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Philippe Fenoglio, Véronique Parel and Pierre Kopp

This work was carried out at:
Université de Panthéon-Sorbonne (Paris I)
106-112 bd de l'Hôpital
75013 Paris

Pierre Kopp
6, rue Duméril
75013 Paris
Tel. 00 33 1 45 35 19 08
E-mail: pkopp@easynet.fr

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ABSTRACT

Aim, design and setting. The economic costs of alcohol, tobacco and illicit drugs to French society are estimated using a cost-of-illness framework. **Measurements**. For cause of disease or death (using ICD-9 categories), pooled relative risk estimates from meta-analyses are combined with prevalence data by age and gender to derive the proportion attributable to alcohol, tobacco and/or illicit drugs. The resulting estimates of attributable deaths and hospitalizations are used to calculate associated health care, law enforcement, productivity and other costs. The results are compared with other studies, and sensitivity analyses are conducted on alternative ways of measuring risk attribution and costs. **Findings**. The use of alcohol, tobacco and illicit drugs cost more than 200 billion francs (FF) in France in 1997, representing 3714 FF per capita, or 2.7% of GDP. Alcohol is the drug that gives rise to the greatest cost in France, 115,420.91 million FF (1.42 % of GDP), or expenditure per capita of 1,966 FF in 1997. Alcohol represents more than half of the social cost of drugs to society. The greatest share of the social cost of alcohol comes from the loss of productivity (57,555.66 million FF), due to premature death (53,168.60 million FF), morbidity (3,884.0 million FF) and imprisonment (503.06 million FF). Tobacco leads to a social cost of 89,256.90 million FF, that is, expenditure per capita of 1,520.56 FF, or 1.1% of GDP. Productivity losses amount to 50,446.70 million FF, with losses of 42,765.80 million FF a result of premature death and 7,680.90 million FF linked to morbidity. Health care costs for tobacco occupy second place at 26,973.70 million FF. Illicit drugs generate a social cost of 13,350.28 million FF, that is, expenditure per capita of 227.43 FF, or 0.16% of GDP. Productivity losses reach 6,099.19 million FF, with 5,246.92 million FF linked to imprisonment and 852.27 million FF to premature death. The cost of enforcing the law for illicit drugs occupies second place at 3,911.46 million FF, followed by health care costs of 1,524.51 million FF. **Conclusion**. Substance abuse exacts a considerable toll on French society in terms of illness, injury, death and economic costs.

[*] CREDES, Université Nancy 2, 13 place Carnot, 54035 Nancy cedex, E-mail: Philippe.Fenoglio@univ-nancy2.fr
[✧] MATISSE, Université de Panthéon-Sorbonne (Paris I), 106-112 boulevard de l'Hôpital, 75013 Paris, E-mail: vparel@aol.com
[❄] MATISSE, Université de Panthéon-Sorbonne (Paris I), 106-112 boulevard de l'Hôpital, 75013 Paris, E-mail: pkopp@easynet.fr

This article presents an evaluation of the morbidity, mortality and costs attributable to drugs (alcohol, tobacco and illicit substances) in France in 1997, based on the "Cost of Illness" (COI) methodology. This kind of evaluation is of particular interest for public decision-making, even more so as there are no prior studies assessing the social cost of drugs in France.

1 - METHODOLOGY

The "Cost of Illness" (COI) approach is well accepted within the scientific community. Its guiding principle is that a disease or a social problem imposes costs when resources are used as a result of the disease or the social problem, whereas they could have been used differently.

Two hypotheses are put forward. On one hand, the full use of factors is assumed (i.e., all the existing resources are used to produce goods and services). On the other hand, it is assumed that a reallocation of the resources used in suppressing drugs would not affect the level of social benefits. According to these two hypotheses, all the consequences of drug consumption are considered as a "social cost" and therefore a source of a loss of collective well-being.

This reasoning rests on the idea of "opportunity cost," describing the possibility of using resources allocated to an activity in a different and more beneficial way. We thus speak of a "counter-factual" scenario corresponding to an alternative state of affairs.

The COI methodology has been formalized as guidelines in accordance with the work of the U.S. Public Health Service (P.H.S.) task force under the supervision of Dorothy Rice (Rice and al, 1986; Hodgson & Meiners, 1979). It has been the subject of numerous theoretical refinements (Single and al, 1995) and discussions (see among others the comments of Harwood and al, Reuter, Kopp, Kleiman, Cohen in the May 1999 issue of Addiction).

1.1 - QUESTIONS OF METHODOLOGY

Several points regarding the COI methodology merit elaboration: the nature of the consumption said to generate costs, the nature of the costs being considered, and the estimation of productivity losses.

In this study, we allocate to the per se consumption of the product all the costs imposed on society without distinguishing whether the consumption is considered "normal" or "abusive".

Our study is limited to "tangible costs" measuring monetary losses (loss of earnings, for example) and excludes from its scope the "intangible costs" corresponding to a monetary value of subjective damage (pain and suffering, for example).

The social cost, as measured in a study (COI), covers all the tangible costs borne by society, that is, by private agents (leading to private costs) and public authorities (public costs), and induced by consumption (and trafficking in the case of illicit substances), but not including the purchasing cost of the substances.

Besides the costs directly borne by the consumers of substances (consumption expenses, drop in salary linked for example to premature deaths, some non-reimbursed medical charges, etc.), the private costs comprise the indirect or private external costs borne by private agents' non-users of substances (individuals and organizations). The costs imposed by substance consumers on other non-user private agents (for example companies bearing costs linked to a loss of production due to of the absenteeism of the substance consumers hospitalized because of the consumption itself of alcohol, tobacco or illicit drugs) are recorded in this second category, as well as the expenses directly incurred by private agents (mainly by the associations).

The public costs comprise three kinds of expenses linked to the consumption and the trafficking of drugs by private agents. The first category of expenses concerns the government expenditure in the meaning of the national accounting, i.e. the expenditure taken into account in the State budget. In this field we find all the expenses incurred by the various departments. The second category of expenses represents the entire expenses borne by local administration (regions, departments, towns). The third category is constituted by the social transfers, mainly by those incurred in the field of health. Those transfers are here recorded in the public costs, which the French national accounting, neither than that of most European countries, does not do as those costs are financed by the entire community including the households or the companies corresponding to private agents. Nevertheless, to further the comparability of the different studies on an international level, we will rather follow the American and the British practice, recording the entire social costs in the public expenditure.

We use the cost classification of the Public Health Service Task Force on Cost-of-Illness (Hodgson & Meiners, 1979) rather than the slightly different classification used in the report of the National Institute on Drug Abuse (N.I.D.A., 1998). The social costs may be direct, i.e., corresponding to expenses borne in the actual fight against the negative effects of drugs, or indirect, i.e. describing the value of goods and services not produced because of the drugs.

In the context of alcohol, tobacco and illicit drugs' consumption, the neoclassical economics approach considers that the social costs are the result of pure externalities. In other words, the prices, around which the individual decisions of consumption are made, do not internalize all the external negative consequences induced by these activities. The value of the consumption (as it is reflected by the market price) is lower than the costs imposed on the third parties. Those external costs reflect the loss in comfort. The economical theory describes as «externality», in a «strict sense», the damage caused by an agent (or by a group of agents) to an other agent (or to an other group of agents).

The strict application of the neoclassical economical approach would exclude from the calculation of the total social cost the cost of medical care and the cost induced by the morbidity and the mortality of the substance consumers, as these costs would be implicitly compensated by the benefits of the consumption. On the contrary, the C.O.I. methodology considers that the consumers are the first victims of the consequences of the drug consumption. From this, there is a larger acceptance according to which the «externalities» in a «broad sense» comprise not only the damage caused by the drug consumers to the community but also the damage that they cause to themselves.

The C.O.I. approach wanders also from a strict application of the economical theory as it only considers the expenses incurred by the entire private and public agents without recording at any time the «income» or «benefit» aspect linked to the consumption of these substances. According a standard cost-benefit analysis, a rational individual decision of using drugs intervenes when the benefits drawn by an individual exceed the private costs. Then, an approach based on the «social cost» concept appears to be thoroughly different from the «costs-benefits» method, usually used in public economy. This latter method recommends to choose, between two projects likely to be realized, the project that creates the most important net earnings, i.e. the most important positive difference between income and costs.

For these reasons, we have chosen the method of Single and al. (1998), who recommend following Collins & Laspley (1996) in calculating, in the scope of COI studies, only the “gross” social costs. Thus the “net” costs, which would take into account possible positive side effects that could be generated, for instance, when the moderate consumption of alcohol could reduce the incidence of heart disease, are not calculated.

Moreover, this is a “prevalence-based” study, meaning that it estimates the cost of the problems appearing during a given year, in this case 1997.

The losses of income and productivity due to premature death are estimated according to the "human capital" method using the present value of future income. This approach, the most frequently used, differs from the "willingness to pay" approach (Hodgson & Meiners, 1982) that calculates the value of human life according to the amount of money that an individual is prepared to spend to modify his or her life expectancy. As a rule, the results obtained with the "human capital" method are lower than those obtained with the "willingness to pay" approach.

The human capital method requires the calculation of the present value of future income lost as a result of premature death due to drug consumption. The results shown below are calculated using a discount rate of 6%.

1.2 - THE IMPUTATION OF MORBIDITY AND MORTALITY TO DRUG CONSUMPTION.

The first step in calculating costs is to estimate the number of deaths and hospitalizations attributable to alcohol, tobacco and illicit drugs. A list of the causes of mortality and morbidity linked to drugs has been drawn up from the sources listed below. For tobacco and alcohol, we have calculated the proportion of risk attributable to these factors. For those conditions where consumption is a contributory cause (etiological fraction > 0 but < 1), the etiological fraction is determined by one of the following two methods. In the first, a death or a hospitalization is directly recorded by the administration as linked to the consumption of a drug. The second method, indirect, combines estimations of relative risks of particular pathologies with the substance use (for various levels of use) and with prevalence data on the number of persons consuming at various levels in order to deduce the proportion of cases that can be attributed to the use of alcohol, tobacco and illicit drugs using the following formula (English and al., 1995):

$$\text{Etiological Fraction} = \frac{P_0 + P_1(RR_1) - 1}{P_0 + P_1(RR_1)}$$

where P_0 and P_1 are the prevalence rates of non-consumers and consumers, respectively, and where RR_1 is the relative risk for the consumers in comparison with the non-consumers.

In the present study, the data concerning mortality, morbidity and relative risk are taken from existing epidemiological studies[1].

For tobacco, the data on consumption come from Anguis & Dubeaux (1997), and the data on morbidity come from the data calculated for France by Hill (Hill, 1996). These figures are compared with those of the US Department of Health and Human Services U.S.D.H.H.S. (1982 and 1989). The figures on mortality come from the Institut National de la Santé et de la Recherche Médicale (Inserm, 1998)[2]. For alcohol, the data on morbidity and mortality are taken from the French study of Pignon & Hill (1991), from the works of the Inserm (1998) and the Observatoire National Interministériel de Sécurité Routière (0.N.I.S.R., 1997)[3] and from the report of the Office Français des Drogues et des Toxicomanies (O.F.D.T., 1999)[4]. Concerning illicit drugs, the sources are the Inserm (1998) and the report of the O.F.D.T. (1999).

The data on costs come from national accounting, from the data collected by specialized agencies (S.E.S.I.: Service des Statistiques, des Etudes et des Systèmes d'Informations[5]; D.R.E.E.S.: Direction de la Recherche des Etudes, de l'Evaluation et des Statistiques[6];

[1] For epidemiological data, see annex.
[2] Inserm: French National Institute for Health and Medical Research.
[3] Observatoire National Interministériel de Sécurité Routière : French National and Interministerial Institute for Road Safety.
[4] O.F.D.T.: French Agency on Drugs and Drug-Addictions.
[5] S.E.S.I. : Statistics, Studies and Information Systems Service.
[6] D.R.E.E.S.: Directorate of Research, Studies, Evaluation and Statistics.

P.M.S.I.: Programme de Médicalisation des Systèmes d'Information[7]) and from specific studies (Kopp & Palle, 1996). The calculation of public expenditure for the fight against illicit drugs follows the principle that the only expenses taken into consideration for prevention are those explicitly dedicated to the fight against illicit substances and not those aimed at a more general prevention, even though these actions support the fight against illicit substances (Kopp, 1999). 5

Table 1 - Mortality and Morbidity in France, 1997

	Attributable premature deaths (1)			Years of life lost			Number of hospitalizations			Total number of days at the hospital		
	M	F	Total	M	F	Total	M	F	Total	M	F	Total
Alcohol	35,446	8,517	43,963	591,866	150,232	742,098	297,266	86,115	383,381	2,824,027	818,093	3,642,120
Tobacco	39,131	2,646	41,777	454,526	27,078	481,604	509,857	259,620	769,477	4,741,670	2,388,504	7,130,174
Illicit Drugs	not av.[2]	not av.	547	not av.	not av.	not av.	not av.	not av.	not av.	not av.	not av.	not av.
Total			86,287			1,223,702	807,123	345,735	1,152,858	7,565,697	3,206,597	10,772,294

(1) Premature deaths compared to life expectancy. For illicit drugs, only deaths due to overdose and HIV are taken into consideration; (2) not available.

Alcohol:

In the French population (58.7 million in 1997), the Office Français des Drogues et des Toxicomanies (O.F.D.T.)[8] estimates that 14% of males (3.6 million) and 3% of females (817,000) are alcohol-addicted, that is, 4.4 million persons. The study shows that 43,963 people lost their lives in France in 1997 because of their own alcohol consumption (35,446 males and 8,517 females). This figure includes deaths due to the various pathologies linked to alcohol (35,888); to suicides (4,130); to accidents (3,712), road fatalities in particular (2,716); and to homicides (233). The number of years of life lost totals 742,098. Not considering comorbidity, the 43,963 deaths represent 8.3% of the annual mortality in France in 1997. Moreover, alcohol consumption led to 383,381 hospitalizations, that is, 3,642,120 days spent at the hospital.

Some data are missing or merit discussion. Gaudin-Colombel (1997) indicates that some pathologies (fibrosis, arterial hypertension, optic neuritis, psoriasis, etc.) for which alcohol could be a risk factor are not taken into account by Pignon & Hill (1991). Lacking a coefficient of risk attribution and an ICD-9 code, these pathologies are not recorded by the D.R.E.E.S., the P.M.S.I. or the Inserm[9]. Murders and acts of violence committed under the influence of alcohol are very likely underestimated because they are not the subject of systematic statistical monitoring. Domestic violence and sexual violence in particular are under-reported.

Tobacco:

We count 13.5 million regular smokers (1 cigarette or more per day), that is, 23.13% of the overall population. Of these 13.5 million regular smokers, 8 million are male and 5.5 million are female; 12.3 million are age 18 and older and 1.2 million are between 12 and 18 years old. This latter category is equally divided between males and females (Anguis & Dubeaux, 1997).

Concerning tobacco, all the attributable risks are taken from Hill (1996). The number of deaths caused by tobacco in France in 1997 is estimated at 41,777 (39,131 males and 2,646 females), that is, 7.89% of overall mortality. Three main pathologies caused 63.95% of the deaths attributable to tobacco: tracheal, bronchial, and lung cancers (37.67%), ischemic cardiopathy (19.14%), and mouth and pharynx cancers (6.16%), resulting in a loss of 481,604 years of life. In addition, 769,477 hospitalizations, or 7,130,174 days spent at the hospital due to tobacco, were recorded in France for 1997.

Illicit drugs:

[7] P.M.S.I.: Program for the Medicalization of Information Systems.
[8] See footnote (4).
[9] See footnotes (6), (7) and (2).

An estimated 547 people died from illicit drug use in France in 1997 (228 from overdoses and 259 of AIDS), that is, 0.10% of the overall mortality (O.F.D.T, 1997). We do not have at our disposal data concerning type-C hepatitis. The average age of the victims is lower than in the case of tobacco and alcohol.
In total, we recorded 86,287 deaths attributable to drugs (alcohol, tobacco and illicit drugs) in France in 1997, i.e. 16.29% of overall mortality. The total number of potential years of life lost because of drugs amounts to 1,223,702 (alcohol and tobacco) and the number of hospitalizations reaches 1,152,858 (alcohol and tobacco), that is to say 10,772,294 days spent in a hospital because of drugs (alcohol and tobacco).

1.3 - CALCULATION OF ASSOCIATED COSTS.

The details of the sources and calculation methods of the costs associated with mortality, morbidity and other problems linked to drugs are presented below.
We take the following costs into account:

(a) The direct costs of health care include hospital treatment (general and psychiatric), ambulance services, residential care, medical care provided by specialized agencies, ambulatory care, and medications. These are costs of care regardless of whether some of the costs are reimbursed by social security.
(b) The direct costs of prevention and research include private and public expenditures dedicated to prevention. These involve mainly public expenditures directly allocated, subsidies granted for selective actions, and the financing of public servants working in this field.
(c) The direct costs of suppression include the public expenditures of specialized enforcement agencies, a representative share of the action by public authorities (police, gendarmerie, customs, justice, etc.) working in this field.
(d) The direct costs of uncollected compulsory taxes reflect the decline in tax revenues as individuals die, are imprisoned or are hospitalized.
(e) The other attributable costs describe public firefighting measures and expenditures by insurance companies indemnifying the victims of road accidents.
(f) The indirect costs of losses of household income and production losses of companies are explained by the lost productivity resulting from illnesses linked to drug consumption (e.g. absenteeism), from premature deaths and from crimes and criminal careers, when we have data on this last point.

(a) The direct costs of health care: the costs of hospital treatment are obtained by multiplying the number of hospitalizations attributable to drugs by the unit cost of hospitalization. This cost includes ambulatory and inpatient medical care. The costs linked to comorbidity are not included for lack of specific studies on this particular point. The data are taken from the D.R.E.E.S. study (1996)[10], corrected by the data of Rosa (1994, 1996) to take into account short-term hospitalizations. The pathologies are classified according to the international nomenclature ICD-9. Regarding illicit drugs, the data concerning AIDS come from a previous study (Kopp and al., 2000). There are no data for type-C hepatitis.

(b) The direct costs of prevention and research: the campaigns against tobacco conducted by the Comité Français d'Education et de Santé (C.F.E.S.)[11] and by the Centre National Contre le Tabac (C.N.C.T.)[12] are funded by the Caisse Nationale D'Assurance Maladie (C.N.A.M.)[13] and in part by the government. The action plan for combating alcoholism is monitored by the Ministry of Health, with funding from the national budget. In addition, there are the actions of private organizations, such as the association of former alcohol-addicted individuals or the actions of alcohol producers. The allocation of private and public funds is uncertain as most of these entities are subsidized by the government.

[10] See footnote (6).
[11] C.F.E.S.: French Committee on Education and Health.
[12] C.N.C.T.: National Center Against Tobacco.
[13] C.N.A.M.: National Office for Health Insurance.

Regarding illicit drugs, we find the same situation. The main portion of the funds devoted to prevention comes from the government and from private institutions largely subsidized by the government. According to Kopp & Palle (1996) there are approximately 50 people (equivalent to full time) carrying out research on illicit drugs.

(c) The direct costs of suppression: the largest share of the direct costs of suppression is aimed at the fight against illegal substances. We consider a) expenditures by the specialized agencies in engaged in combating narcotics (Office Central de Répression du Trafic International de Stupéfiants (O.C.R.T.I.S.)[14]; b) the share of the activities of non-specialized agencies charged with enforcing the law (police, gendarmerie, customs, penitentiary administration, etc.). We use the number of offenses against the Law on Narcotics (O.L.N.) as a criterion for apportionment. The data are taken from the previous study by Kopp & Palle (1996). This approach does not take into account the fact that a large number of people are questioned, judged, sentenced and imprisoned initially for reasons other than the O.L.N., even if the use of an illicit drug could be implicated in the perpetration of the offense. The same is true for alcohol: a consensus prevails that crimes, offenses and violence linked to alcohol are underestimated (Got and Weill, 1997, O.F.D.T., 1999)[15]. Both the gendarmerie and the national police dedicate resources to monitoring blood alcohol levels. The data used in the calculation of the costs come from the Observatoire National Interministériel de la Sécurité Routière (O.N.I.S.R., 1997)[16]. There is no available information on violence linked to alcohol consumption. The cost borne by the penal administration for the 6,566 prisoners, imprisoned for 18,611.7 months (i.e., an average of 2.8 months per prisoner), is estimated according to the data given by Kopp & Palle (1996). We do not have at our disposal data on activity aimed at curbing alcohol and cigarette smuggling.

(d) The direct costs of uncollected compulsory taxes: taxes collected from individuals who die prematurely, are hospitalized or imprisoned because of drugs are lower than they would have been without the occurrence of such events. We use a discount rate of 6%. The calculations are based on Gross Available Income, dividing the population into age groups. For tobacco and alcohol, we retain the data of Rosa (1994, 1996) regarding the average duration of hospitalization. For the three categories of drugs, we take into account the loss of earnings due to hospitalization (3 days lost and 25% not covered for each additional day of hospitalization).

(e) Other attributable costs: we include in this category public expenditures devoted to fighting fires attributable to tobacco use. The firefighting budget is the only one that can be considered as a direct cost. Thus the cost of forest replacement is not taken into account. The only data available for this point are fragmentary and come from Rosa (1994, 1996), who indicates that 1.67% of forest fires are caused by smokers. The data concerning compensation for road accidents are taken from the O.N.I.S.R. (1997). The injury caused to others, even if the driver is under the influence of alcohol, is covered by the insurance guarantee of third party liability. On the other hand, if it turns out that the driver is inebriated, the material damage caused to the vehicle of the responsible party will not be covered. Consequently, we can assume that road accidents involving drivers under the influence of alcohol are highly underestimated.

(f) The indirect costs of income and productivity losses: The value of lost productivity resulting from premature death is estimated by the product of the number of deaths associated with the use of a substance and the present value of future income. The present value of future income takes into account the age and gender and is calculated according the cause of death using the following formula:

[14] O.C.R.T.I.S.: Central Office of Suppression of International Narcotics' Trafficking.
[15] See footnote (4).
[16] See footnote (3).

$$FDI_i = n_i^1 \left[\frac{\left(t_i^1 xR\right)}{(1+r)^{t_i^1}} \right] + n_i^2 \left[\frac{\left(t_i^2 xR\right)}{(1+r)^{t_i^2}} \right]$$

- each pathology identified as a medical cause of death is marked by the index *i* (with *i* = 1, ..., *n*).
- males are identified by the exponent 1 and females by the exponent 2.
- n_i^1 corresponds to the number of males who died of the medical cause *i* and n_i^2 corresponds to the number of females who died of the same medical cause *i*.
- t_i^1 represents the difference between the life expectancy of males and the average age at the death of males due to the medical cause *i* and t_i^2 represents the difference between the life expectancy of females and the average age at the death of females due to the medical cause *i*.
- *r* is the discount rate (6%).
- *R* is the same average income for both males and females.
- FDI_i describes the Flow of Discounted Income lost by males and females prematurely deceased owing to the medical cause *i*.

Company productivity losses due to the hospitalization of drug users are equivalent to the loss of added value not realized by the company during the hospital stay minus the loss of primary income. Low productivity attributable to tobacco, alcohol and illicit drugs is estimated from the index of hourly productivity calculated by the Institut National de la Statistique et des Etudes Economiques (I.N.S.E.E., 1998)[17]. Data related to the duration of hospital stays come from the D.R.E.E.S.[18] and from Rosa (1994, 1996). Lost productivity due to imprisonment following offenses linked to alcohol (or to illicit drugs) takes into account only offenses related to driving under the influence of alcohol (or the Offenses against the Law on Narcotics, O.L.N.). We do not have data concerning other implications of consumption of alcohol (or of illicit drugs) as a factor in the reasons for imprisonment. Moreover, in order to calculate company productivity losses, the retirement age replaces life expectancy.

It is impossible to take into account the social occupational category of the individuals who die or are hospitalized because of the use of various drugs. In the absence of data, the calculation estimates the value of the life of an individual independent of income level.

2 - RESULTS

2.1 - THE COSTS LINKED TO DRUG USE

Table 2 gives a view of the estimated overall costs of tobacco, alcohol and illicit drugs in French francs (FF). The total social cost is estimated at 218 billion francs, that is, for a population of 58.7 million inhabitants, expenditure per capita of 3,714 FF, or approximately 2.7% of GDP.

Alcohol is the drug that imposes the highest cost in France, 115,420.91 million francs (1.42 % of GDP), or expenditure per capita of 1,966 FF in 1997. Alcohol represents more than the half of the social cost of drugs to society. The largest share of the social cost of alcohol results from lost productivity (49.8%, or 57,555.66 million FF), due to premature death (53,168.60 million FF), morbidity (3,884.0 million FF) and imprisonment (503.06 million FF). Expenditures by insurance companies for compensation after accidents occupy second place (20%) at 23,120 million FF. Health care expenditures occupy third place (16%), with 18,421.76 million FF divided among hospitalizations requiring surgery (8,805.40 million FF), general medicine (8,232.90 million FF) and hospitalizations without surgery (1,383.80 million FF). In fourth place are uncollected compulsory taxes (10.6%; 12,280.53 million FF), consisting of taxes that the government could not collect because of the death,

[17] I.N.S.E.E.: French National Institute of Economic and Statistical Information.
[18] See footnote (6).

hospitalization or imprisonment of consumers of alcohol. Expenditures for prevention (3.18%) amount to 3,675.60 million FF, while the cost of enforcing the law represents only 0.32% of the social cost of alcohol, 367.36 million FF.

Tobacco leads to a social cost of 89,256.90 million FF, that is, expenditure per capita of 1,520.56 FF or 1.1% of GDP. Productivity losses of 50,446.70 million FF represent 56% of the overall social cost of tobacco: 42,765.80 million FF owing to premature death and 7,680.90 million FF linked to morbidity. Since there are no accidents as in the case of alcohol, health care costs occupy second place (30.2%), with 26,973.70 million FF divided among hospitalizations requiring surgery (17,373.7 million FF), general medicine (6,857.7 million FF) and hospitalizations without surgery (2,742.6 million FF). After that come uncollected compulsory taxes (13.23%, or 11,806.30 million FF). The other costs are not significant (< 0.01%): 18.5 million FF for prevention and research and 11.7 million FF for fighting forest fires.

Table 2 - Social costs of drugs in France in 1997 (in million FF)

	Rank	Alcohol	Rank	Tobacco	Rank	Illicit drugs	Rank	Total
1. Direct costs of health care	3	18,421.76	2	26,973.70	3	1,524.51	2	46,919.97
1.1. - hospitalization with surgery		8,805.40		17,373.40		*		26,178.80
1.2. - hospitalization without surgery		1,383.80		2,742.60		924.51		5,050.91
1.3. - general medicine		8,232.56		6,857.70		600.00		15,690.26
2. Direct costs for prevention and research	5	3,675.60	4	18.50	4	948.88	5	4,642.98
2.1. - public agencies and C.N.A.M.** total		3,669.90		18.50		948.88		4,637.28
2.1.1. - campaigns of the C.F.E.S.**		*		16.80		*		16.80
2.1.2. - C.N.C.T.**		*		1.70		*		1.70
2.1.3. - prevention campaign of the C.N.A.M.**		22.00		*		*		22.00
2.1.4. - financing of the ANPA** by the C.N.A.M.**		7.00		*		*		7.00
2.1.5. - C.N.A.M.** compensation for industrial injuries		3,401.34				*		3,401.34
2.1.5. - ministry of employment and solidarity		218		*		*		239.56
2.1.6. - social affairs, health, local administration		*		*		798.75		798.75
2.1.7. - M.I.L.D.T.**		*		*		45.36		45.36
2.1.8. - education		*		*		56.01		56.01
2.1.9. - youth and sports		*		*		17.08		30.87
2.1.10. - contribution to the E.U.** budget		*		*		30.87		30.87
2.1.11. - work, employment and professional training		*		*		0.81		0.81
2.2. - private agencies		27.26		not av.		not av.		5.70
3. Direct costs of implementing the law	6	367.36		*	2	3,911.46	6	4,278.82
3.1. - public agencies (gendarmerie, police, justice, cooperation, foreign affairs, P.N.U.C.I.D.**)		331.14		*		3,906.20		4,237.34
3.2. - public agencies, fight against cigarette-trafficking		*		not av.		*		*
3.3. - fines of private agents		36.22		*		5.26		41.48
4. Direct costs of the losses in compulsory taxes	4	12,280.53	3	11,806.30	5	866.24	3	24,953.07
4.1. - premature deaths		11,977.09		11,348.30		100.25		23,425.64
4.2. - hospitalization		230.00		458.00		not av.		688.00
4.3. - imprisonments for offenses against the highway code and the O.L.N.**		73.44		*		765.99		839.43
5. Other direct attributable costs	2	23,120.00	5	11.70		*	4	23,131.70
5.1. - public expenditure for firefighting		*		11.70		*		11.70
5.2. - road accidents (insurance companies expenditures)		23,120.00		*		*		23,120.00
6. Indirect costs of the losses of income and productivity	1	57,555.66	1	50,446.70	1	6,099.19	1	114,101.55
6.1. - losses of income for private agents		25,159.96		24,188.20		1,774.73		51,122.89
6.1.1. - premature deaths		24,538.20		23,250.00		205.39		47,993.59
6.1.2. - hospitalizations		471.30		938.20		not av.		1,409.50
6.1.3. - imprisonments for offenses against the highway code and the O.L.N.**		150.46		*		1,569.34		1,719.80
6.2. - company losses in production		32,043.10		26,258.50		4,324.46		62,626.06
6.2.1. - premature deaths		28,630.40		19,515.80		646.88		48,793.08
6.2.2. - hospitalizations		3,412.70		6,742.70		not av.		10,155.40
6.2.3. - imprisonments for offenses against the highway code and the O.L.N.**		352.60		*		3,677.58		4,030.18
TOTAL	1	115,420.91	2	89,256.90	3	13,350.28		218,028.09

*Notes: not av. = not available ; * = not relevant ; ** = see list of abbreviations*

Illicit drugs generate a social cost of 13,350.28 million FF, expenditure per capita of 227.43 FF or 0.16% of the GDP. Productivity losses represent 45.69% of the social cost of illicit drugs. They amount to 6,099.19 million FF, of which 5,246.92 million FF is linked to O.L.N. imprisonment and 852.27 million FF to premature death. Because these substances are illegal, the cost of implementing the law occupies second place (29.3%) at 3,911.46 million FF. Next come health care costs (11.42%), i.e. 1,524.51 million FF divided between hospitalizations without surgery (924.51 million FF) and general medicine (600 million FF). In fourth place, (7.11%) are the costs for prevention and research (948.88 million FF) and, finally, the losses from uncollected compulsory taxes (6.49%; 866.24 million FF).

Table 3 shows the distribution of the overall social cost of drugs by category (health care, prevention and research, application of the law, uncollected compulsory taxes, losses of income and production).

We will pay special attention to the first three lines of Table 3, which describe the costs generated by the implementation of actions (private or public) targeted at an objective. Regarding costs for all drugs combined, health care occupies first place, followed by prevention and research, and, finally, law enforcement. A comparison of illicit drugs to licit ones (alcohol and tobacco) reveals that the cost of enforcing the laws governing illicit drugs (29.3%) exceeds the amount spent for health care (11.4%) and for prevention and research (7.1%). Comparing alcohol to tobacco, we find that the cost of health care for tobacco-related illnesses exceeds the cost generated by alcohol. This is probably due to the younger age of the patients and to the longer duration of their illnesses. Particularly noteworthy is the extremely meager amount of money devoted to enforcing the laws on alcohol (367 million FF) compared to that dedicated to the fight against illicit drugs (3.9 billion FF). The share of the social cost of alcohol generated by implementation of the law is very low (0.32%), even though a significant proportion of the deaths are provoked by transgression of the law (3,945 deaths out of 43,963, or 9%). Moreover, our calculations do not take into account the crimes and offenses committed under the influence of alcohol. The relatively higher sums spent for prevention and research for alcohol-related problems compared to those spent for tobacco (3.6 billion compared to 15.5 million FF), even though the number of attributable deaths is nearly identical, should be underlined. The difference is probably a result of the fact that the problems generated by alcohol have been known for a longer time than those generated by tobacco.

Table 3 - % of the social costs of drugs divided by the type of actions in France in 1997 (in million FF)

	Alcohol	Tobacco	Illicit drugs	Total
1. Direct costs of health care	18,421.76 (15.96%)	26,973.70 (30.2%)	1,524.51 (11.42%)	46,919.97 (21.52%)
2. Direct costs of prevention and research	3,675.60 (3.18%)	18.50 (0.02%)	948.88 (7.11%)	4,642.98 (2.13%)
3. Direct costs of enforcing the law	367.36 (0.32%)	*	3,911.46 (29.30%)	4,278.82 (1.96%)
4. Direct costs of losses of uncollected compulsory taxes	12,280.53 (10.64%)	11,806.30 (13.23%)	866.24 (6.49%)	24,953.07 (11.44%)
5. Other direct attributable costs	23,120.00 (20.03%)	11.70 (0.01%)	*	23,131.70 (10.61%)
6. Indirect costs of the losses of income and production	57,555.66 (49.8%)	50,446.70 (56.52%)	6,099.19 (45.69%)	114,101.55 (52.33%)
Social cost (1+2+3+4+5+6)	115,420.91	89,256.90	13,350.28	218,028.09
Expenditure per capita	1,966.28	1,520.56	227.43	3,714.28
Social cost as % of GDP	(1.42%)	(1.10%)	(0.16%)	(2.68%)

2.2 - DISCUSSION

Comparisons with previous studies:

Our methodology is particularly close to that of Single and al. (1998), as the two studies follow a COI approach, do not take into account intangible costs and deal with the same substances. Concerning the percentages of GDP, the results of these two studies are identical: 2.7% of the GDP. The coincidence between these two results should not be over-interpreted.

Table 4 - Social costs of drugs (in % of GDP)
(studies published in the 1990's)

Study	Country	Studied year	Alcohol	Tobacco	Illicit drugs	Total costs in % of GDP[1]
Single and al. (1998)	Canada	1992	1.1%	1.4%	0.2%	2.7%
Rice and al. (1990)	USA	1980	1.7%	1.4%	1.1%	4.2%
N.I.D.A. (1998)	USA	1992	2.0%	-	1.0%	-
Collins and Laspley (1996)	Australia	1992	1.0%	2.4%	0.4%	3.8%
Fazey and Stevenson (1990)	UK	1988	-	-	0.4%	-
Institut Suisse (1990)	Switzerland	1988	-	-	0.2%	-

Jeanrenaud and al. (1998)[2]	Switzerland	1995	-	2.7% (1.3%)	-	-
Rosa (1996)	France	1995	-	0.26%	-	-
This study (2000)	France	1997	1.4%	1.1%	0.16%	2.7%

1. The total cost includes all the direct and the indirect costs, as specified by the author of the study, unless otherwise indicated.
2. The Swiss Institute (1990) included all the intangible costs. The percentage without intangible costs is in parentheses.

These results by substance require comment. As far as alcohol is concerned, the social cost in France exceeds the cost of tobacco. Such a ranking, however, is obtained without taking into account the crimes and offenses committed under the influence of alcohol (except for offenses against the highway code). Only the N.I.D.A. study takes totally these costs into consideration while Single and al. (1998) include only partial results. That study, dealing with the U.S. case, is the only one reporting a social cost of alcohol expressed as a percentage of GDP that is higher than that in France. In all the other cases, when crimes and offenses are not included in the calculation, France occupies first place.

For tobacco, our result is close to that of the other studies. The difference of the higher percentages found by Jeanrenaud and al. (1998) or Collins & Laspley (1996) results from the fact that they take into account (entirely in the first case and partly in the second) the intangible costs. Once the intangible costs are subtracted from the social cost of tobacco calculated by Jeanrenaud and al. (1998), the social cost of tobacco as a percentage of GDP in Switzerland and in France appears to be close (1.3% and 1.1%).

As far as illicit drugs are concerned, our result is similar to that of the other studies in terms of percentage of GDP (0.16%), with the two exceptions involving the United States, those of Rice and al. (1990) and N.I.D.A. (1998). This can probably be explained by the higher prevalence of illicit drugs in the United States.

The only study dealing with the calculation of social cost in France (Rosa 1996) concerns tobacco. The social cost of tobacco calculated by Rosa is substantially lower than the cost calculated in this study. It amounts to 21,133.5 million FF in that study, a difference of 68,123.1 million FF compared to our study. Expressed in percentage of GDP, the social cost of tobacco calculated by Rosa represents 0.26% of GDP, compared to 1.1% in the present study. The difference lies in the fact that Rosa underestimates the production losses due to premature deaths. He calculates the deaths due to tobacco on the basis of the average age of smokers whose deaths are attributable to tobacco. As this average age is 6 years lower than the average life expectancy, the average age of death of the smokers is higher than retirement age. Consequently, in the Rosa report, production losses attributable to premature deaths are equal to zero, whereas in our opinion the losses amount to 26,258.5 million FF.

2.3 - WHO BEARS THE COSTS?

The social cost imposed by drugs on society is divided among the various types of social actors. We retain the classical division of society used in the national accounting: households, government, private institutions (i.e., associations) and companies. Table 5 shows the primary distribution among those groups of the social costs of the different categories of drugs. These different costs are then transferred to other groups by means of transfers: health care costs for drug consumers are borne by the social security system and funded by society as a whole; the associations are subsidized by the government; the government collects taxes, etc.

Table 5 - Allocation of the social cost of drugs among social groups in France in 1997 (million FF)

Groups/ Substances	Household (incl. drug consumers)	Government	Associations	Companies	Total
Alcohol	**43,617.94**	**16,260.01**	**27.26**	**55,515.70**	**115,420.91**
% of the total cost of alcohol borne by a group	(38%)	(14%)	(0%)	(48%)	(100%)
Tobacco	**51,161.90**	**11,836.50**	**0.00**	**26,258.50**	**89,256.90**
% of the total cost of tobacco borne by a group	(57%)	(13%)	(0%)	(29%)	(100%)
Illicit drugs	**3,304.50**	**5,721.32**	**0.00**	**4,324.46**	**13,350.28**
% of the total cost of illicit drugs borne by a group	(25%)	(43%)	(0%)	(32%)	(100%)
Total	**98,084.34**	**33,817.83**	**27.26**	**86,098.66**	**218,028.09**
% of the total cost of drugs borne by a group	(45%)	(15.5%)	(0%)	(39.5%)	(100%)

Households bear the largest share (45%) of the overall social cost, followed by companies (39.5%) and the government (15.5%). The burden imposed by tobacco on smokers is of particular significance and is greater than that imposed by alcohol on drinkers (57% vs. 38%), even though the cost of hospitalizations linked to tobacco (with or without surgery) is twice the cost linked to alcohol. This could be explained by several factors which require further checking: a) it may be that there is no level of tobacco consumption without risk, while here could be a level (very low) of alcohol consumption without risk; b) it may be that people with tobacco-related illnesses use the health care system more easily than those with alcohol-related illnesses; c) the health care costs of tobacco-related pathologies may be higher than those of alcohol-related ones because the beginning of health care occurs at a younger age; d) tobacco-related pathologies generally require longer health care than the alcohol-related ones; e) hospitalizations linked to car accidents are often short as they are followed either by death or by a quick recovery.

The government's share of the overall social cost occupies first place only for illicit substances because of the high costs generated by enforcing the law. The greater share of the social cost of alcohol borne by the associations is explained, on one hand, by the importance of the associations of former drinkers and, on the other hand, by the action of the alcohol industry lobby. These two phenomena are less important for tobacco: there is little proselytizing by former smokers and less activity from the lobby because the government, up to 1998, occupied a central position in the production and marketing of tobacco in France. Companies bear the greatest share of the costs generated by alcohol (48%). This is not the case for tobacco, in which companies (29%) follow the Households (57%) in precedence. This is explained by the magnitude of the production losses for the companies resulting from the higher mortality rate (46%) for alcohol compared to tobacco. In contrast, the cost to companies of morbidity linked to tobacco is almost twice that for alcohol.

The losses of income for Households are not quite as high as for companies. For the same reasons, the cost of mortality linked to alcohol exceeds the cost linked to tobacco, whereas regarding morbidity, the cost of tobacco is higher than that of alcohol.

2.4 - SENSITIVITY ANALYSES OF AND COMPARISON WITH EXISTING STUDIES

We have conducted sensitivity studies to determine the extent to which the results are influenced by the choices made during the calculation of the various components of cost. We list below the choices made for the calculation and then we gather the results of the alternative calculations, which give a different result. In the two cases for which we have data allowing us to calculate an alternative scenario, alcohol and tobacco, we arrive at a lower result than that found in the study (15% lower for alcohol and 27% lower for tobacco).

Alcohol

- ☞ Ministry of Justice: Instead of calculating the time spent in prison during a year by the people imprisoned for offenses related to alcohol, and instead of comparing this figure to the overall annual time spent in prison by the total prison population, we calculate a "stock" of individuals imprisoned (at a given moment) for alcohol-related offenses compared to the overall annual prison population.
- ☞ Industrial injuries: Instead of keeping an estimate of 20% of industrial injuries caused by alcohol, we test a hypothesis of 10%.
- ☞ Insurance companies: The new calculation relies on the exploitation of a divergence in data concerning the sharing between reimbursements paid by the insurance companies for material loss and those for bodily injury.
- ☞ Losses of income, production and compulsory taxes: Differences exist here as to the number of days to be used as indicator of the duration of the hospitalizations (morbidity), the method for estimating the number of years lost in case of death (average age of the individuals at death or average quintile of age) and finally, the method of estimation used for the imprisonments (see above: comment on the Ministry of Justice).

Tobacco

- ☞ Health care expenditure: It is possible to calculate an alternative scenario if we modify the attribution coefficients of the pathology risk of a drug. The only French study (Hill, 1996) repeats the U.S. results of the U.S. D.H.H.S. Nevertheless, as women have begun to smoke more recently in France than in the United States, Hill divided by two the relative risks for non-cancerous diseases and by four those for cerebrovascular diseases and ischemic cardiopathies from age 65. Following these procedures, we obtain lower health care expenditure.
- ☞ Loss of income, production and compulsory taxes: The use of the Hill coefficients (1996) leads to a lower result. Moreover, we also take into account the fact that differences exist concerning the number of days that may be used as an indicator of the duration of hospitalization (morbidity) and on the method for evaluating the number of years lost in case of death (average age of the individuals at death or average quintile of age).

Table 6 - Social cost: low, medium and high hypotheses, France, 1997 (in million FF)

		Alcohol	Tobacco	Illicit drugs	Total
1. Direct costs of health care	(Low)	*	14,482.40	*	
	(Medium)	18,421.76	19,505.70	1,524.51	46,919.97
	(High)	*	26,973.70	*	
2. Direct costs of prevention and research		*	*	*	
		1,974.93	18.50	948.88	4,642.98
		3 675,60	*	*	
3. Direct costs of the implementation of the law	(Low)	*	*	*	
	(Medium)	331.86	*	3,911.46	4,278.82
	(High)	367.36	*	*	
4. Direct costs of the losses of compulsory taxes	(Low)	*	8,246.70	*	
		9,171.85	9,361.70	866.24	24,953.07
		12,280.53	11,806.30	*	
5. Other attributable direct costs	(Low)	*	*	*	
	(Medium)	22,066.00	11.70	*	23,131.70
	(High)	23,120.00	*	*	
6. Indirect costs of losses in income and in production	(Low)	*	35,320,10	*	
	(Medium)	45,350.97	37,255.60	6,099.19	114,101.55
		57,555.66	50,446.70	*	
Social cost	(Low)	*	58,079.40	*	
	(Medium)	97,317.37	65,153.20	13,350.28	218,028.09
	(High)	115,420.91	89,256.90	*	
Expenditure per capita	(Low)	*	989.43	*	
	(Medium)	1,657.87	1,101.00	227.43	3,714.28
		1,966.28	1,520.56	*	
Social cost in % of GDP	(Low)	*	(0.71%)	*	
	(Medium)	(1.20%)	(0.80%)	(0.16%)	(2.68%)
	(High)	(1.42%)	(1.10%)	*	

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