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Smoking-attributable mortality in Switzerland

Estimation for the years 1995 to 2007

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Smoking-attributable mortality in Switzerland. Estimation for the years 1995 to 2007

Summary

This study calculates the number of smoking-attributable deaths in Switzerland from 1995 to 2007. The estimate is based on the Smoking-Attributable Mortality, Morbidity and Economic Costs (SAMMEC) method developed by the US Centers for Disease Control and Prevention (CDC). The calculations are based on data from the Swiss Health Survey and the Federal Statistical Office's (FSO) Causes of Death Statistics. The results show that in 2007, 6427 men and 2774 women died as a consequence of smoking. Cancer accounted for 3729 smoking-attributable deaths, including 2485 cases of lung cancer (1797 men and 688 women). Cardiovascular diseases accounted for 3800 additional deaths and respiratory diseases for 1669 deaths. Over the past decade, the number of deaths rose by 17% among women aged up to 64 and decreased by 11% among men of the same age. Among women aged 65 and older, the number rose by 5%; among men of the same age, it declined by 9%. The decreasing number of deaths from smoking is primarily attributable to a decline in the number of deaths due to smoking-related cardiovascular disease (-18%). Smoking-attributable mortality due to chronic obstructive pulmonary disease (COPD) rose by 2%; due to cancers it increased by 11%. Smoking continues to cause the largest number of preventable deaths in Switzerland.

Introduction

Consumers are harmed by the consumption of cigarettes and other tobacco products for their intended use. Because disease and death do not occur immediately after consumption, this correlation is sometimes denied. The harm caused by tobacco can be quantified, for example by calculating the number of smoking-attributable deaths. Corresponding figures for Switzerland were published for the first time in 1992 [1]: in 1990, the number of tobacco victims amounted to 10,552.

An analysis of the causes of death by birth cohort published in 2008 showed that men of any age born between 1900 and 1924 had a higher lung cancer mortality rate than those born before or after those years [2]. Among women, an exponential growth in lung cancer rates was found; at a given age, the rates were approximately twice as high for women born between 1950 and 1954 as among those born between 1930 and 1934.

The WHO Framework Convention on Tobacco Control of 2003 also spurred tobacco prevention efforts in Switzerland. This raises the question of whether positive results are already discernible. The present study aims to document the number of smoking-attributable deaths between 1995 and 2007.

Methods

The data used for the calculations stem from the Swiss Health Survey (SHS) and the FSO's Causes of Death Statistics. The prevalence of smoking by sex and age (ages 20–64 and 65–84) was determined based on the four SHS surveys of 1992, 1997, 2002 and 2007. For each birth-year cohort, the data of the four survey years and the adjacent birth-year cohorts were smoothed. The prevalences for the four years between each survey were interpolated for each birth-year cohort. Finally, for each birth-year cohort, the age-specific prevalences and their population weight were taken to determine the corresponding rate of smokers and ex-smokers.

The number of deaths from 1995 to 2007, broken down by diagnosis, age and sex, was drawn from the Causes of Death Statistics. Because the coding rules were changed between 1994 and 1995, older data were not used.

The analysis is based on the method developed by the US Centers for Disease Control and Prevention to calculate smoking-attributable mortality [SAMMEC-System 3]; the 2004 version was used. For each of the 22 causes of

death, the smoking-attributable fraction is calculated from the relative risk for smokers and ex-smokers (Table 1) and the proportion of smokers and ex-smokers in the population. Multiplying these fractions by the number of all registered deaths due to the corresponding cause of death shows the number of smoking-attributable deaths. The estimates of age- and sex-specific relative risks were taken from the American Cancer Society's Cancer Prevention Study II (CPS-II) [4] for current and former smokers for each cause of death for the 1982–1988 period. For cardiovascular diseases, the estimates of relative risk were broken down by age (aged 35–64 and aged 65 and older).

The present estimate does not take into account deaths resulting from fires caused by discarded or forgotten tobacco products and deaths due to passive smoking. For the 10-year comparison, the mean values of the years 1995–97 and 2005–07 were compared with each other in order to compensate for random fluctuations from one year to another.

Results

The number of smoking-attributable deaths estimated for the year 2007 is 9201, of whom 6427 were men and 2774 women (Table 2). A quarter of these deaths involved persons under the age of 65 (Table 3), a proportion that was similar for both sexes (Table 4). 22% of the total number of deaths among men irrespective of age are attributable to smoking; among women aged up to 64, the figure is 16% and among women aged 65 and older, 8%.

Overall, 41% of these deaths are attributable to cancer and to cardiovascular diseases and 18% to respiratory diseases (Table 5). The three leading specific causes of death attributable to smoking (Table 6) are lung cancer (2485), coronary artery diseases (1597) and chronic obstructive pulmonary diseases (COPDs) (1335).

The proportion of cardiovascular diseases is equally high among men and women. However, the proportion of cancers is higher among men, while the proportion of lung diseases is somewhat lower (Table 7).

In a 10-year comparison between the 1995–97 and 2005–07 periods, smoking-attributable mortality among women rose by 185 cases (+7%). Among women aged up to 64, it grew by 83 cases (+17%); among those aged 65 and older it rose by 103 (5%). Among men, the number of deaths decreased by 682 during this period (-10%). Both male age groups registered a decline of a similar magnitude.

The receding total number of deaths from smoking is primarily attributable to a decline in the number of deaths due to smoking-related cardiovascular disease (-18%); the rates were similar among men (-20%) and women (-18%). Smoking-attributable deaths due to lung cancer rose by 1% among men and by 61% among women. Tobacco deaths due to other types of cancer rose by 7% among men and by 19% among women. Chronic obstructive pulmonary diseases (COPDs) declined by 13% among men and rose by 33% among women. There was a similar decline in the case of other lung diseases (men -15%; women -14%).

Commentary

More than 9000 people die every year in Switzerland from the consequences of smoking. This is 15% of all deaths. Between 1995 and 2007, the number of smoking-attributable deaths decreased among men and increased among women. This trend lags behind the development of consumption habits. Among men, the smoking rate has been declining for a long time; among women, it increased until the end of the 1990s. In particular, because women are beginning to smoke at a much younger age, smoking-attributable diseases also occur earlier in life.

The demographic trend of an increase in older age groups in the population also contributes to keeping the numbers at a high level. Although death rates are declining in all age groups, the absolute number of deaths is declining much less because the number of older people is growing significantly.

A similar sharp increase in smoking-attributable deaths among women, as well as a decrease of deaths due to cardiovascular diseases and an increase in deaths due to cancer and respiratory diseases is also observable in the United States and Canada. [5–7]

The figures presented here are not statistical counts but rather estimates based on commonly used international methods. The method used was developed by the CDC [3]. Other estimation methods produce in some instances lower results with deviations ranging from about 10% to a maximum of 20%. The CDC's SAMMEC method was chosen because its intermediate steps are easier to derive and the results are consequently more comprehensible. The competing method by Peto et al. [8] chooses not to make smoking prevalence estimates based on population surveys. It starts out from a general risk model that is based directly on lung cancer deaths. The Peto method has the advantage that it can also be used for countries in which there are no statistical data on tobacco consumption. Consequently, it is indispensable for the estimation of worldwide smoking-attributable mortality.

The results presented in this report are subject to certain limitations that can result both in overestimates and underestimates.

– The relative risks used for the calculations are based on data from 1982–1988. At that time, the American birth cohorts had different consumption habits (older when starting to smoke, different cigarettes, possibly other consumption volumes and other ways to stop smoking). It is not clear whether and in what direction the relative risks may have changed.

– The relative risks on which the calculations were based were adjusted for age effects but not for other potential bias factors. The data from the American Cancer Prevention Study II showed only negligible effects of education, alcohol consumption and other potential bias factors on the estimates of smoking-attributable mortality from lung cancer, COPD, ischaemic heart disease and cerebrovascular diseases.

– The estimates only take into account cigarette consumption; deaths resulting from other smoking products such as cannabis, cigars and pipes were excluded.

– COPD is a serious consequence of smoking which occurs, to varying degrees, in practically all long-term smokers and which reduces the probability of recovery from many diseases and operations. In more than 50% of deaths in which COPD appears in the Causes of Death Statistics, it is listed as a secondary cause, i.e. as an additional disease that contributed to death. The present calculation does not take account of secondary causes; it is based exclusively on the main causes of death.

– Lastly, the variability of the data on which the estimates are based was not taken into account. The statistical precision of the calculations cannot be indicated.

The above-named limitations can result both in an overestimate and an underestimate of the absolute numbers. Because the numbers are not directly measurable, estimates are the only possibility to determine the extent of the harm caused by tobacco. Because the same method was used in this study for all years investigated, these limitations apply to a far smaller extent to the changes observed during this period.

In summary, we can make the following observations: In the 10 years between the periods 1995–1997 and 2005–2007, the number of smoking-attributable deaths declined by 10% among men, somewhat less among men aged 65 and older (9%) than among men below that age (11%). During the same period, the number of smoking-attributable deaths rose by 17% among women under age 65 and by 5% among older women, predominantly due to an increase in lung cancer, COPD and other types of cancer. Smoking continues to cause the largest number of preventable deaths in Switzerland.

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T1 Diseases considered

Diagnosis no.	ICD-9	ICD-10	Diagnosis description
1	010–012	A15–A16	Respiratory tuberculosis
2	140–149	C00–C14	Cancer of the lip, oral cavity, pharynx
3	150	C15	Cancer of the oesophagus
4	157	C25	Cancer of the pancreas
5	161	C32	Cancer of the larynx
6	162	C33–C34	Lung cancer
7	180	C53	Cancer of the cervix uteri
8	188	C67	Cancer of the urinary bladder
9	189	C64–C66	Kidney cancer
10	390–398	I00–02, 05–09	Rheumatic heart disease
11	400–404	I10–I15	Hypertension
12	410–414	I20–I25	Ischaemic heart disease
13	426	I26–I28	Pulmonary heart disease
14	420–425, 427–429	I30–I52	Other heart disease
15	430–438	I60–I69	Cerebrovascular disease
16	440	I70	Atherosclerosis
17	441	I71	Aortic aneurysm
18	442–448	I72–79, M30–31	Other arterial disease
19	480–486, 470–474	J10–J18	Pneumonia/influenza
20	490–492	J40–J44	Bronchitis, emphysema, COPD
21	493	J45–J46	Asthma
22	776.2	P22	Respiratory distress of newborn

T2 **Smoking-attributable deaths, by sex, 1995–2007** calculated with the CDC method

Year	Men		Women		Total	Percentage of all deaths		
	Number	%	Number	%	Number	Men	Women	Total
1995	7247	75	2449	25	9696	22.9	7.7	15.3
1996	7016	74	2526	26	9542	22.8	7.9	15.2
1997	7214	73	2687	27	9901	23.5	8.3	15.8
1998	7191	73	2708	27	9899	23.2	8.6	15.8
1999	7007	71	2798	29	9805	23.0	8.7	15.7
2000	6867	71	2762	29	9629	22.6	8.6	15.4
2001	6602	72	2547	28	9149	22.1	8.1	14.9
2002	6450	71	2604	29	9054	21.7	8.1	14.7
2003	6627	70	2787	30	9414	21.9	8.5	14.9
2004	6309	70	2663	30	8972	21.8	8.5	14.9
2005	6649	71	2715	29	9364	22.4	8.6	15.3
2006	6356	70	2730	30	9086	21.8	8.8	15.1
2007	6427	70	2774	30	9201	21.8	8.8	15.1
Change between 1995–97 and 2005–07								
absolute	-682		185		-496			
in %	-9.5%		7.3%		-5.1%			

T 3 Smoking-attributable deaths, by age, 1995–2007 calculated with the CDC method

Year	0–64		65+		Total	Percentage of all deaths		
	Number	%	Number	%	Number	0–64	65+	Total
1995	2253	23	7443	77	9696	18.7	14.5	15.3
1996	2116	22	7426	78	9542	18.7	14.5	15.2
1997	2266	23	7635	77	9901	20.2	14.8	15.8
1998	2291	23	7608	77	9899	20.7	14.8	15.8
1999	2223	23	7582	77	9805	20.7	14.6	15.7
2000	2232	23	7397	77	9629	20.5	14.3	15.4
2001	2113	23	7036	77	9149	20.1	13.9	14.9
2002	2073	23	6981	77	9054	19.6	13.6	14.7
2003	2059	22	7355	78	9414	19.7	14.0	14.9
2004	2030	23	6942	77	8972	20.0	13.9	14.9
2005	2123	23	7241	77	9364	21.0	14.2	15.3
2006	2062	23	7024	77	9086	20.6	14.0	15.1
2007	2125	23	7076	77	9201	21.2	13.9	15.1
Change between 1995–97 and 2005–07								
absolute	-108		-388		-496			
in %	-4.9%		-5.2%		-5.1%			

T 4 Smoking-attributable deaths, by age and sex, 1995–2007 calculated with the CDC method

Year	Men				Women				Total	Percentage of all deaths			
	0–64		65+		0–64		65+			Men		Women	
	Number	%	Number	%	Number	%	Number	%	Number	0–64	65+	0–64	65+
1995	1749	24	5498	76	504	21	1945	79	9696	21.8	23.3	12.4	7.0
1996	1645	23	5371	77	471	19	2055	81	9542	22.1	23.0	12.1	7.3
1997	1765	24	5449	76	501	19	2186	81	9901	24.1	23.4	13.0	7.7
1998	1762	25	5429	75	529	20	2179	80	9899	24.0	22.9	14.2	7.8
1999	1670	24	5337	76	553	20	2245	80	9805	23.9	22.8	14.9	7.9
2000	1703	25	5164	75	529	19	2233	81	9629	24.1	22.1	13.8	7.9
2001	1585	24	5017	76	528	21	2019	79	9149	23.2	21.8	14.3	7.3
2002	1547	24	4903	76	526	20	2078	80	9054	22.8	21.4	14.0	7.3
2003	1510	23	5117	77	549	20	2238	80	9414	22.4	21.7	14.8	7.7
2004	1512	24	4797	76	518	19	2145	81	8972	22.9	21.4	14.6	7.8
2005	1570	24	5079	76	553	20	2162	80	9364	23.9	21.9	15.5	7.8
2006	1479	23	4877	77	583	21	2147	79	9086	23.2	21.3	16.0	7.8
2007	1537	24	4890	76	588	21	2186	79	9201	24.1	21.1	16.3	7.8
Change between 1995–97 and 2005–07													
absolute	-191		-491		83		103		-496				
in %	-11.1%		-9.0%		16.8%		5.0%		-5.1%				

T5 Smoking-attributable deaths, by diagnostic groups, 1995–2007 calculated with the CDC method

Year	Cancer (incl. lung cancer)		Cardiovascular diseases		Lung diseases (excluding lung disease)	
	Number	%	Number	%	Number	%
1995	3288	34	4766	49	1640	17
1996	3289	34	4583	48	1673	18
1997	3326	34	4703	48	1871	19
1998	3435	35	4582	46	1884	19
1999	3366	34	4466	46	1973	20
2000	3538	37	4272	44	1816	19
2001	3514	38	4087	45	1551	17
2002	3433	38	3993	44	1626	18
2003	3509	37	4120	44	1781	19
2004	3486	39	3857	43	1626	18
2005	3642	39	3922	42	1798	19
2006	3653	40	3806	42	1626	18
2007	3729	41	3800	41	1669	18
Change between 1995–97 and 2005–07						
absolute	374		-841		-30	
in %	11.3%		-18.0%		-1.8%	

T6 Smoking-attributable deaths, most important diagnoses, 1995–2007 calculated with the CDC method

Year	Lung cancer		Ischaemic heart disease		Chronic obstructive pulmonary disease		Other diseases	
	Number	%	Number	%	Number	%	Number	%
1995	2168	22	2073	21	1238	13	4215	43
1996	2164	23	1977	21	1300	14	4104	43
1997	2199	22	2026	20	1379	14	4296	43
1998	2274	23	2034	21	1389	14	4204	42
1999	2217	23	1930	20	1481	15	4177	43
2000	2360	25	1847	19	1298	13	4121	43
2001	2334	26	1717	19	1202	13	3899	43
2002	2256	25	1697	19	1223	14	3876	43
2003	2333	25	1747	19	1386	15	3944	42
2004	2327	26	1613	18	1258	14	3771	42
2005	2432	26	1654	18	1389	15	3887	42
2006	2416	27	1614	18	1286	14	3769	41
2007	2485	27	1597	17	1335	15	3781	41
Change between 1995–97 and 2005–07								
absolute	267		-404		31		-393	
in %	12.3%		-19.9%		2.4%		-9.3%	

T 7 Smoking-attributable deaths, by diagnosis and sex, 1995–2007 calculated with the CDC method

Year	Lung cancer		Other types of cancer		Cardiovascular diseases		Chronic obstructive pulmonary disease		other lung diseases	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
1995	1760	408	850	270	3426	1340	957	281	253	149
1996	1770	394	858	267	3209	1374	952	348	227	146
1997	1788	411	849	278	3275	1428	1013	366	289	203
1998	1814	460	881	280	3203	1379	1007	382	286	209
1999	1717	500	878	271	3047	1419	1073	408	291	201
2000	1829	531	882	296	2929	1343	916	382	309	209
2001	1836	498	891	289	2826	1261	837	365	213	136
2002	1725	531	878	299	2742	1251	859	364	246	157
2003	1763	570	885	291	2800	1320	943	443	234	161
2004	1731	596	873	286	2623	1234	863	395	218	150
2005	1843	589	898	312	2707	1215	958	431	241	168
2006	1742	674	922	315	2629	1177	853	433	211	129
2007	1797	688	913	331	2634	1166	877	458	205	129
Change between 1995–97 and 2005–07										
absolute	21	246	59	48	-647	-195	-78	109	-37	-24
in %	1.2%	60.8%	6.9%	17.5%	-19.6%	-14.1%	-8.0%	32.9%	-14.6%	-14.5%