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Aspects of tobacco attributable mortality: systematic review

ABSTRACT

The objective of the article was to assess methodologies published and applied in calculating mortality attributable to smoking. A review of the literature was made for the period 1990 to 2006, in the electronic databases MEDLINE and LILACS. A total of 186 studies were found, which measured mortality based on calculating the smoking-attributable risk. Of these, a total of 41 were selected. The studies that were carried out in the United States and Canada presented a more standard methodology and reported smoking attributable mortality to be 18%-23%, with male mortality being 25%-29% and female mortality 14%-17%. The variations can be attributed to methodological differences and to different estimates of the main tobacco-related illnesses.

DESCRIPTORS: Smoking, mortality. Attributable risk. Epidemiologic studies. Review [Publication type].

INTRODUCTION

Tobacco, the most widespread and widely used drug in the world, was responsible for approximately 50% of 5 million official deaths in 2000, in developing countries.[19,65] It is estimated that in the period 2002/2030, tobacco-attributable deaths will decrease by 9% in developed countries, but increase by 100% (to 6.8 million) in developing countries. It is also estimated that by 2015, smoking related deaths will be 50% more than those caused by the HIV/AIDS epidemic and that tobacco will be responsible for approximately 10% of all deaths on the planet.[38]

A systematic review of 139 studies concerned with the prevalence of tobacco smoking in adults found that more than 1.1 billion people across the world smoke, of which 82% reside in developing countries.[31] In 2000, the prevalence of tobacco smoking in the world was greater among men, although the difference between the sexes has been decreasing in developed countries (prevalence is 37% among men and 21% among women). In the Latin America and Caribbean region, the prevalence was estimated to be 32% in 2000, which corresponds to 40% among men and 24% among women.[32]

The negative health effects caused by cigarette smoking are well documented and the control of smoking is considered by the WHO to be one of the greatest present challenges to public health.[26]

There is strong evidence to suggest that tobacco forms part of the causality chain of nearly 50 different illnesses, in particular cardiovascular diseases, cancer and respiratory illness.[59,60,64]

Ezzati et al[20] (2005) estimated that 11% of all cardiovascular deaths in the world in 2000 could be attributed to tobacco, in particular ischemic heart disease and cerebrovascular disease. In addition, cancer has been attributed to 21% of all cancer deaths in the world, including 29% of deaths in developed countries and 18% in developing countries.[15]

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The various impacts that tobacco has on society can be measured in number of ways, such as the mortality burden, which represents tobacco-attributable deaths.[62]

Smoking attributable mortality (SAM) has been widely used in studies and is considered to be one of the most relevant summary statistics, due to its capacity to show the harm that tobacco causes to health.[63] However, some methodological problems in the calculation of its estimates have been found (Tanuseputro et al, 2005).[54] SAM has been used in studies in the form SAM%, meaning that of all deaths in general or of those with a specific cause, the proportion that are attributable to tobacco.

The objective of the study was to analyze the methodologies used and published to calculate smoking attributable mortality.

METHODS

In May 2006, a review of the MEDLINE and LILACS electronic databases was carried out for the period 1990 to 2006. Search terms taken from the Medical Subject Headings (MeSH) were used, including "attributable risk", "mortality", "smoking" and the key words "tobacco", "smoking habit". The systematic review method was used to analyze the studies. A total of 186 articles were found, 30 of which were selected since they were concerned with SAM as a method for calculating the attributable risk in a given population. As a result of this first review, a further 11 articles and abstracts were identified, of which three from the 1970s and 1980s were included since they were among the most cited articles. In this way, a total of 41 articles were included in the analysis.

Articles published in Portuguese, Spanish, English, French and Italian were included; those in other languages were excluded irrespective of whether they contained a summary in English. Another criterion for their inclusion was the measurement of SAM based on the calculation of the population attributable fraction (PAF). The PAF uses parameters relating to the prevalence of smoking according to the level of exposure (smokers, ex-smokers and non-smokers) and the relative risk (RR) of death from tobacco-related illnesses. Potential causes of error that are normally ignored in the calculation of the PAF include: uncertainties about present and past exposure to smoking, the use of estimates for prevalence, mortality or relative risk by stratum, and the long latency period between exposure and occurrence of the disease. If estimates are to be more applicable and accurate, these variables need to be taken into consideration. The PAF is useful for estimating the proportion of cases of a disease that could have been prevented with reduction or elimination of the risk factor.[45,47]

Data extraction from the chosen articles was carried out by just one reviewer using a pre-determined method. The following information was gathered: authors, location where the study was carried out, publication year, study period, age or age range of the population under study, way of calculating the SAM, parameters used for this calculation, main findings and limitations or problems identified. The SAM is obtained by multiplying the number of deaths for each tobacco-related disease by the population attributable fraction, PAF.

In the 1980s, the Centre for Disease Control and Prevention (CDC) created a software called SAMMEC (Smoking-Attributable Mortality, Morbidity, and Economic Costs Software, version II), with the aim of calculating the SAM and thus estimating the impact of tobacco-related diseases. This software allows for the rapid calculation of deaths, years of life lost, direct costs of health care, indirect costs of death and costs of smoking associated incapacity.[49] The SAMMEC was used as a criterion for evaluating the scientific articles. It uses 22 tobacco related diseases in adults, four in children (resulting from mothers who smoke), RR drawn from the Cancer Prevention Study[59] (CPS) II with a calculation method that measures prevalence according to the level of exposure to smoking in different countries and smoking attributable deaths by burning. Those articles that fulfill these criteria and also include deaths resulting from passive smoking scored higher points. The other articles score proportionally lower marks in relation to the criteria.

RESULTS

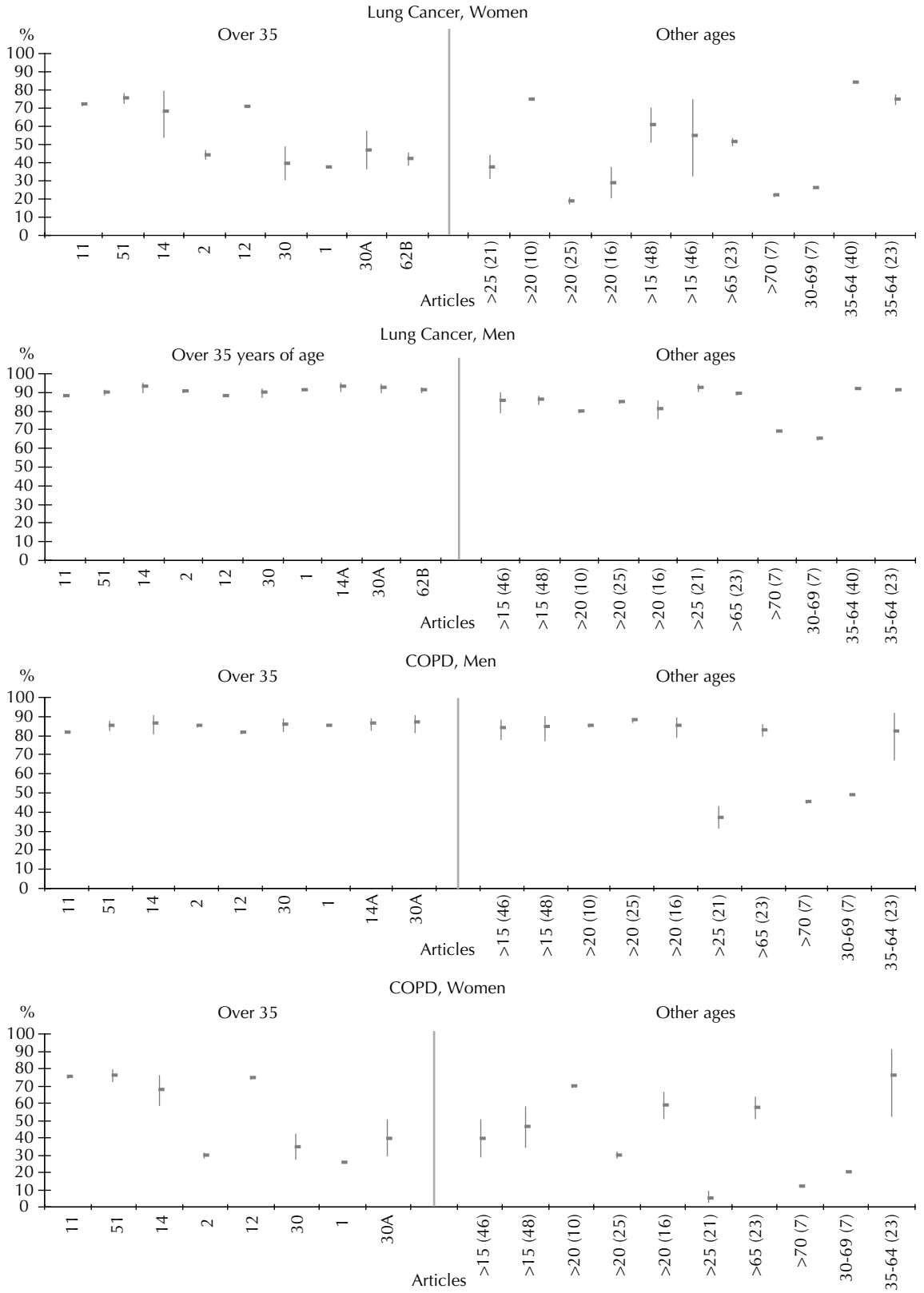
Table 1 shows the results of the articles, by author/year, location of publication, period of the study, age range under analysis and method of calculating the SAM. Table 2 presents the principle findings and general characteristics of the studies.

The studies were organized according to the methods used for calculating the SAM. Firstly those articles that scored highest points in the criteria for evaluating the methodology were taken into consideration, followed by those that involved one or more uncertainty or discrepancy.

Most studies used an age range of between 1 and 35 for the calculation of the SAM, with some exceptions[1,2,3,14,22,30,61,63] that work with the over 35 age group. The age range under analysis was not mentioned in some studies.[9,24,50,59]

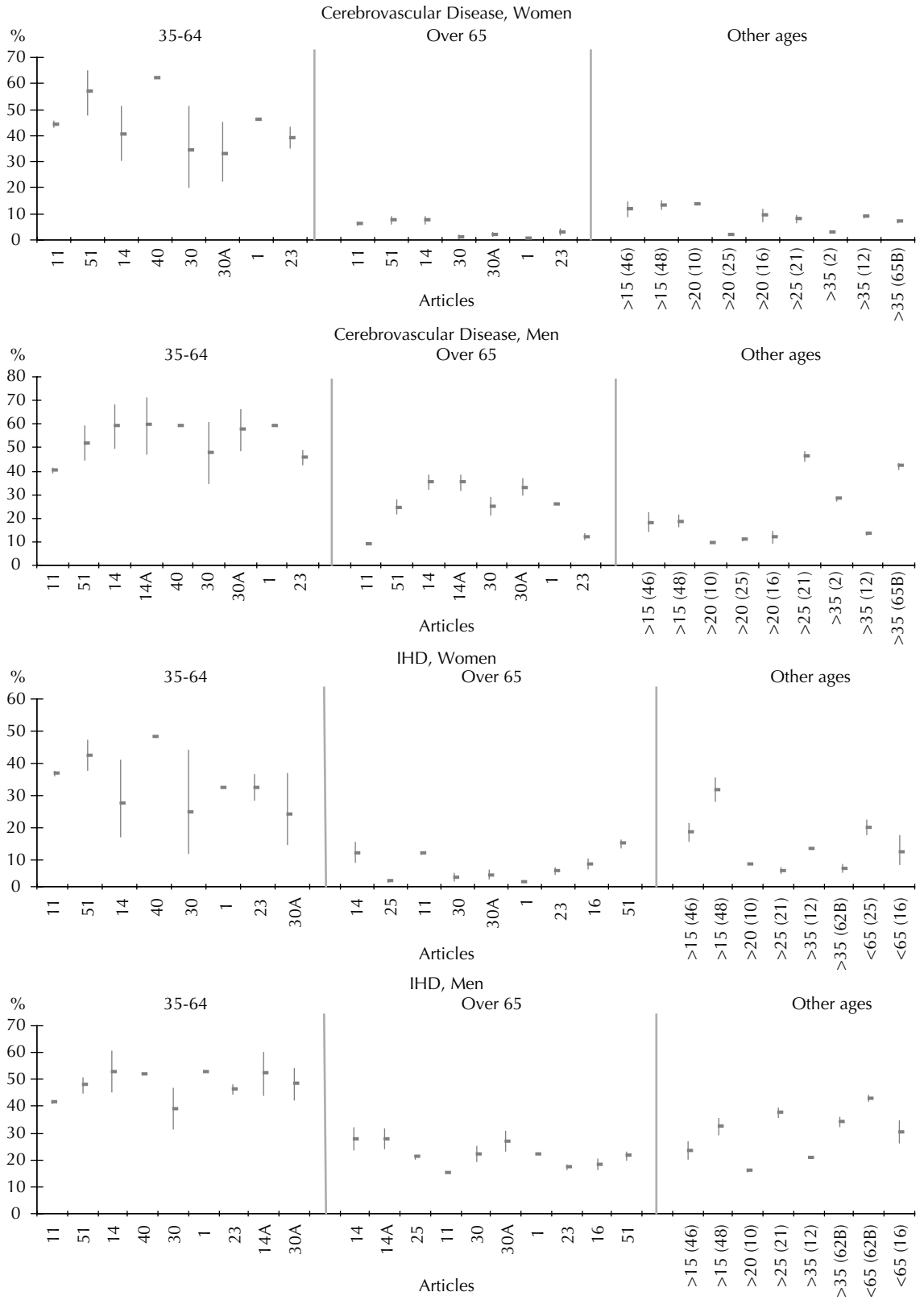
Most studies used the relative risk (RR) from CPS II, with some exceptions.[9,10, 15,16,24,34,36,37,41,46,48,50,59,61,63]

Smoking related pediatric illnesses were included in most studies, but not in these cited.[1-3,9,14,15,21,22,25,30,34,36,37,40,41,46,48,61,63]



Studies 1 and 44 do not provide absolute numbers for calculating the CI. Certain studies provide a very accurate number for the CI, making it impossible to be included visually in the figures below.[2,8,12,13,14,26,29]
References followed by letters indicate different years of a study.

Figure 1. Tobacco attributable mortality (%) and confidence intervals (CI) for lung cancer and chronic obstructive pulmonary (COPD) disease, by sex and age range in the different studies.



Studies 1 and 44 do not provide absolute numbers for calculating the CI. Certain studies provide a very accurate number for the CI, making it impossible to be included visually in the figures below.[2,8,12,13,14,26]
References followed by letters indicate different years of a study.

Figure 2. Tobacco attributable mortality (%) and confidence intervals (CI) for cerebrovascular disease and ischemic hearth disease (IHD), by sex and age range in the different studies.

Table 1. Methods used in calculating the SAM by location and date of study.

Reference	Location/ Year of Study	Method used to calculate attributable mortality					
		SAMMEC	Proportion of illnesses adult/ pediatric	RR CPS II	Calculation of PAF%*	Death by fire	Passive smoking
8	USA, 1990	Y	22/4	Y	3	Y	Y
7	USA, 1988	Y	22/4	Y	3	Y	Y
51	Kentucky – USA, 1996	Y	22/4	Y	3	Y	Y
42	Kansas, 1990	Y	22/4	Y	3	Y	Y
6	Kentucky-USA, 1988	Y	22/4	Y	3	Y	Y
27	Canada, 1991	Y	22/4	Y	3	Y	Y
13	Canada, 1989	Y	22/4	Y	3	Y	Y
28	Canada, 1994/1996	Y	22/4	Y	3	N	Y
12	USA, 1997-2001	Y	19/4	Y	3	Y	Y
11	USA, 1995-1999	Y	18/4	Y	3	Y	Y
17	Indiana-USA, 1990	Y	22/4	Y	3	Y	N
29	Canada, 1998	Y	22/4	Y	3	N	Y
56	Oregon- USA, 1989-1996	Y	22/4	Y	3	Y	N
5	USA, 1985	Y	21/4	N	3	N	N
10	USA, 1984	N	19/4	N	3	N	N
40	Harlem-USA, 1992-1994	Y	22/A	Y	3	N	N
50	Canada, 1992	Y	22/4	N	3	Y	N
63	Taiwan, 2001-2020	N	A/A	N	1	N	Y
36	Taiwan, 1994	N	A/A	N	1	N	N
37	Taiwan, 1980/ 1992	N	16/A	N	2	N	N
62	Taiwan, 1981/1990	N	17/4	Y	3	Y	Y
52	Spain, 2001	N	A/A	Y	3	N	N
11	Spain, 1998	N	A/A	Y	1	N	N
22	Spain, 1978/1992	N	A/A	Y	3	N	N
30	Barcelona, 1983-1998	N	A/A	Y	3	N	N
14	Castilla-La Mancha, Spain, 1987/1997	N	A/A	Y	3	N	N
48	Castilla and Leon-Spain, 1995	N	A/4	N	1	N	N
3	Canary Isles-Spain, 1975-1994	N	A/A	Y	3	N	N
46	Granada-Spain, 1985	N	A/A	N	1	N	N
9	Mexico, 1992	Y	A/A	N	N/A	N	N
55	Mexico, 1986	Y	20/A	N	3	N	N
33	Germany, 1997	Y	22/4	Y	3	N	N
23	Italy, 1998	Y	20/4	Y	3	N	N
25	France, 1990	N	A/A	Y	N/A	N	N
61	General Population of British Columbia – Canada, 1997/2001	N	19/4	N	3	N	N
21	Tunisia, 1997	N	A/A	Y	3	N	N
41	Canada, 1974	N	7/A	N	1	N	N
34	New Zealand, 1976	N	8/A	N	1	N	N
16	Porto Rico, 1983	Y	20/4	N	3	N	N
61	Madrid, 1998	Y	21/A	Y	3	N	N
24	New Hampshire – USA, 1983	N	A/4	N	1	N	N

SAMMEC: Smoking-Attributable Mortality, Morbidity, and Economic Costs Software
CPS II: Cancer Prevention Study
PAF: Population attributable fraction
N: no; Y: yes; N/A: information not given; A: information absent about number of tobacco-related illnesses among adults and children
* Method used to calculate the PAF (%). See the Results section.

Table 2. Principle findings and general comments in selected studies.

Reference	Principle findings (SAM %)			Comments
	Both	Male	Female	
8	20.0	-	-	Age range: > 30 and < 1 years
7	20.0	25.4	14.0	SAM given as a rate. Used the mortality rate of the US population in 1988, adjusted as a percentage. Not possible to calculate the IC.
51	23.0	29.0	17.0	
42	18.0	-	-	
6	22.1	28.4	15.0	
27	21.2	26.4	15	
13	20.0	-	-	
28	21.2	26.2	16	Included death by smoking related fires in 1994 but not in 1996. Results for SAM only given for 1996.
12	-	-		SAM only given for tobacco related illnesses. Data presented in graphic form.
11	-	-	-	SAM only given for tobacco related illnesses. Data presented in graphic form.
17	20.0	-	-	SAM given as a rate. Used the mortality rate of the population of Indiana in 1990 and adjusted as a percentage. Deaths caused by cigarette related fires were estimated as 50% of total deaths by fire. Not possible to calculate the IC.
29	22.0	27.0	17.0	
56	20.1	-	-	
5	15.0	-	-	SAM given as a rate. Used the mortality rate of the US population in 1985 and adjusted as a percentage. Not possible to calculate the IC. RR estimated on the basis of 4 perspective studies.
10	-	20.4	8.6	SAM given as a rate. Used the mortality rate of the US population in 1984 and adjusted as a percentage. Age range: > 20 e < 1 years. Not possible to calculate the IC. RR estimated on the basis of 4 prospective studies.
40	-	-	-	SAM% only for tobacco related illnesses. Data presented in graphic form. Age range: 35 – 64 years. Tobacco prevalence estimated through telephone based research, resulting in the under-representation of certain sub-groups such as youth, men and the poor. SAM under-estimated.
50	17.0	11.7	5.3	RR estimates agregated, rather than based on just one study – under-estimation of SAM. Adult illnesses also obtained from 2 other studies. Estimates for RR grouped according to the Surgeon General's Report – 1989.
63	16.0	22.0	6.0	Projections for SAM based on different scenarios: reductions in the prevalance of smoking by 0%, 2%, 4% and 10%. Did not include important smoking related illnesses: cancer of the larynx, pancreas, bladder and kidney. Deaths by arterial coronary disease and strokes in people aged 65 and above were not included. Short duration of cohort study in Taiwan in 1982 – RR with low level of significance for certain smoking related diseases.
36	-	13.9	3.3	12 year cohort study in Taiwan (1982 – 1994). Small number of deaths for certain illnesses that are proven to be associated with smoking. Age range: > 40 years and RR not significant
37	1980/92 34.9/31.8			Age range: > 15 years
62	19.0	22.0	13.0	Passive smoking based on estimated from the National Academy of Science - USA Estimates of death by burning based on the US Federal Emergency Management Agency
52	15.5	14.1	1.4	RR from CPS II used (which was in the advanced phase of the tobacco epidemic) which could over-estimate the RR in Spanish women, who have only recently become regular cigarette smokers.
11	16.0	-	-	
22	1978/92 13.7/14.7			Did not include deaths prior to 35 years old, nor deaths due to external causes (accidents, fires).
30	14.0	25.1	2.9	RR from the CPS II may have different characteristics to the population under study (white, over 30, middle class)
14	18.7	-	-	Only considered neoplasias, cardiovascular, cerebrovascular and respiratory illnesses – under-estimation of the SAM
48	9.3			Age range: > 15 years. RR obtained from a meta-analysis in Grenada.
3	1975/94 20.0/24.0			
46	16.0	21.2	10	Did not include some tobacco related illnesses: cancer of the cervix, uterus, stomach and acute respiratory infections. Age range: > 15 years. RR obtained from a meta-analysis in Grenada.
9	9.0	-	-	RR not available: used an index based on mortality rates for lung cancer in the USA and Mexico as a general measure of risk. Low SAM reflects low prevalence of past smoking and may fail to capture increases in mortality resulting from recent changes in smoking habits.
55	4.2	-	-	Age range: > 20 years. RR based on a weighted average of 4 longitudinal studies.
33	11.0	13.0	6.3	Age range: 0-64 years
23	15.1	24.4	5.8	
25	11.7	21.0	2.0	Age range: >20 years
61	1997/01 21.8/20.8	-	-	Age range: >34 and < 1 years. SAM separated into age ranges for analysis.
21	13.7	22	4.0	Age range: >25 years
41	17.6	-	-	Age range: 1-70 years. CPS II had not yet happened (1982 – 1988). First study found here that calculated and adresses the SAM. Did not work with some diseases such as cancer of the stomach and pancreas, ulcers and other cardiovascular diseases, since at the time there was not sufficient evidence of the associatoin between these diseases and cigarette smoking.
34	15.0	-	-	Age range: >18 years. RR based on a literature review of 8 studies.
16	11.4	-	-	Age range>20 years. RR used here was based on 4 longitudinal studies.
61	15.9	28.4	2.8	
24	15.6	-	-	

SAM: smoking attributable mortality

With some exceptions,[6-8,11,12,13,17,27,42,50,51,56,59,62] deaths caused by tobacco related fires were not included in most studies analyzed here.

Deaths associated with passive smoking were not calculated in most of the studies. However, some used deaths associated with lung cancer and heart disease among non-smokers as estimates.[11,12,29,62] In addition to these illnesses, other studies included cerebrovascular diseases [63] and lung cancer alone.[6,7,8,13,27] Some studies also failed to mention the method used for the calculation.[28,42,51,59]

Estimates for deaths attributed to passive smoking and fires were, in the majority of studies, drawn from national studies or used relative risk estimates taken from studies that address this question.

Seven studies received a positive evaluation for their calculation of the SAM %.[6,7,8,13,27,42,51] These studies also received a higher scoring because they included in the general calculation of the SAM deaths resulting from passive smoking (Table 1).

Three methods for calculating the PAF were identified (Table 1):

1. PAF% – the proportion of smoking attributed deaths in a population:

PAF% = Pi(RRi-1)/[1+P(RRi-1)]

where P is the prevalence of exposure to smoking in the population and RR is the relative risk of death (among smokers and ex-smokers), compared with non smokers. The SAM is calculated by multiplying the PAF% by the number of deaths in each disease category. Number 3 is derived from this formula.

2. PAF% includes the incidence rate of selected causes of death in the general population, and in smokers, non-smokers and ex-smokers. The proportion of smokers to non-smokers and the relative risk of death among smokers and non-smokers are also taken into consideration. The SAM is calculated by multiplying the PAF% by the number of deaths in each disease category.

3. PAF = [P0+P1 (RR1)+p2 (RR2)]-1/[P0+P1 (RR1)+p2 (RR2)]

PAF represents the percentage reduction in deaths that would be expected if exposure to the risk factor were removed from the population. p0 = % of never smokers; p1= % of current smokers; p2= % of ex-smokers; RR1= Risk of death of current smokers compared to never smokers; RR2 = Risk of death of non-smokers compared to never smokers.

Ezzati & Lopez[18] (2003) showed that the general rate of SAM globally was 12%, and 18% among men and 5% among women. In developed countries, this figure rose to 19% and in developing countries was 9%. Peto et al[44] (1996) observed that in the 44 developed countries that were analyzed, tobacco was responsible for 24% of all deaths in men and 7% of all deaths in women. In the studies assessed here, the general SAM was between 18% and 23%. In men, the rate was between 25.4% and 29.0% and in women, between 14% and 17% (Table 2).

In the USA and Canada, values for the SAM varied between 15% and 23% and in European countries, between 13.7% and 24.0%. In some Latin American countries, such as Mexico and Porto Rico, the values ranged from 4.2% and 11.4% respectively (Table 2).

As well as the general SAM, articles that calculate the SAM for the four principle tobacco attributable illnesses were also taken into consideration (lung cancer, chronic obstructive pulmonary disease – COPD – cerebrovascular diseases and ischemic heart disease). Figure 1 shows the values and the confidence intervals for the SAM% - lung cancer and COPD – by sex and age range in the different studies.

Studies (Figure 1) show that an important proportion of deaths by lung cancer and COPD among men are attributable to tobacco, independent of age, with more precise confidence intervals. The same is not true for women, for whom there are significant variations in the SAM% and wide confidence intervals.

Cardiovascular and ischemic heart diseases were the only illnesses that showed differences in the age range for the calculation of the SAM% in the studies (35-64 and 65 and over) in relation to the specific values of the RR for these illnesses. This was not the case in some articles[14,46,48] that used other age ranges. Figure 2 makes a comparison of these two diseases by sex and age range.

The values of the SAM% for cerebrovascular diseases in the 35 – 64 age range varied between 35% and 45% [11,14,23,30] and 55%-65%[40,51] for women; for men the rate ranged from 40%-48%[11,23,30] and 52%-60%.[1,14,30,40,51] In the over 65 age range, the results from the studies were found to be more uniform among women and varied by between 2% and 8%. Among men, the variation was between 10% and 12%[11,23] and 25%-35%.[1,14,30,51]

For ischemic heart disease, the SAM% among women in the 35-64 age range was between 22% and 32%[1,14,23,30] and 37% and 47%.[11,40,51] For men in the same age range, the value was between 38% and 52%. For the over 65 year olds, some studies calculated a SAM% among women of around 10%[11,14,51] and others of between 2% and 6%.[1,16,23,25,30] Among men, the values were between 15% and 25%.

DISCUSSION

A comparison between the results that Ezzati & Lopez[18] (2003) and Peto et al[44] (1996) reported for SAM% with those from studies that use a more uniform methodology (USA and Canada) shows that the general mortality rate (18% - 23%; including 25% - 29% amongst men and 14% - 17% amongst women) was higher for the world and for developed countries in the former studies.

Those tobacco related illnesses that most contribute towards the SAM were cancer of the trachea/ bronchial/ lungs,[2,8,23,51] ischemic heart disease,[11,29,30,42,50,51] COPD[22,66] and cerebrovascular diseases.[3,22,23]

Ezzati & Lopez[19] (2004) also found cardiovascular disease, COPD and lung cancer to be the three principal causes of smoking related deaths in developed and developing countries in the year 2000.

It is widely recognized that a considerable number of deaths occur among people aged 65 or over, resulting from ischemic heart and cerebrovascular diseases. Tobacco and other risk factors have been shown to be important causes for these deaths (González Enríquez et al,[22] 1997). The SAM is low for these diseases in the 65 and over age group, when compared with the 35-64 age group, in which the number of deaths is fewer but the percentage of tobacco attributable deaths is high (40% - 60%), mainly among men. This involves a young adult population that is economically active and dies early from a modifiable risk factor that could be reduced or even eliminated if measures to promote and prevent tobacco addiction amongst younger age groups were established as public health policies.

The differences that were observed in the SAM for the four principle diseases associated with tobacco may reflect not only the methodological differences in the studies, but also the different prevalences of smoking that are used to calculate the FAF in the different countries.

The studies reviewed here are quite heterogeneous in many aspects: the method for calculating the attributable fraction,[46,48] the inclusion or not of certain tobacco-related diseases in adults or children,[2,14,22,40] the age range considered,[50] the inclusion of death by burning,[8,12] passive smoking[8,12,29] and the application of the current prevalence to calculate the SAM. All these factors influence the results of the attributable mortality in the various studies.

In addition, factors such as changes in mortality rates, reductions in smoking prevalence, differences in the methods used to calculate the FAF, omission of the consumption of other tobacco related products (cigars, pipes) in calculating the SAM may also have contributed towards the differences in the studies[8,11,12,61] and represent important limitations in the use of the SAM-MEC software.

The SAM is the result of a previous exposure to tobacco (around ten years between exposure and the development of the disease), a fact that must be taken into consideration in the studies. In a discussion on the findings of Illing & Kaiserman[29] (2004), Tanuseputro et al[53] (2004) found that when adjustments are made to take into account the latency period (either two or three decades) between exposure to smoking and measurement of the associated effect (mortality), there is an increase in the estimation of the SAM by between 8% and 22%, depending on the adjustment method that is applied. Just one study calculated the SAM using a ten year latency period.[63]

While cigarette smoking is associated with a series of illnesses, its influence does not appear to be the same for each disease. This fact justifies the use of different relative risks of death for different illnesses. The RR must be estimated for each population in the study, taking into account different biological, cultural and socioeconomic variables. Obtaining these RR for each country is likely to be costly, since it would require specific studies. For this reason, the majority of studies used the RR of death of the CPS II.[59]

Some authors discussed the criticisms that are held against using the RR from the CPS II to calculate the SAM, since it is likely to overestimate the burden of death. The most relevant criticism points to the fact that the CPS II is a national mortality survey based on a sample of approximately 1.2 million adult Americans aged 30 and over, who present different characteristics to those of the general population of the USA. The great majority of participants in the study were married, white and with high levels of schooling and income. In short, it is held that the sample is not representative of the overall population and as a result, this compromises the possibility of generalizing the results for the whole American population.[15,35]

The second critique that was commonly made was that the national estimates were adjusted for age, but not for other potentially confounding factors such as alcohol use, level of education, hypertension, and the prevalence of diabetes mellitus.[39,52] In response to these criticisms, Thun et al[57,58] (2000) adjusted the RR obtained from the CPS II for potential confounders such as age, race, education, marital status, occupation, total daily consumption of citrus fruits and vegetables, and alcohol. The results show that adjustments for demographic and behavioral factors did not significantly alter the estimates for the SAM, with a difference of no greater than 1.0%. Malarcher et al[39] (2000) and Wen et al[63] (2005) also showed that changes in the results after adjusting for confounding variables were minimal.

In order to reduce the excess risk attributed to smoking in the RR of the CPS II, Ezzati & Lopez[18] (2003) used a constant corrective factor (30.0%) to avoid overestimating mortality as a result of the repetition

of risk estimates, although these were adjusted only for age and sex. The authors used as the basis of their work a method proposed by Peto et al[43] (1992), who used mortality attributed to lung cancer as an indirect marker for the accumulated risk of smoking. This method incorporates the RR of death for tobacco related diseases from the CPS II – also only adjusted for sex and age – corrected by an excess risk of 50.0%. For Sterling et al[52] (1993) and Bronnum-Hansen & Juel[4] (2000), the advantage of this method is that it does not include in the calculation the prevalence estimate of the at risk population.

These methodological variations may, in part, account for the differences found in the over- and under-estimation of the general SAM in the studies considered here and the different estimates for the principle tobacco-related diseases.

This analysis of different studies has shown the powerful impact that tobacco consumption has on the mortality of populations in different countries. It is essential that public policies take into consideration the influence that smoking has on mortality and incapacity levels of any population, including the Brazilian population. It is further hoped that by making available factual information and quantitative data, this can also have an impact on the policies and programs that aim to reduce tobacco related deaths. This systematization of articles highlighted the importance of tobacco as a risk factor and its impact on diseases that most affect populations.

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