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Review
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Review

Tobacco Cost of Illness Studies: A Systematic Review

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Abstract

Introduction: To identify studies reporting costs arising from tobacco use and detail their (1) economic approaches, (2) health outcomes, and (3) other cost areas included.

Methods: We searched PubMed, Scopus, Cochrane Library, EconLit, and Google Scholar for studies published between 2008 and April 2018 in English. Eligible articles reported tobacco-related costs and included all tobacco-using populations (multinational, national, subpopulations, and involuntary smokers). All economic approaches that resulted in monetary outcomes were included. We reported USD or converted local currencies to USD. Two health economists extracted and two researchers independently reviewed the data.

Results: From 4083 articles, we reviewed 361 abstracts and examined 79 full-texts, with 63 (1.6%) deemed eligible. There were three multinational, thirty-four national, twenty-one subpopulation or condition(s)-specific analyses, and five evaluating involuntary smoking. The diverse approaches and outcomes precluded integrating costs, but these were substantial in all studies. For instance, about USD 1436 billion in global health expenditures and productivity losses in 2012 and USD 9 billion in lost productivity in China, Brazil, and South Africa in 2012. At the national level, costs ranged from USD 4665 in annual per respondent health expenses (Germany 2006–2008) to USD 289–332.5 billion in medical expenses (United States 1964–2014).

Conclusions: Despite wide variations in the methods used, the identified costs of tobacco are substantial. Studies on tobacco cost-of-illness use diverse methods and hence produce data that are not readily comparable across populations, time, and studies, precluding a consistent evidence-base for action and measurement of progress. Recommendations are made to improve comparability.

Implications: In addition to the health and financial costs to individual smokers, smoking imposes costs on the broader community. Production of comparable estimates of the societal cost of tobacco use is impaired by a plethora of economic models and inconsistently included costs and conditions. These inconsistencies also cause difficulties in comparing relative impacts caused by differing factors. The review systematically documents the post-2007 literature on tobacco cost-of-illness estimations and details conditions and costs included. We hope this will encourage

replication of models across settings to provide more consistent data, able to be integrated across populations, over time, and across risk factors.

Introduction

It is estimated that in the 20th century tobacco killed about 100 million people worldwide and it is projected to kill 1 billion people in the 21st century.[1,2] Overall, the annual combined social and economic cost is assessed at more than 1 trillion US dollars.[3] Further, tobacco use kills more than 7 million people each year, more than the joint annual deaths from tuberculosis, HIV/AIDS, and malaria.[1,2]

Globally, tobacco use is the leading risk factor for disability-adjusted life years lost for men and the ninth largest risk factor for women.[4] In 2015, it was the leading risk factor for disease burden in 24 countries, including the United States, Canada, many western European countries, Greece, Australia, Thailand, Papua New Guinea, Uruguay, and Vietnam.[5] Smoking is either partly or wholly responsible for a wide range of adverse health impacts, including respiratory diseases, cancers, and cardiovascular disease.[5,6]

Cost-of-illness or social cost studies attempt to estimate in monetary terms the impact of a disease, condition, or behavior. As such, these studies combine the costs arising from a diversity of outcomes or interventions. In relation to smoking, the major cost item is likely to be premature mortality with other costs including treatment costs, other health care costs, lost productivity, absenteeism, other tangible costs (eg, fires), and intangible costs (eg, the intangible costs of premature death). However, even though the relationship between smoking, morbidity, and mortality has long been known,[6,7] there are likely to remain gaps in our knowledge on the full extent and range of costs arising from tobacco use. Understanding the extent of these costs and the range of people affected underpins the rationale for policy and public health interventions and can also guide some interventions such as optimal tax rates.

In general, cost-of-illness studies exclude private costs (eg costs to the smoker of tobacco, pain, and suffering) based on the assumption that an individual's consumption arises from a rational decision process that weighs up the available resources and the costs and benefits that would arise from that set of consumption choices.[8,9] In such cases, there is no economic rationale for interventions to address these internal costs. However, tobacco is highly addictive. The idea of rational and informed tobacco consumption—and consumption of other drugs of dependence—is open to doubt. Although the "rational addiction model"[8] proposes that current consumption may be rational even for substances of dependence, it rests on a number of strong assumptions, which lack empirical support. These include potential consumers holding perfect information about the health implications of the substance and the probability of dependence developing before they commence use and that their preferences are consistent and are perfectly rational. About 90% smokers report that they regret that they ever started smoking[10] and 80% are discontented that they are unable to quit smoking.[11] In Australia, many smokers (60%) report that they are planning to give up and about 75% say that have attempted to cut down or been unable to quit smoking in the last 12 months.[12] A large proportion of current smokers began smoking when they were children.[13,14] Overall, this suggests that the majority of smokers are not adequately informed or in a position to make a "rational" decision that takes into account all of the potential impacts, when they start smoking mostly as young children, about either the health consequences or the risk of long-term addiction. Thus, given the addictive nature of tobacco, including all or part of the corresponding costs associated with tobacco use since childhood will likely result in higher estimated costs.

This review aimed to summarize recent evidence on the social costs of tobacco. (For details of health conditions, readers are referred to the most recent Surgeon General's report.[6]) The starting date selected was 2008. This marked the release of the World Health Organizations' (WHO) MPOWER report,[1] captures a period of considerable change in smoking control measures,[2] and coincides with the most recent national cost-of-illness study in Australia by Collins and Lapsley.[15] In 2004–2005, they estimated the net total cost to be around $31.5 billion across both tangible and intangible costs with 14 901 deaths arising from tobacco consumption.[15] They reported a net cost, as any savings identified were deducted from the total cost, for example, premature mortality reducing future hospital costs.[15] The analysis also included a component attributable to involuntary smoking. Any harm that was incurred in those less than 15 years of age was deemed to be because of involuntary smoking (eg low birth weight and otitis media). In addition, for those aged more than 15 years, the analysis included a proportion of cases (eg lung cancer and ischemic heart disease) in nonsmokers exposed to smoke in the home or at work.

The objective of this review of the social cost of tobacco was to identify recent studies, the range of conditions included, their methodological approach—including issues such as the long-lead time for many conditions and to make suggestions for improvements to the consistency and compatibility of data from future studies. The review covered all age groups, including those exposed to second-hand smoke. The studies had to include an aspect of the social costs of smoking (eg health, productivity, and deaths). This type of social cost study does not require a comparator group, as the relative risks allow the comparison of harms with an equivalent "never smoker" population. However, this also introduces a potential limitation to the study design in terms of its policy relevance, as these headline costs have an implicit counterfactual that removal of the behavior or exposure would remove the cost; this is not the case with smoking as while smoking cessation reduces risks to the individual, it does not (for most conditions) reduce them to those of a "never smoker"[16], p.871–875. If a study seeks to identify avoidable costs of smoking, these will typically need to be calculated separately by comparing relative risks of current and former smokers. Outcomes had to include a monetarized component (see PICOS Table in Supplementary Appendix 1).

Methods

We systematically searched the literature using the terms "cost of illness" and tobacco, "cost of illness" and smoking (detailed in Supplementary Appendix 2) in PubMed, Scopus, Cochrane Library, EconLit, and Google Scholar. We developed and tested the strategy initially in SCOPUS (Supplementary Appendix 3) and then used the search terms in the other databases. Further, we reviewed the reference list of all the included studies to identify other potentially relevant studies. To be eligible for inclusion, the studies had to be published between 2008 and April 2018 (inclusive), available in

English or with an English language summary and report on the social or economic costs of tobacco use in monetary terms. If not reported in USD, monetary values were converted to USD for the study target year (or midpoint of range) via a purchasing power parities calculator.[17] Tobacco use included both smoking and other forms of consumption in terms of our inclusion criteria; however, most studies relate to smoking of cigarettes and this is used as the generic term unless referring to studies specifically relating to other types of tobacco use. We excluded reports that were only available as conference abstracts or were not original research, such as editorials, review articles, or systematic reviews. However, in the latter two cases, the studies reported within the reviews were eligible if they fulfilled the other criteria. The initial search was conducted by one author (MM) with data extracted by MM and TD into a predesigned spreadsheet. These data were checked by RJT (data transcription) and SW (economic content). The review (protocol) was not registered.

Results

We identified 4083 articles and after inspection of their titles and abstracts, 63 were deemed to be eligible for inclusion in the review (see Figure 1 for details of the elimination process). We abstracted the key information into summary tables (Supplementary Tables 1 and 2). The first of these tables contains the basic description of the studies and the methodological approach used, together with information on the costs included. Supplementary Table 2 summarizes the source(s) of information on the prevalence of smoking together with the method of estimation used. The table also provided a written summary (Supplementary Appendix 4 provides a graphical summary) the main findings and costs. It also lists the disease conditions (with *International Classification of Disease codes 10th revision*[18] (*ICD-10*) if reported). Where the number (or detail) of conditions listed was too extensive to include in the table, we report these in Supplementary Appendix 5. Both the tables were subdivided into estimates based on data from multiple countries, single country studies, and analysis that focused on a specific subgroup of the population or targeted a specific condition(s) in a country. Finally, we present the results of studies reporting on involuntary smoking exposure.

There were three (5%) multinational, thirty-four (54%) national, twenty-one (33%) subpopulation or condition-specific investigations, and eight (13%) involuntary smoking estimates. Of the sixty-three studies, fifty-six (89%) used the prevalence approach, four the incidence approach,[19–22] one the demographic[23] with two using other methods.[24,25] To adjust for the lag time of some health conditions, eight studies used the smoking impact ratio,[21,26] and three the lagged prevalence, with the remainder using the current prevalence or not describing a method.[27,28] Supplementary Table 2 gives a summary of each study included in the review, particularly noting whether internal costs were incorporated, the data sources and methods used, target age or group, estimated costs, and specific disease conditions

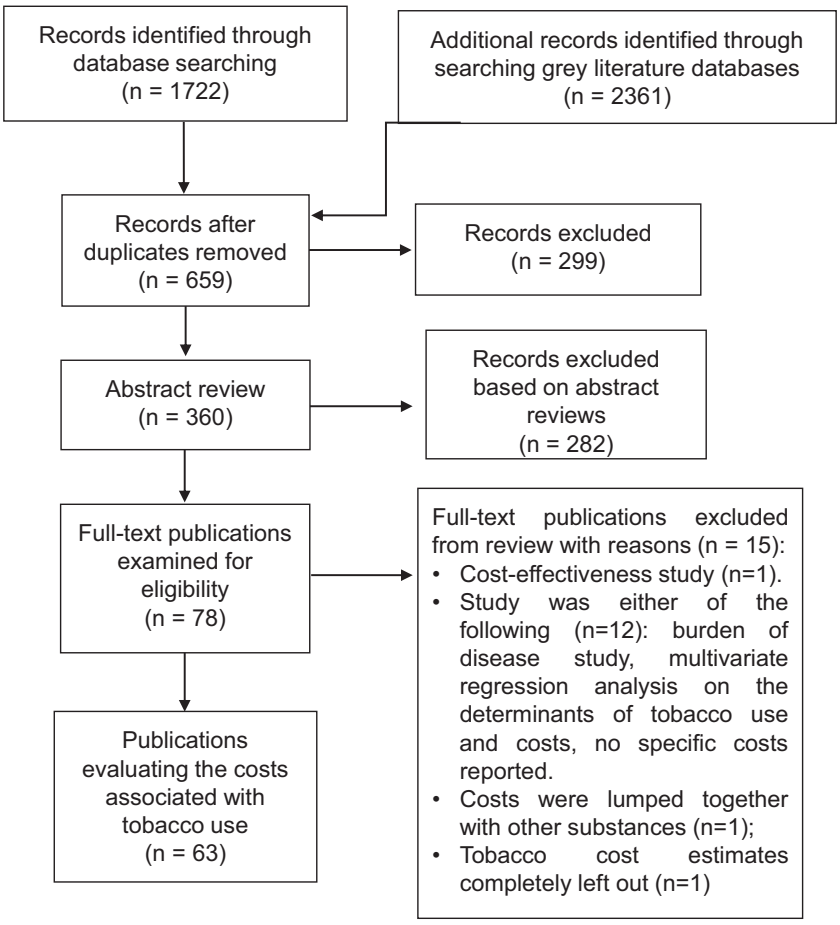

Figure 1. PRISMA flow chart.

included. We note that the differences in methodologies used in calculating costs and the variations in the disease conditions considered in each study precluded any meaningful comparisons across populations, time, and studies.

The first three studies in Supplementary Table 2 quantify the costs imposed by tobacco consumption on a global or multinational level. For example, Pearce et al.[22] reported that in 2012, tobacco use contributed to an estimated USD 7.9 billion, USD 402 million, and USD 138 million in lost productivity in China, Brazil, and South Africa, respectively. The Directorate-General for Health and Consumers study[26] reported that the estimated costs attributed to tobacco smoking in the European Union amounted to about USD 714.9 billion in 2009 and a global estimate was that the economic burden of smoking tobacco was about USD 1436 billion in 2012.[29]

Supplementary Table 2 also reports the tobacco-related costs based on national estimates. As mentioned earlier, cost estimates reported by each study will differ, partly because of differences in terms of the specific timeframes considered for the analysis, the methodologies adopted, and the disease conditions considered. Regardless of such differences, tobacco-related costs are clearly nontrivial across countries. For example, tobacco use contributed to an estimated USD 11–15.1 billion in health care (direct and indirect) costs between 2012 and 2013 in Canada,[27,30] while in Indonesia, nearly USD 2.2 billion was linked to tobacco-related treatment costs.[31] In the United States, smoking accounted for about USD 289–332.5 billion in medical expenses over the period 1964–2014.[6] Smoking contributed to about USD 2.18 billion in medical costs in Thailand in 2009,[32] USD 36.5 billion in Russia in 2008,[33] USD 3.1 billion in Korea in 2008,[34] and USD 22.4 billion in India in 2004 and 2011.[35] Overall, the results suggest a substantial cost burden amounting to USD millions or billions linked to tobacco use in many countries across the globe.

At the subpopulation level, we also observe a substantial cost burden attributed to tobacco consumption. For instance, tobacco consumption contributed to about USD 550.4 million in costs in the Northern Territory of Australia in 2005–2006,[36] USD 5.9 billion in Australia's New South Wales in 2006–2007,[23] USD 7.01 billion in lost productivity in the United Kingdom in 2010–2011,[37] and about USD 18.1 billion for California in 2009.[38]

The last set of studies, in Supplementary Table 2, provides the estimated costs attributed to second-hand smoking (SHS). The results show that exposure to SHS contributed to about USD 228.7 million in direct and indirect medical costs in the state of Minnesota in 2008,[39] USD 183 million (lost productivity, direct and indirect costs) to those living in public housing in 2011,[40] USD 293.3 billion in medical costs in North Carolina in 2006,[41] and about USD 6.6 billion in lost productivity in 2006.[42] In rural China, SHS costs USD 1.2 billion to adult nonsmokers, with out of pocket medical expenses accounting for 47% of their income.[43] Two studies reported SHS costs as part of overall costs[44,45]—these are included in the "Sub-population or specific conditions" section of the tables (Supplementary Table 1). In Taiwan, SHS represented USD126 million of overall smoking costs of USD 1670 million because of health-related expenses and lost productivity.[45] In rural Southwest China, SHS contributed USD 79.4 million compared with USD 95.5 million from active smoking, associated with lost productivity and health costs from chronic diseases.[44]

In Table 1, we provide an updated list of conditions wholly or partially attributed to smoking based on the global burden of disease study,[5] with additions from the US Surgeon General reports[6,16,46,47] and the International Agency for Research on Cancer[48–50] as a suggested list of conditions for inclusion in future studies.

Conclusions

The studies identified by the review were heterogeneous in many respects including the eligible tobacco-related disease conditions, cost categories or sources of costs considered, the methodological approaches used, the age groups included, and time periods assessed. However, it is clear from the review that, regardless of setting or country, the costs associated with tobacco use are substantial. Notably, many studies only focus on a limited set of the disorders that have been attributable to smoking, albeit that the health conditions that make the largest contributions to costs (eg chronic obstructive pulmonary disease, other respiratory diseases, cancers, and cardiovascular diseases[36]) were generally included. The adverse perinatal outcomes were specifically identified in only a few studies, even though low birth weight is likely to make a substantial contribution to cost estimates.[36]

There are obvious differences in the costs reported, with part of the variations across countries potentially attributable to the number of disease conditions included in each study. In addition, new econometric approaches (eg Max et al.[38]) use model-based rather than disease-specific approaches to determine the excess cost of smoking. Smoking-attributable fractions derived from these models tend to produce higher cost estimates that the traditional epidemiologically based smoking-attributable fractions.[51] Although the purpose of the review was not to compare the specific costs associated with tobacco use across countries, one would expect studies including a greater number of tobacco-attributable disease conditions to report relatively higher costs bearing in mind that the reported costs might depend on a number of other factors apart from a mere count or list of disease conditions. The variations in the list of disease conditions included in the studies might also be an indication of the differences in availability of the relevant or required information across countries. Nevertheless, it is surprising that a standard list of conditions caused by smoking is not more broadly used, albeit one that would need updating, as witnessed by the changes in the listing of conditions in the series of US Surgeon General reports.[6,16,46,52]

Another observation from the results pertains to the different methodologies used ranging from prevalence or incidence-based approaches, demographic or human capital-based approaches, country-specific methodologies such as the Centers for Disease Control and Prevention's computer-based application (Smoking-Attributable Mortality, Morbidity, and Economic Costs or SAMMEC), approaches based on the WHO-recommended methodology, and other studies based on methodologies that could not easily be fitted into the more standard approaches.

The recent MPOWER report[2] provides some positive evaluations of progress in tackling the tobacco epidemic with an increasing proportion of the global population protected by at least some of the WHO-recommended measures to reduce tobacco use. Nevertheless, with an estimated 7 million deaths, 1 billion smokers, and potentially USD 1 trillion social cost,[3] the epidemic still has many years to run. Even in countries where there have been dramatic reductions in the prevalence of smoking, costs remain high, although for many conditions health risks for former smokers decline over time.[6] Cost-of-illness studies provide impetus to policy makers to enact tobacco control and harm prevention programs with the promise of long-term economic benefits.[6]

Table 1. Conditions Wholly or Partially Caused by Tobacco Use

Condition	Source	*ICD-10* codes	Exposure
Tuberculosis	a	A15, A16, A19, B90	5-year lag
Lip and oral cavity cancer	a	C00–C09, C14	SIR
Nasopharynx cancer	a	C10–C13	SIR
Esophageal cancer	a	C15	SIR
Stomach cancer	a	C16	SIR
Colon and rectum cancer	a	C18–C20	SIR
Liver cancer	b	C22	SIR
Pancreatic cancer	a	C25	SIR
Cancer of nasal cavity	c	C30	SIR
Cancer of accessory sinuses	c	C31.0–31.9	SIR
Larynx cancer	a	C32	SIR
Tracheal, bronchus, and lung cancer	a	C33–C34	SIR
Cervical cancer	a	C53	SIR
Endometrial cancer (protective)	b, d	C54.1	SIR
Kidney cancer	a	C64–C65	SIR
Bladder cancer	a	C66–C67	SIR
Acute myeloid leukemia	a	C92	SIR
Diabetes mellitus	a	E11	5-year lag
Parkinson's disease (protective)	b	G20	5-year lag
Cataract	a	H25–H26	5-year lag
Macular degeneration	a	H35.3	5-year lag
Hypertensive heart disease	a	I11	5-year lag
Ischemic heart disease	a	I20–I25	5-year lag
Atrial fibrillation and flutter	a	I48	5-year lag
Other cardiovascular and circulatory diseases	a	I46–I47, I49–I52, I77–I79	5-year lag
Ischemic stroke	a	I63, I64, I65, I66, I69.3, I69.4	5-year lag
Hemorrhagic stroke	a	I60, I61, I62, I69.0, I69.1, I69.2	5-year lag
Atherosclerosis	a	I70	5-year lag
Aortic aneurysm	a	I71	5-year lag
Peripheral vascular disease	a	I72–I74	5-year lag
Influenza and pneumonia	b	J10–11, J12–J18	Current
Chronic obstructive pulmonary disease	a	J43–J44	SIR
Asthma adolescents	b, e	J45–J46	Current 300+ cigarettes per annum
Asthma (adult)	a	J45–J46	Current
Interstitial lung disease and pulmonary sarcoidosis	a	J84	SIR
Other chronic respiratory diseases	a	J47, J70, J80–J82, J85–J86, J90–J91, J93–J94, J96, J98	SIR
Peptic ulcer disease	a	K25–28	5-year lag
Rheumatoid arthritis	a	M05–M06	5-year lag
Erectile dysfunction	b, e	N52.03	Current smoker
Reduced fertility in women	b	N97	Current smoker
Ectopic pregnancy	b, e	O00	Current smoker
Hypertension in pregnancy (protective)	b	O10–O16	Smoking while pregnant
Premature rupture of membranes	b, f	O42	Smoking while pregnant
Placenta previa and other antepartum hemorrhage	b, f	O44, O46	Smoking while pregnant
Placental abruption	b, f	O45	Smoking while pregnant
Stillbirth	b, e	Z37.1, Z37.3, Z37.4, Z37.6, Z37.7	Smoking while pregnant
Miscarriage	g	O03	Smoking while pregnant
Hip fracture	a	S72	5-year lag
Non-hip fracture	a	S02, S12, S22, S32, S42, S52, S82, S92	5-year lag
Fire injuries	b	X00–X01, X04–X09	Current
Exposure to second-hand smoke			
Lung cancer	b	C34	Adults secondary smoke
Otitis media	b	H65–H67	Children secondary smoke
Ischemic heart disease	b	I20–I25	Adults secondary smoke
Cerebrovascular disease	b	I60–I69	Adults secondary smoke
Lower respiratory illness (child)	b	J12–18, J20–J22	Children secondary smoke
Asthma (child)	b	J45–J46	Secondary smoke—one parent
Asthma (child)	b	J45–J46	Secondary smoke—both parents
Low birth weight	b	P05, P07	Children secondary smoke
Orofacial clefts	b	Q35–Q37	In utero secondary smoke
Sudden infant death syndrome	h	R95	Children secondary smoke

SIR = smoking impact ratio.

[a]Global Burden of Disease Study.[4,5]

[b]US Surgeon General.[6]

[c]International Agency for Research on Cancer.[63]

[d]US Surgeon General.[16]

[e]US Surgeon General.[47]

[f]Assessment of strength of causal relationship from US Surgeon General.[64]

[g]Assessed by US Surgeon General as "The evidence is suggestive but not sufficient to infer a causal relationship"[6] but we regard subsequent studies as having strengthened the evidence for inclusion sufficiently to warrant inclusion in this study.[65,66]

[h]Assessment of strength of causal relationship from US Surgeon General.[64]

With the exception of four studies that used the incidence approach,[19–22] one study that used the demographic approach and two studies that used other approaches,[23–25] the majority of the studies (n = 56) used a prevalence-based approach. An incidence-based approach to costing quantifies the present and future (ie lifetime) costs attributed to the use of a specific substance (in this case, tobacco) in a given year, whereas prevalence-based methods include both existing and new cases in the target year and are generally used for determining current economic costs.[53] These approaches should be regarded as complementary rather than contradictory, with the choice of a specific approach depending on the question being asked and the context of the study. For example, the prevalence approach might be more relevant in government budgeting and planning purposes, whereas the incidence approach might be more useful in instances where the primary goal might be to measure the impact of tobacco policy. Other approaches such as the human capital approach provide an estimate of the lost productivity value (ie the current and future, discounted expected earnings) of each worker that dies as a result of a tobacco-related illness. In comparison, the demographic approach quantifies the current costs of tobacco-related mortality in the past and present years and compares the actual situation with a scenario of no past or present tobacco use.[54] Only one study included in this review had used the demographic approach[23]: this may be partly because of data availability problems in estimating the counterfactual population structure required in using this method.

Four studies from the United States[55,56,57] quantified the costs of tobacco using the Centers for Disease Control and Prevention computer-based application, SAMMEC.[58] This was developed specifically for the United States and calculates the health-related economic consequences of smoking to adults and children based on the attributable-risk methodology and has been in operation since 1987. This methodology is mostly used in quantifying the cross-sectional estimates of the gross costs of smoking and is relevant in similar economically advanced countries that have relatively well-developed health care systems and are in the mature phase of the smoking epidemic.[54] However, just like any other methodology used to quantify the costs of tobacco, the approach is subject to some limitations.[59] First, the approach potentially underestimates the number of deaths linked to smoking, given that the software uses the current prevalence of smoking in its death computations, which will also subsequently underestimates the associated cost estimates. Given that present mortality can be attributable to past smoking behavior, which might have occurred when smoking prevalence was much higher, underestimation is quite likely. Second, in its calculations of the economic costs of smoking and years of potential life lost, the approach fails to take into consideration all deaths because of SHS, fires, and maternal smoking.

There are very few studies using the WHO methodology in the calculation of the costs associated with tobacco use. The WHO methodology, which recommends that cost studies be conducted within a cost-of-illness framework following general guidelines on the type of cost categories to include, was proposed with the intention of having a more unified framework for the estimation of costs associated with substance abuse to the broader society. Of the 64 studies included in the review, only three[29,40,60] used the WHO methodology. Even among these studies, comparisons of the quantified costs of tobacco are still problematic given the disparities in the included disease conditions, target subpopulations, and the scope of the costs calculated. For instance, although the study by Goodchild *et al.*[29] provided global or multinational estimates for the year 2012, the Mason *et al.*[40] study calculated the costs associated with second-hand (involuntary) exposure to tobacco in the United States, whereas the study by Wu *et al.*[60] provided cost estimates for a specific subpopulation. These observations highlight the current challenges in the literature, especially concerning comparability of cost estimates as evidenced by the wide range of methodologies used across countries.

Comparing the relative costs between counties is always likely to be problematic. Where costs were only reported in the local currency we used a purchasing power calculator to convert to USD applicable in the target year.[17] This is unlikely to address significant differences between countries in major cost items such as health-related costs or the value used in estimating the impact of premature mortality. We also acknowledge that the lack of health surveillance data in some countries may hinder the estimation of costs. Nevertheless, increasing penetration of tobacco control measures through the WHO's MPOWER project should improve global access to key data.[2] Further, citing just the total cost also does not adjust for the number of smokers in the target population considered by the study. Including an estimate of the cost per smoker would help to address at the least that source of variation.

It was also noted that most analyses were restricted to direct (eg inpatient care) and indirect (eg lost value of productivity) tangible costs and did not include intangible costs such as those arising from premature mortality or from living with a smoking-related disease. In the most recent Australian national study, intangible costs represented nearly 62% of the total social cost of tobacco ($19 459.7 million of $31 485.9 million).[15] The Global Burden of Disease health data tool shows that years lived with a disability represent about one-third of the disability-adjusted life years from smoking.[61] Therefore, the decision as to whether or not to include these costs will have a major impact on the "bottom line" figure from such analyses.

Overall, the key recommendations are that the tobacco social cost literature would be improved by (1) the use of a standard set of health conditions, (2) a standard methodological approach, such as the WHO guidelines, and (3) the standard inclusion of cost areas (ie tangible, intangible, and private costs) or at least their separate identification. These recommendations come with the acknowledgment that different methods (eg incidence vs. prevalence approach) are required, depending on the objective of the study, and that data constraints will influence the inclusion of cost areas and tobacco-attributable diseases. In addition, consistent methods and inclusions would also facilitate comparison with other sources of social costs such as alcohol and illicit drugs.

The range of potential problems in conducting social costs studies can result in a nihilistic interpretation of their value. However, without attempting to monetarize impacts, it would effectively be impossible to compare the full extent of outcomes of different conditions where they extend beyond health effects.[66] Notwithstanding, the methodological disparities and the variety of health and other cost categories included across studies, the economic burden of tobacco consumption across countries is quite evident and substantial. This review has shown that studies on tobacco cost-of-illness use diverse methodologies and hence produces data that are often not comparable across populations, time, and studies, precluding a consistent evidence-base for action and measurement of progress. The findings here could assist policy makers to draft policies that continue to raise awareness concerning tobacco use and its consequences by providing a basis for consistent replication of the methods and associated costs.

Supplementary Material

Supplementary data are available at *Nicotine and Tobacco Research* online.

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Declaration of Interests

All authors declare that they have no conflicts of interest with respect to this article.

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