium	Italy	Ireland
Setting 1[a]	Not impl.	2.05 (200 000)	Not imp.	1.17 (97)	Not impl.	N/A	0.65 (320)
Setting 2[a]	7.75 (80)	1.12 (15 334)	7.56 (862)	2.54 (197)	2.38 (100)	0.25 (10 000)	Not impl.
Setting 3[a]	0.91 (300)	2.82 (3314)	0.65 (120)	1.91 (119)	Not impl.	9.99 (300)	N/A
MEAN	4.33	2.00	4.10	1.88	2.38	5.12	0.65

Note: Number of students covered for each level and setting of intervention between parentheses
[a]These three settings were schools in the Netherlands, Portugal, Finland and Ireland (1 corresponds to schools A, 2 corresponds to schools B, and 3 corresponds to schools C, in each country); in Germany, setting 1 is a national-level institution, setting 2 a regional-level institution from Lower Saxony and setting 3 a sub region-level institution from Saxony Anhalt; in Italy setting 2 is a regional-level institution from Lazio, Italy, that implements a school educational programme in Schools A and B, among others and setting 3 corresponds to school C.
Not impl. = Not implemented; N/A = data not available.

scale are expected, as certain policies have significant fixed costs related to setting up monitoring activities, but very low marginal costs. As such, when reaching a certain degree of coverage, average costs decrease and population-level interventions, as bans, become less costly than individual-level ones.[24]

However, the scale of implementation does not explain all variations: despite its larger population-size, Tampere–Finland has a higher cost pp of implementation of non-school bans than Latina-Italy. In this case, higher implementation costs are related to a higher number of person-hours, possibly associated with a stronger implementation of TCPs.[25,26] The association between magnitude of costs and strength of implementation is depicted in figure 1, which suggests that higher yearly costs of implementation of non-school bans are positively associated with higher scores of non-school bans, as assessed by the Tobacco Control Scale.[25]

The costs of implementation of these policies can further depend on their design. Bans with a comprehensive design may have lower costs of implementation, in contrast to those with a partial design[27]: comprehensive designs state the ban more clearly, with greater ease in communication and, possibly, enforcement. This may lead to a smaller number of inspections and of sanctions applied, compared to those bans with partial design.

Smoking prevalence or smoking de-normalization may influence these policies' implementation costs, as contexts with lower prevalence could require less implementation efforts. Though, despite presenting the lowest smoking prevalence, Finland presented the highest costs of implementation of non-school bans; possibly continuous monitoring and sanctioning efforts contribute to maintain a low smoking prevalence. Multi-strategy approaches, as combining smoking bans with raising prices of tobacco products, may more effectively reduce smoking prevalence[1,28] without

affecting the costs of implementation of these policies. This may explain the outlier in figure 1: Ireland is one of the leading countries on tobacco control coupling high taxation of tobacco products with the implementation of comprehensive bans,[25] but the implementation costs of these bans are similar to those from countries situated in the middle rank. As effectiveness varies regarding the context, cost estimation must be complemented with cost-effectiveness analyzes, to inform which TCP may be more cost-effective, in which context and level of implementation.

Evaluation of the methodology

In order to obtain cost data of TCPs implemented in a real-world setting, we combined previously defined quantitative methodologies,[12] with interviews on how implementation was performed, to quantify and value all ingredients used. This second method was indispensable to guarantee that all ingredients were included, and that costs were collected without significant discrepancies by context or informant. Moreover, we ensured flexibility in the process without losing comparability by constantly communicating with local researchers. Complementing the quantitative approach with this methodology may be needed for future studies that seek to estimate costs of already implemented policies, especially in diverse settings.

Though our estimations were not much discrepant from the costs reported in the literature, several limitations must be noted. First, the lack of financial data records led most informants to report approximate values. In the absence of more precise values, we collected approximate estimates of time devoted to monitoring bans, quantity of equipment acquired, and salaries per hour. Second, we used a sample of municipalities and schools that may not be fully representative of the national scenario. Cost estimates
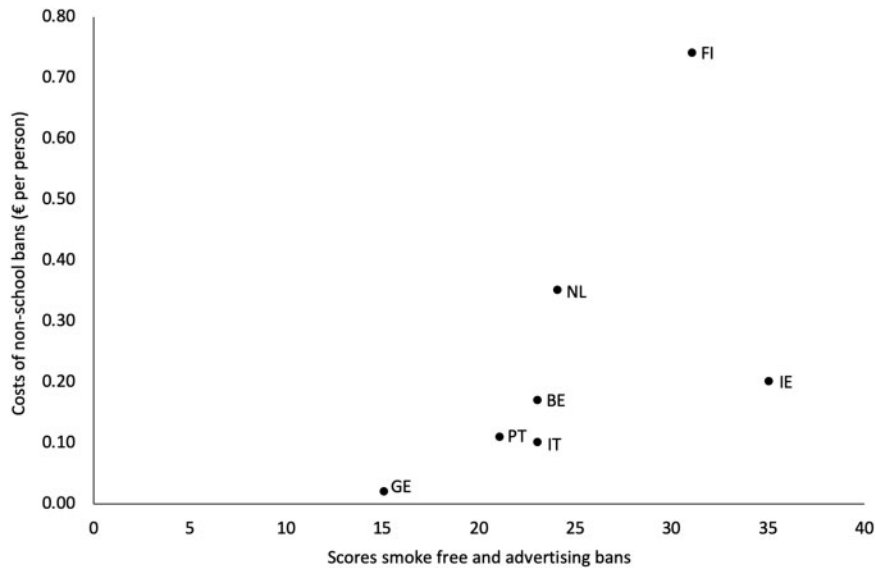
Figure 1 Comparison of countries' costs of implementation of non-school bans to the score of the smoke free bans and bans on tobacco advertising.[25] Costs are PPP-adjusted. Note: FI, Finland; IE, Ireland; NL, the Netherlands; GE, Germany; BE, Belgium; IT, Italy; PT, Portugal.

were based on specific setting-years, and on the policies' design. Note, however, that costs data were collected in medium-sized cities in which the mean income was similar to the national average, and that despite some expected discrepancies, costs were rather similar across countries.

Conclusions

By collecting the costs of implementation of these TCPs across seven European countries, we showed that the measurement of costs of already implemented public health policies is feasible, using real-world, context-specific data. Costs were mostly dependent on the number of person-hours devoted to implementation, and to the scale of implementation. The implementation of all policies together cost less than €36 pp in the 'conservative' scenario, while in a more 'realistic' scenario it cost less than €6 pp, in all countries, for 2016. These results clearly demonstrate that smoking prevention policies have low implementation costs, especially when comparing to the astronomical costs of smoking-related diseases.[29]

Supplementary data

Supplementary data are available at *EURPUB* online.

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Conflicts of interest: None declared.

Key points

- The evidence of the large-scale, real-world and context-specific costs of implemented TCPs targeting adolescents is scarce, but essential to support decision-making.
- We collected data on the costs of implementation of non-school bans, school smoking bans and school educational programmes, in seven European countries.
- The yearly costs of implementation of these policies varied from €9 to €36 pp, which are clearly lower than the costs of smoking-related consequences.
- This study shows that the measurement of the real costs of implementation of public health policies is feasible, and it demonstrates how it can be performed using real-world, context-specific data.

Contributors: JP and AEK conceptualized the study. TL and JP contributed to the study design, data analysis and interpretation of results. TL, AEK and JP wrote the manuscript. All authors contributed to data collection, interpretation, and discussion of the results, as well as revision and approval of the manuscript.

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Changes in tobacco-related morbidity and mortality in French women: worrying trends

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Background: The high prevalence of smoking among French women since the 1970s has been reflected over the past decade by a strong impact on the health of women. This paper describes age and gender differences in France of the impact of smoking on morbidity and mortality trends since the 2000s. **Methods:** Smoking prevalence trends were based on estimates from national surveys from 1974 to 2017. Lung cancer incidence were estimated from 2002–12 cancer registry data. Morbidity data for chronic obstructive pulmonary disease (COPD) exacerbation and myocardial infarction were assessed through hospital admissions data, 2002–15. For each disease, number of deaths between 2000 and 2014 came from the national database on medical causes of death. The tobacco-attributable mortality (all causes) was obtained using a population-attributable fraction methodology. **Results:** The incidence of lung cancer and COPD increased by 72% and 100%, respectively, among women between 2002 and 2015. For myocardial infarction before the age of 65, the incidence increased by 50% between 2002 and 2015 in women vs. 16% in men and the highest increase was observed in women of 45–64-year-olds. Mortality from lung cancer and COPD increased by 71% and 3%, respectively, among women. The estimated number of women who died as a result of smoking has more than doubled between 2000 and 2014 (7% vs. 3% of all deaths). **Conclusions:** The increase in the prevalence of smoking among women has a major impact on the morbidity and mortality of tobacco-related diseases in women and will continue to increase for a number of years.

Introduction

In industrialized countries, smoking generates a considerable health burden and is the leading cause of preventable death.[1] Women have been an important target of the tobacco industry, which has used all marketing tools for decades to encourage more women to smoke.[2] By using a glamorous and sophisticated image through fashion, ads, films and TV, the tobacco industry has worked hard to surround cigarettes with a positive social image and market that image to women. It also adapted to this new market by developing products specifically designed for women, including flavoured and 'slim' cigarettes. Harnessing societal pressure to stay thin, advertisements presented cigarettes as a way for women to control their weight.[3] Finally, ads also focused on women's independence, encouraging women to smoke as a symbol of their equality with men. In France and elsewhere, the result of this shift in behaviours has been an increase in tobacco use among women over the past 50 years. In 2017, 24% of women aged 18–75 reported smoking every day compared to 30% of men. This trend has remained relatively stable since the 2000s.[4,5]

Research has shown that the same quantity of tobacco results in a greater risk of heart attack and chronic obstructive pulmonary disease (COPD) in women than in men.[6,7] However, studies have shown conflicting results with respect to lung cancer regarding this point.[8–10]

The aim of this article is to describe smoking-related morbidity and mortality trends in France since the early 2000s for both men and women in relation to changes in the prevalence of tobacco use and according to age categories. The morbidity and mortality rates for three pathologies highly attributable to long-term exposure to smoking (lung cancer, COPD) and to shorter-term exposure to smoking (myocardial infarction).[11] Finally, recent trends in smoking-related deaths for all pathologies causally linked to smoking were estimated.

Methods

Prevalence of tobacco use

In France, the prevalence of daily smoking was measured by general quota-sampling population surveys between 1974 and 1991 and cross-sectional surveys, called Health Barometers ('*Baromètre santé*'), were then carried out from 1992 to 2017. These surveys were carried out over the phone using random samples of the population living in mainland France and speaking French.[12]

Morbidity of the main tobacco-related pathologies

Myocardial infarction- and COPD-related morbidities were studied by examining hospitalizations for myocardial infarction or for COPD exacerbation. Data were extracted from the French Hospitalization Activity Database ('*Programme de médicalisation des systèmes d'information–Médecine, chirurgie obstétrique*', hospital discharge databases PMSI) on hospital admissions. For each year of the study period (2002–15), patients over the age of 35, living in France and hospitalized at least once during the year for a myocardial infarction or COPD exacerbation were selected. Hospital stays were identified with a primary diagnosis (PD) of myocardial infarction with the codes I21, I22 and I23 in accordance with the 10th revision of the International Classification of Diseases (ICD-10). For COPD exacerbations, hospital stays corresponding to one of the following criteria were studied: 1/PD of COPD with an acute lower respiratory infection (J44.0) or with an acute, unspecified episode (J44.1); 2/PD of acute respiratory failure (J96.0) or a lower respiratory infection (J09-J18, J20-J22) with a significant associated diagnosis (SAD) of COPD (J44) or emphysema (J43); 3/PD of COPD (J44) or emphysema (J43) with a SAD of an acute COPD exacerbation