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## **The social cost of smoking in Switzerland: *estimation for 1995***

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*Commissioned by the Swiss Federal Office of Public Health*

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## *Results in brief*

The study on the social cost of smoking in Switzerland commissioned by the Swiss Federal Office of Public Health reaches the following conclusions:

- in 1995, smoking-related health disorders caused a total cost of CHF 10.0 billion, or 2.75% of GDP; the cost of smoking was a heavier burden for society than the cost of road accidents (CHF 6.7 billion in 1994);
- the time periods of professional working incapacity caused by illness or disability as well as the years of life lost due to premature deaths led to a reduction in net production and income of more than CHF 2.2 billion;
- net loss of production with regard to domestic chores was estimated at CHF 1.6 billion;
- the intangible costs, i.e. the deterioration in the quality of life of the disabled and the sick; their physical and mental suffering as well as the grief and resentment of the relatives and friends of a sick person or of a person who has died prematurely - amounted to CHF 5.0 billion;
- The 5 million devoted annually to smoking prevention account for 0.05% of the social cost of smoking;
- all costs were valued very prudently and the consequences of second-hand smoking were not taken into account.

### **Social cost of smoking in Switzerland in 1995 in CHF million**

Direct costs (1)	1,211.8
Net indirect costs	3,809.4
<i>Professional activities</i>	<i>2,207.5</i>
<i>Household chores</i>	<i>1,601.9</i>
Intangible costs	4,961.1
Social cost	9,982.3
Internal cost*	9,573.3
External cost**	409.0

(1) Source : HealthEcon 1998

\* Borne by the smokers and their families

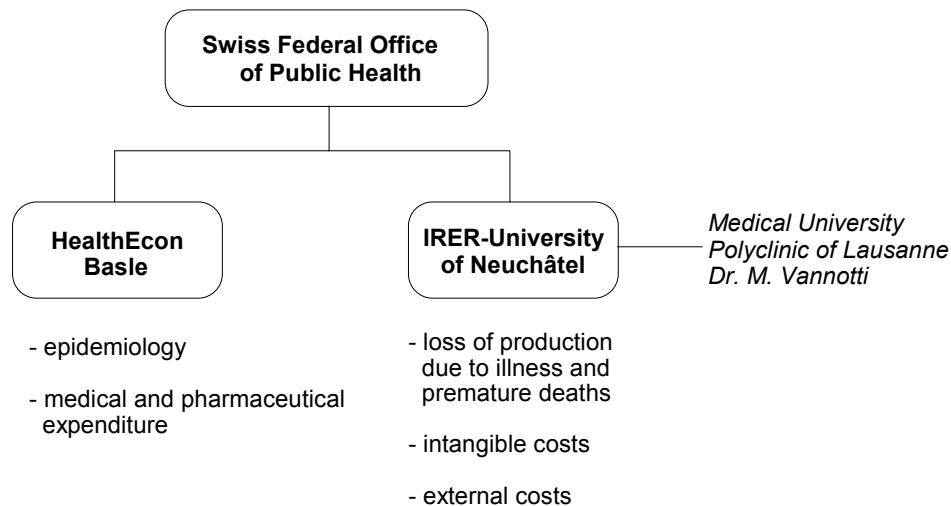
\*\* Borne by society

## ***Introduction***

The adverse health effects of smoking are well known today. In 1995, there were more than 8,000 smoking-related deaths in Switzerland. In certain diagnostic categories, four out of five deaths (cancer of the digestive tract, bronchitis in men) or nine out of ten deaths (lung cancer in men) were the consequence of smoking. In 1995 alone, more than 50,000 years of life were thus lost and nearly five million days of work were sacrificed as a result of temporary smoking-related working incapacity (HealthEcon 1998).

On the other hand, very little is known about the economic consequences of smoking. Even though recent data is available concerning several countries - the United States, Canada, Australia and Finland, for example - the only estimate available concerning Switzerland dates back to more than twenty years. In fact, Leu and Schaub (1985) estimated the social and external cost of smoking in Switzerland for 1976.

The Swiss Federal Office of Public Health requested the Institute of Economic Research (IRER) of the University of Neuchâtel and HealthEcon in Basle to estimate the social cost of smoking in Switzerland. 1995 was chosen as the reference year. The social cost includes medical and hospital expenditure, loss of production as well as the intangible costs resulting from illness and premature deaths. Secondly, the study was also supposed to determine whether the social cost is borne by the smokers themselves (internal cost) or by society (external cost). The IRER co-operated with Dr. Marco Vannotti at the Medical University Polyclinic in Lausanne on the valuation of the intangible costs.



Health disorders entail tangible costs - direct and indirect costs - as well as intangible damage. The latter is termed "intangible", since it corresponds to no expenditure in the market.

***Direct costs:** these are medical, pharmaceutical and hospital expenses of patients arising from their smoking. Some authors also include expenditure on prevention and research. The direct costs are estimated on the basis of expenditure earmarked to prevent or repair damage.*

***Indirect costs:** individuals who are ill because they smoke may be unable to work for a longer or shorter period of time. Production thus lost represents a cost for society. In the case of premature death, the discounted value of production for all the years the individual could have worked is calculated. The indirect costs of deaths and of illness are usually estimated by means of the human capital approach. The cost is related to the value of the production lost.*

***Intangible costs :** illness and premature deaths cause immaterial or "intangible" costs. They correspond to the physical and mental suffering of the patient and the patient's family, to the grief, the pain and the resentment felt by those who have lost a close relative or friend. The approach which is usually chosen to value the intangible costs is that of in-person interviews - by means of a questionnaire - in order to establish the price people would be willing to pay to avoid damage or to reduce the risk of damage.*

Health disorders caused by smoking are most frequently valued with the help of non-monetary indicators: years of life lost, number of individuals with health disorders, days spent in hospital, periods of working incapacity... In the present study, however, all costs are measured in monetary units. All the negative consequences taken together are expressed in a single unit in francs or as a percentage of gross domestic product (GDP).

### **Costs not measured**

Not all the indirect costs of tobacco consumption were measured. Thus, the loss of productivity at work was not considered, for lack of data allowing this valuation to be made. The impact of smoking-related mortality and morbidity on charity work, as well as the reduction in time spent at work due to the need to care for a relative or a close friend were also disregarded for the same reason.

Out of the 22 diagnostic categories, in which smokers run a higher risk of death than non-smokers, only the 15 most important ones were taken into consideration. As a result, deaths and illness due to tobacco consumption were under-valued.

Lastly, when calculating costs, the health disorders of smokers only were included. In other terms, the consequences of second-hand smoking were not considered.

#### **Elements of measured costs**

- Loss of marketable and non-marketable production due to mortality up to the age of 74
- Loss of production due to smoking-related morbidity up to the age of 62 (women) and 64 (men)
- Working incapacity with regard to the 15 most important smoking-related diagnostic categories

#### **Elements of costs not measured**

- Reduction in productivity at work
- Loss of production due to illness and disability after the age of 62/64
- Working incapacity due to caring for a sick relative
- Time spent visiting the sick
- Working incapacity with regard to 7 smoking-related diagnostic categories
- Second-hand smoking

## ***Measuring the indirect costs of smoking***

### ***The human capital approach***

The human capital approach is used most frequently to measure the consequences of disease and death due to smoking. The cost of a premature death or of a temporary working incapacity due to illness is measured by the value of production which could have been generated if the person concerned had continued to work normally. The human capital approach measures the cost of one year of life lost in terms of the value of production that has had to be forgone.

The indirect cost of illness or death thus corresponds to the value of sacrificed production. This method is criticised often for the following fact: disease or death after the age of 62 in the case of women, and in the case of men after the age of 65, supposedly does not result in production being forfeited and therefore does not cause any economic cost. This criticism, however, is unfounded since one does not only consider the loss of marketable production, i.e. loss related to professional activities, but also the loss of non-marketable production resulting from the incapacity to perform domestic activities (household chores, bringing up children, etc.). Furthermore, there are many people who continue to work professionally after the

theoretical age of retirement. The Swiss Labour Force Survey (SLFS 1995) showed that in the age group 62/65 and above 8% of women and 15% of men still worked. Thus, the loss of marketable and domestic production due to mortality was valued up to the age of 74. Beyond that age, these losses are considered sufficiently low to be ignored.

Loss of production is measured indirectly on the basis of the average professional income, as indicated by the Swiss Labour Force Survey. This income varies according to gender and age. A temporary working incapacity lasting for a whole year at the age of 60 results in a loss of income and production of CHF 65,000 in the case of a woman and of CHF 78,000 in the case of a man.

### **Measurement of production losses in an economy with unemployment**

When the human capital approach is applied one assumes that companies cannot replace a sick employee or a deceased employee by hiring an unemployed person. When unemployment was low this approach raised no objections. With rising unemployment, however, should the method of calculating the loss of production not be reviewed?

The issue has been debated in the literature; some authors feel that loss of production is restricted to the time companies take to find a substitute (several weeks or months). In this case, the loss of production caused by premature deaths is much lower.

It must be recalled, however, that the origin of current unemployment is primarily structural, and that the unemployed frequently do not possess the qualifications sought by employers. The OECD estimates that the base of unemployment in Switzerland in 1995 was 3.3%: in other words, the largest part of unemployment (80%) was of a structural nature. In these circumstances, the conditions that apply to the human capital approach are fulfilled. When calculating the indirect costs, the authors did however take into account the risk an individual has of becoming unemployed at some point in his/her professional life.

The incapacity of ill or disabled individuals to perform household chores also constitutes a source of cost. Since household work is not remunerated, it was necessary to find a method of indirect valuation. The authors' first hypothesis was to say that a person had to be hired to perform the domestic chores instead of the sick or deceased person. Thus, the economic cost of death or illness was equal to the wages paid to the substitute (CHF 35,292 in the case of household work, Swiss survey on the structure of wages and salaries, 1994). A second measure of the indirect cost was obtained by taking into account the remuneration of the sick person had he/she devoted the same amount of time to a professional activity (*opportunity cost* method). This latter method provides a better estimation of the real cost of working incapacity.

All individuals who were either ill or disabled due to smoking in 1995 were surveyed. Then the days of working incapacity and loss of production were valued for the same year. Loss of production due to death from smoking is not restricted to 1995 but extends beyond that year. A forty-year old ,who died in 1995, would have been able to have a professional activity or perform domestic chores for more than another thirty years.

***The indirect costs of death***

There were more than 8,300 deaths due to tobacco consumption in 1995. Loss of production was estimated with regard to all individuals who died before the age of 75.

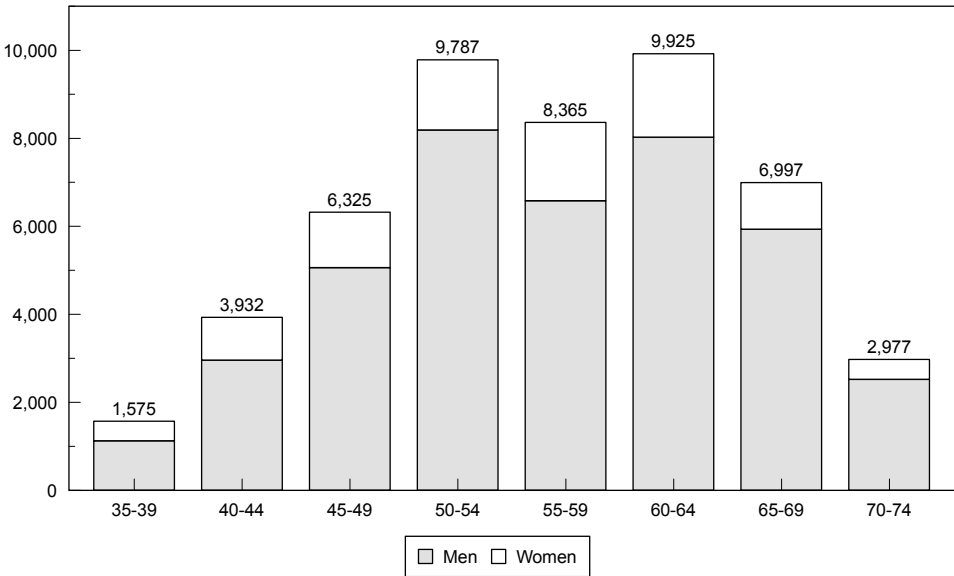
**Death due to smoking in 1995**

	Total	Before the age of 75
Men	6,903	3,487
Women	1,428	737
<b>Total</b>	<b>8,331</b>	<b>4,224</b>

Source : HealthEcon 1998.

The 4,224 deaths occurring before the age of 75 account for a total loss of nearly 50,000 productive years of life. The estimation takes into account the risk of death, the probability of a period of unemployment in the course of a professional life span and the increase in real incomes.

**Deaths from smoking in 1995:  
years of life lost by age at the time of death**



### Discounting and the indirect costs of mortality

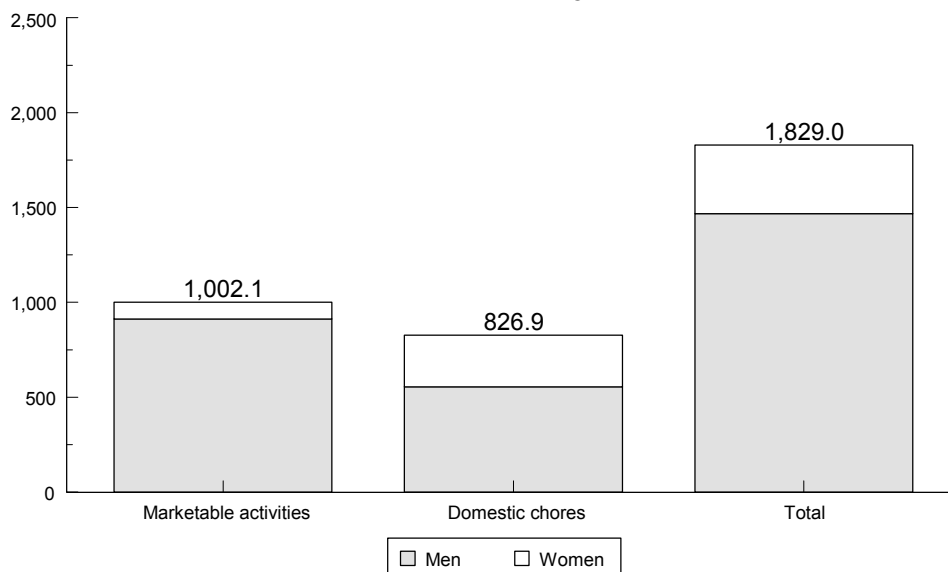
The further removed in time loss is from the reference year, the lower its current value is. The need to reduce the value of future, lost production by calculating a discount arises from the fact that individuals prefer to consume today rather than later. A 2% discount rate was chosen, with variations between 0% and 6%.

Take the case of a person who dies today at the age of 40 due to a smoking-related disease and who would have had the necessary qualifications to make an income of CHF 50,000 a year up to the age of retirement. The remoter in time the working incapacity occurs and the higher the discount rate is, the lower the economic cost of the years of lost life becomes.

Working incapacity			
	in 1995	in 2000	in 2020
2%	50,000	41,017	30,447
6%	50,000	27,919	11,650

The indirect costs of smoking exceeded CHF 1.8 billion. The loss of domestic production (0.8 billion) was only slightly lower than that of marketable activities (1.0 billion). This can easily be explained by the fact that more than half of the deaths due to tobacco consumption occur after the age of 65, i.e.: in the age categories in which nine out of ten individuals no longer have a professional activity.

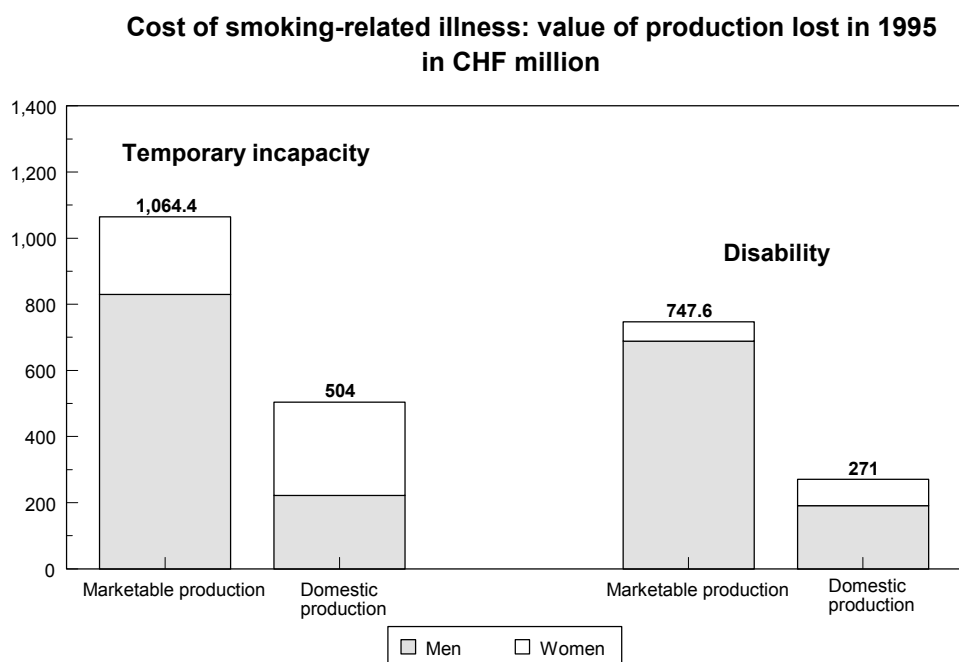
**Loss of gross production due to death from smoking in 1995  
in CHF million**





### *The indirect costs of illness*

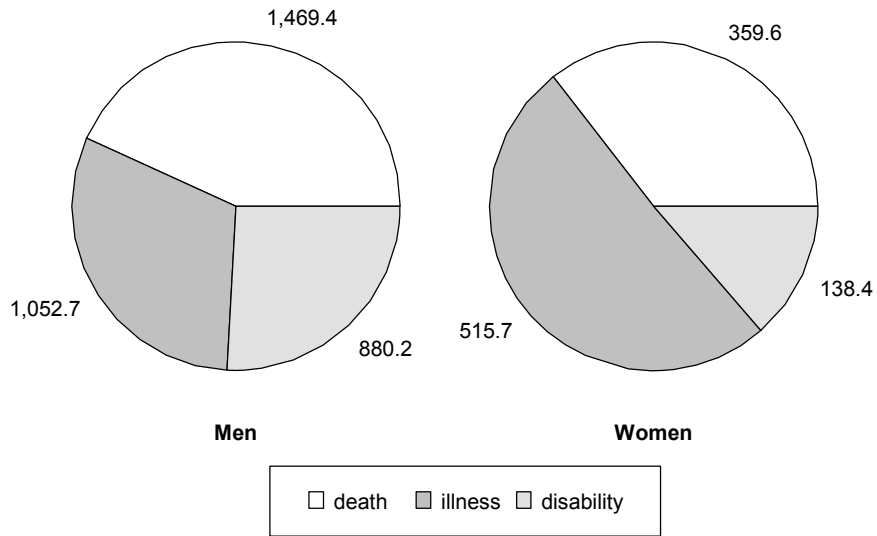
In valuing the indirect costs of the smoking-related morbidity it is necessary to account for the loss of production arising from temporary incapacity to work (illness) and from disability. More than 4 million professional working days were lost due to illness caused by smoking, to which must be added 1.1 million days on which the individuals concerned were unable to perform their domestic chores. The indirect costs of illness and disability amount to CHF 2.6 billion.



### *Total indirect costs*

In 1995, illness and premature deaths due to tobacco consumption accounted for a gross indirect cost of CHF 4.4 billion. In calculating this amount, the working days lost by the sick or disabled individuals were taken into account as was all the production which could have been generated in 1995 and in the subsequent years, had the prematurely deceased individuals been able to continue working until the end of their active working life.

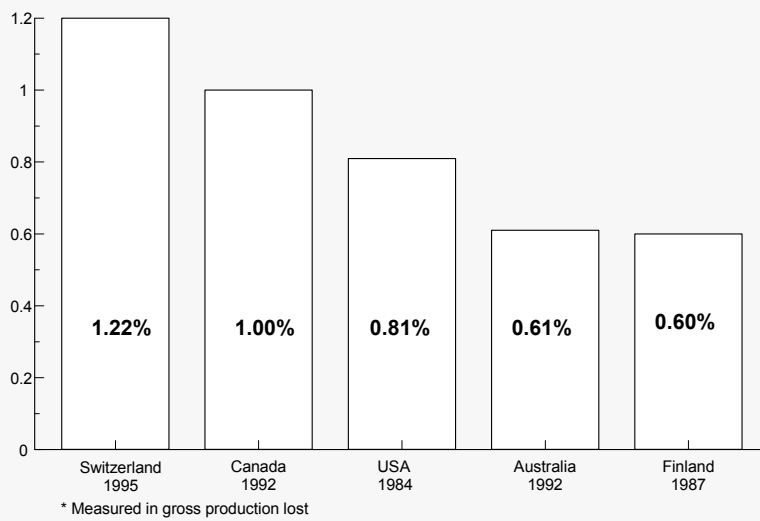
**Loss of gross production due to smoking - 1995  
in CHF million**



**Results obtained abroad**

The total indirect cost expressed as a percentage of the country's production is comparable with the values obtained in research conducted abroad. The slightly lower values found in Australia and in Finland can be explained by the fact that in these two countries the impact of smoking-related mortality and morbidity on domestic production was not taken into account.

**Comparison with other studies: indirect costs of smoking-related\* mortality and morbidity in % of domestic production (GDP)**



## ***Measuring the intangible costs of smoking***

The physical and mental suffering, the grief, the pain and altered quality of life of patients and their relatives were estimated with regard to six types of diseases which could be attributed to smoking: four circulatory disorders (angina pectoris, stroke, myocardial infarction with favourable outcome and fatal infarction), a respiratory disorder (chronic bronchitis) and lung cancer. The intangible costs engendered by other disorders caused by smoking were not considered. Thus, the estimation obtained is prudent.

### ***The contingent valuation method***

Health is a commodity the price of which is not fixed by market mechanisms. Nonetheless, it has a price since it contributes to the well-being of individuals. The value of health or of its counterpart - the costs generated by illness - can be valued with the help of monetary or non-monetary measurements. The contingent valuation method is in the former category.

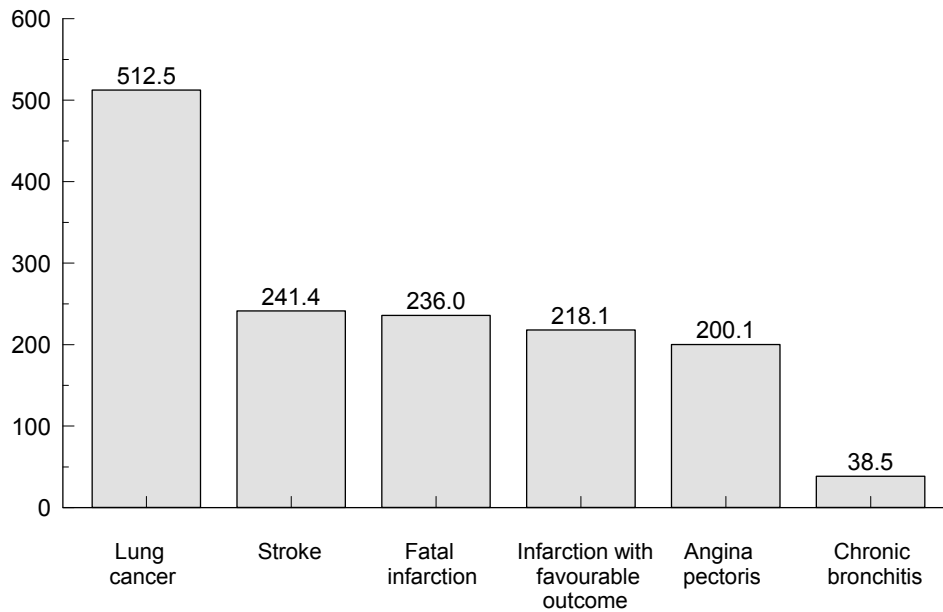
A contingent valuation requires that a sample of the population be surveyed by means of a questionnaire. The concept is very simple: first, the consequences of a disease are described as precisely as possible. Then, a solution, which makes it possible to reduce the risk of being affected by this disorder, is proposed. The purpose of this approach is to determine the maximum amount the interviewed person would be willing to pay to benefit from a reduction in risk. This amount establishes the value individuals attribute to the intangible consequences of the disease.

The survey was conducted with a sample of 868 individuals 18 years old and above in the three linguistic regions of our country. Stringent precautions were taken in designing the questionnaire and during the econometric analysis of the data in order to limit absurd replies given by the interviewed persons in view of the artificial character of the market described to them.

### ***The intangible costs per sick person***

Interviewees indicated lung cancer as being the most serious disease with an intangible cost of CHF 512,500 per affected individual. The least serious disorder, according to them, was chronic bronchitis with CHF 38,500. Circulatory disorders were situated between CHF 200,100 and CHF 241,400.

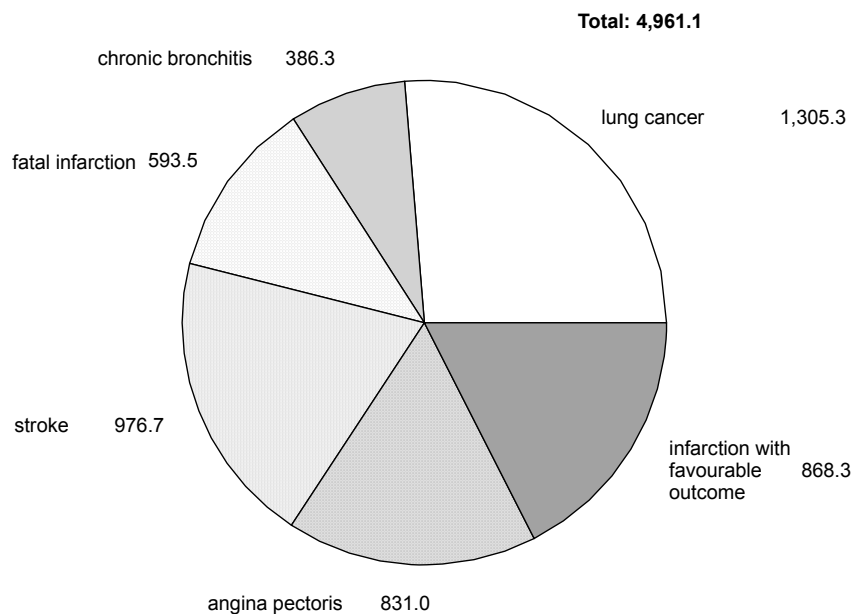
**Intangible cost of smoking by diagnostic category in 1995 in CHF thousands**



***Total intangible costs***

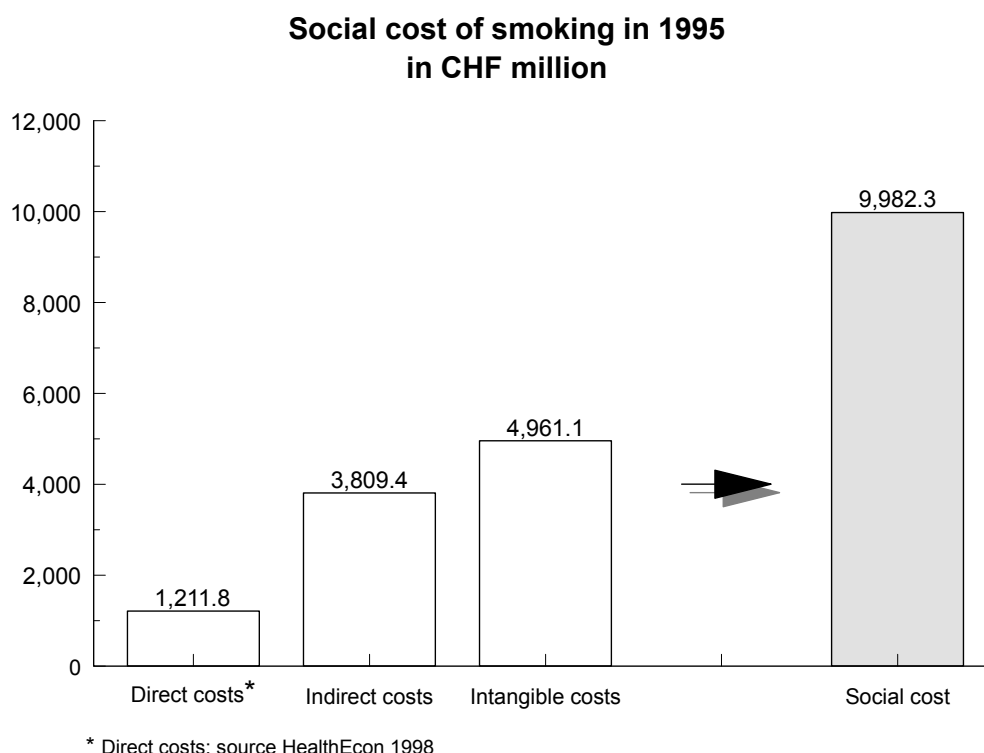
This is the intangible costs per patient multiplied by the number of persons falling ill in a year. In the case of lung cancer, they amount to CHF 1,305.3 million and in the case of chronic bronchitis to CHF 386.3 million. As to the total intangible costs of smoking, they amount to 4,961.1 million.

**Intangible costs of smoking in 1995 in CHF million**



## ***The social cost of smoking***

Health disorders - illness, disability and premature deaths - caused by tobacco consumption gave rise to a cost of approximately CHF 10 billion. The intangible costs - physical and mental suffering, pain, grief of the sick and of their relatives and friends - are just as substantial as the tangible costs. In order to aggregate the various components of the social cost, it is necessary to consider the net losses of production (the consumption of the deceased individuals is subtracted from the losses of production). The indirect costs switch from CHF 4.4 billion to CHF 3.8 billion.



The social cost of smoking accounted for 2.75% of the value of the Swiss economy's output in 1995. This share is slightly higher than the one calculated by the authors of a similar study in Australia (2.4%) and in the United States (2%). The latter study did not include the estimation of intangible costs.

By way of comparison, the social cost of road accidents - direct, indirect and intangible costs - was estimated at CHF 6.7 billion in 1994 (Swiss Federal Statistical Office, 1996).

## ***Who bears the social cost: the smoker or society?***

Does the smoker or society pay for the direct and the indirect costs? In the first case the costs are internal, in the second, external.

Society bears part of the direct cost of smoking:

- by having the State cover the deficits of hospitals;
- by the health funds and insurances covering disability inasmuch as the calculation of premiums does not take into account the difference in the risks smokers and non-smokers take.

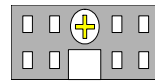
Regarding indirect costs, one has to determine who bears the consequences of production losses, the smoker or society? Part of the additional risk is imposed on society through the general insurance scheme (social security, AVS/AI - state pension and disability scheme, professional pension funds and daily indemnity insurances).

The terms of the valuation of the external costs are not the same for the direct and for the indirect costs. Since the intangible costs are borne by the smoker and the smoker's family, they count as an internal cost.

### ***Direct costs***

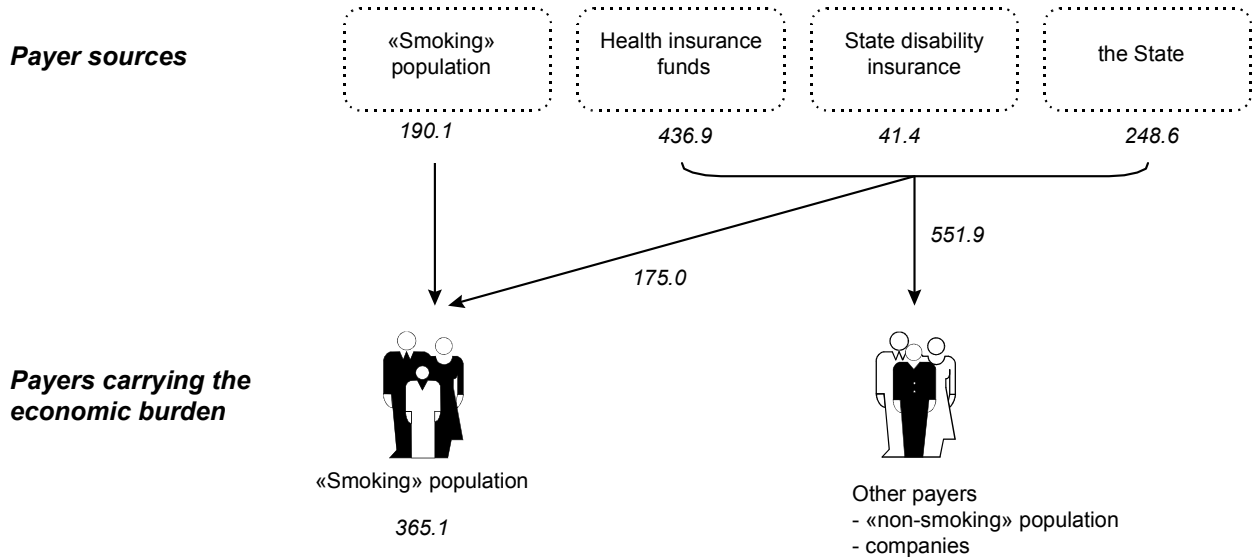
Smoking-related medical and hospital expenditure amounted to CHF 1.2 billion. The following question was put: how is this burden shared between the smoker and the rest of society?

Smoking-related hospital and medical expenditures are shared by smokers and the other payers (health insurance funds, state disability insurance scheme (AI) and the State). Smokers assume CHF 190.1 million themselves directly, mainly in terms of participation in expenses, deductibles, and, above all, private insurance benefits. Smokers also participate in the financing of the additional expenditures of the State and of insurances by paying a higher level of social contributions and taxes (CHF 175.0 million).



### Smoking-related hospital expenditures

917.0 million



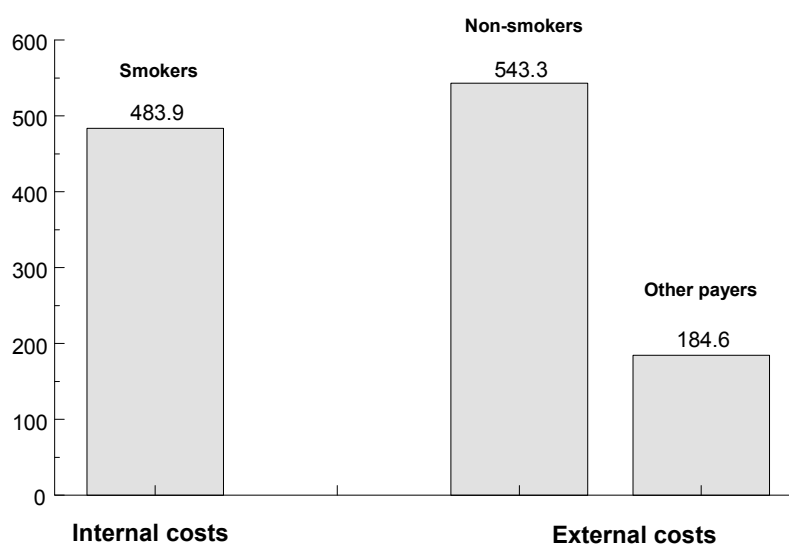
On average, smokers pay for 40% of the smoking-related medical, pharmaceutical and hospital costs. Third parties - non-smokers and companies - cover 60% of this expenditure. The share of the direct cost, which is not borne by the smokers themselves - the external cost -, amounts to CHF 727.9 million.

#### Payers carrying the economic burden of smoking-related medical, pharmaceutical and hospital costs in 1995 in CHF million

	Smokers	Non-smokers	Others*	Total
Medical consultations	84.6	96.3	19.5	200.4
Medication	34.2	51.5	8.7	94.4
Hospitalisation	365.1	395.5	156.4	917.0
Internal costs	483.9			483.9
External costs		543.3	184.6	727.9

\* Mainly companies

**Smoking-related medical, pharmaceutical and hospital costs: sharing the burden between smokers and other payer sources in 1995  
in CHF million**



***Indirects costs***

The net production losses due to smoking amount to CHF 3,809.4 million. Knowing that the loss of domestic production - household chores - is borne entirely by the smokers and their families, it remained to be determined how the burden represented by the loss of marketable production is shared by the smokers (internal cost) and the rest of society (external cost).

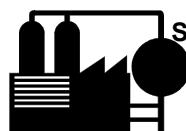
If smokers, whose health is impaired and who consequently are unable to work, did not receive compensation the total cost would be borne by the smoker and the smoker's family. There are, however, several types of compensation as a result of which part of the costs are placed on society:

- a person with a temporary working incapacity continues to receive his/her wage or salary or receives daily indemnity benefits if that person's employer has taken out such an insurance;
- disabled persons receive a State disability pension, possibly also a pension granted by a professional pension fund.

With regard to smoking-related deaths, the surviving family members may be the beneficiaries of pension under the State pension scheme or receive a pension from a professional pension fund.

The greatest part of the indirect costs (CHF 3,809.4 million) is borne directly by the smokers (CHF 2,529.6 million), the balance is paid for indirectly by the smokers (CHF 290.1 million) and by third parties (CHF 989.7 million) in the shape of higher contributions. Thus, smokers bear 75% of the total indirect costs of smoking.

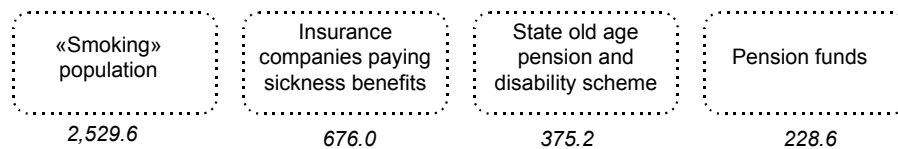




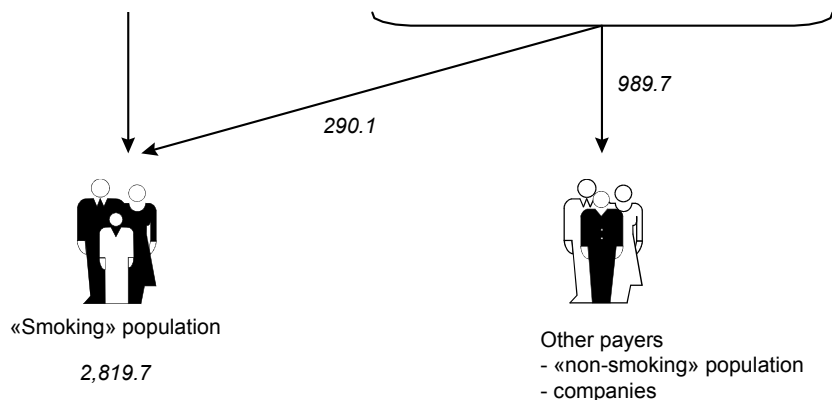
**Smoking-related loss of production**

3,809.4 million

**Payer sources**



**Payers carrying the economic burden**

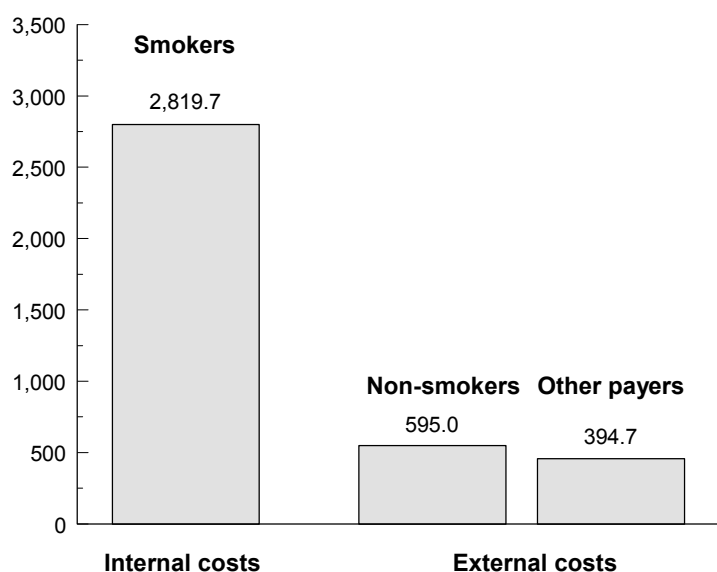


**Payers carrying the economic burden of production lost due to smoking in 1995 in CHF million**

	Smokers	Non-smokers	Others*	Total
Illness	1,079.6	376.6	112.2	1,568.4
Disability	631.2	172.9	214.5	1,018.6
Death	1,108.9	45.5	68.0	1,222.4
Internal cost	2,819.7			2,819.7
External cost		595.0	394.7	989.7

\* Mainly companies

**Smoking-related net loss of production: sharing the burden  
between smokers and other payers in 1995  
in CHF million**



***Unpaid old age pensions***

The premature deaths of smokers lead to a reduction in the old age pension benefits paid out by the State pension scheme (AVS - assurance vieillesse, décès et survivants) (CHF 1,200.4 million) and by the pension funds (CHF 472.2 million). If smokers had the same life expectancy as the population at large, the AVS and the pension funds would have to find additional resources to finance smokers' pensions. An increase in contributions would be inevitable. Society would pay higher premiums and smokers would receive larger old age pensions. One must specify that the unpaid pensions merely represent a transfer from the "smoking" to the "non-smoking" population and not a genuine economic gain. The transfer in favour of the non-smokers and the other payers (CHF 1.3 billion) must be subtracted from the external costs.

**Institutions benefiting from a reduction in the economic burden  
due to unpaid old age pensions in 1995  
in CHF million**

	Smokers	Non-smokers	Others*	Total
AVS	294.1	356.5	549.8	1,200.4
Professional pension funds	69.9	162.9	239.4	472.2
<b>Total</b>	<b>364.0</b>	<b>519.4</b>	<b>789.2</b>	<b>1,672.6</b>

\* Mainly companies

### ***The external cost of smoking***

To summarise, the external costs of smoking amounted to CHF 409 million in 1995. Less than the revenue from the tax on tobacco the same year (1,332.9). Although the main purpose of the tobacco tax is to oblige smokers, by making them pay a tax, to compensate for the damage they cause society, the objective is achieved, and even surpassed.

Economists maintain that the choices consumers make turn out to be effective when the price paid for each product reflects its social cost (including the price of the damage inflicted on third parties). This rule does not, however, apply to tobacco. In fact, it presupposes that the consumer be able to choose freely and in the full knowledge of either consuming or foregoing a commodity. For this to be so, the consumer must first of all be well informed of the consequences and of the risks of his/her choice. Secondly, the consumer must not be in a relationship of dependence with regard to the product consumed. If one of these conditions is not fulfilled, the rule loses much of its meaning and the boundary between internal costs and external costs becomes very blurred. This is why too great an importance should not be attached to the external costs of smoking. It is the social rather than the external cost which is the significant factor in health policies.

#### **External cost of smoking in 1995 in CHF million**

Medical and hospital costs	727.9
Loss of production	989.7
Unpaid old age pensions	-1,308.6
External cost	409.0