Eur J Health Econ (2017) 18:883–892
DOI 10.1007/s10198-016-0835-9

ORIGINAL PAPER

The social cost of drugs in France in 2010

Pierre Kopp[1] · **Marysia Ogrodnik**[2]

Received: 15 December 2015 / Accepted: 20 September 2016 / Published online: 8 October 2016

Abstract The social cost of drugs is the monetary cost of both the consequences of their trade and their consumption. In this paper, drugs considered are tobacco and alcohol, which are legal, plus those that are illegal. The social cost is the sum of the external cost: value of loss in quality of life, value of years of life lost and value of loss in productivity, plus public expenditure. Public expenditure consists of public spending on medical care, prevention, and law enforcement, minus savings from unpaid pensions and taxes levied on tobacco and alcohol. The parameters for the calculations have used the recommendations of a French governmental working group (2013) Quinet, L'évaluation socioéconomique des investissements publics [Internet], Centre d'Analyse Stratégique, 2013, http://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/archives/CGSP_Evaluation_socioeconomique_17092013.pdf, and the health data were derived from the scientific literature. The social costs are €122 billion for tobacco, €118 billion for alcohol, and €8.7 billion for illegal drugs. The largest fraction of the costs (53, 56, and 31 %, respectively) derives from the number of deaths, 79,000 for tobacco, 49,000 for alcohol, and 1600 for illegal drugs, given the high cost of a year of life lost (€115,000). The external cost corresponds to 86, 97, and 68 % of the social cost, respectively, for tobacco, alcohol, and illegal drugs. The annual drug-related net expenditure represents €13.9, €3.0, and €2.3 billion, respectively, for tobacco, alcohol, and illegal drugs. The tax revenues on tobacco and alcohol, €10.4 and €3.2 billion, represent less than half of the corresponding healthcare costs, which are €25.9 and €7.7 billion.

Keywords Social cost · Tobacco · Alcohol · Drugs

JEL Classification H00 · I18

Introduction

Social cost studies aim to provide public policymakers with a measure of the burden a social problem represents for the community. Used to compare the social cost of different drugs, this can help distribute public funds. The methodology to study the social cost of drugs has been formalized in guidelines, following the work of Collins and Laspley [2] and of the U.S. Public Health Service (PHS) Task Force, led by Dorothy Rice [3]. However, carrying out such a study in a given country depends on data availability and on national information systems and needs to take into account national recommendations in terms of economic calculations. In France, a governmental working group [1] has provided recommended values for human life, annual discount rate, and marginal cost of public funding.

The present study of the social cost of drugs in France in 2010 evaluates the overall consequences of drugs in terms

Electronic supplementary material The online version of this article (doi:10.1007/s10198-016-0835-9) contains supplementary material, which is available to authorized users.

✉ Marysia Ogrodnik
marysia.ogrodnik@univ-paris1.fr

Pierre Kopp
pierre.kopp@univ-paris1.fr

[1] The Paris School of Economics, Centre d'Economie de la Sorbonne, Panthéon-Sorbonne University (Paris I), 106-112 boulevard de l'Hôpital, 75 647 Paris Cedex 13, France

[2] Centre d'Economie de la Sorbonne, Panthéon-Sorbonne University (Paris I), 106-112 boulevard de l'Hôpital, 75 647 Paris Cedex 13, France

of monetized costs for society. The drugs considered in this study are tobacco and alcohol, which are both legal, plus those that are illegal. The trade and consumption of these drugs have negative consequences, since they lead to illnesses, loss in quality of life for the diseased individuals, premature deaths, losses in production for businesses, and public expenditure. The state has to prevent and treat those consequences. On the other hand, taxation on alcohol and tobacco and savings in pensions not paid to drug consumers prematurely dying generate revenue, and these positive consequences must also be taken into account.

The main scope of this study on the social cost of drugs is on tangible costs related to an identifiable source or asset, but some intangible costs, such as loss in quality of life, are taken into account; others, however, such as psychological suffering, have not been included in the analysis. Moreover, to avoid complexity, calculations are done under the hypothesis of full employment of resources: all available resources are used in the most efficient way, and there is only frictional unemployment.

Methods

Social cost components

The social cost of drugs is made up of two components, the external cost, and the effect on public expenditure (Table 1).

The external cost measures the opportunity cost of resources wasted due to the presence of drugs. It includes intrapersonal externalities, i.e., the costs for drug consumers, which are considered as unintentional (loss in quality of life, premature death), as well as classic externalities, i.e., costs to third parties (production losses). According to the Cost of Illness methodology used in this study, the "intrapersonal externalities" are treated as classic externalities, as recommended by the literature on the evaluation of health policy [4], and are therefore included in the calculation of social cost.

The effect on public expenditure is the difference between [1] the total amount spent to treat the health consequences of the drugs plus the cost of research, prevention and law enforcement, and [2] the total amount saved, i.e., the income from the taxation of tobacco and alcohol plus the unpaid civil servants' pensions, due to premature deaths, this difference being multiplied by the coefficient of impact on public funding. The coefficient of impact on public funding is set at 1.2, following Quinet [1], assuming that levying €1 in taxes has a cost of €1.2 in welfare [1].

Materials

The use of alcohol, tobacco, or illegal drugs increases the risks for a number of diseases and external causes, as listed in Table 1 (for more detail about the categories of diseases, see Appendix A). For each of these causes, data for mortality, morbidity, as well as the average age of death and the resulting years of life lost are necessary to compute the external cost and public expenditures.

Mortality and morbidity

The mortality attributable to tobacco, alcohol, and illegal drugs in 2010 is estimated by multiplying the number of deaths for each cause of death by an attributable fraction. The morbidity attributable to a drug during the same year is obtained by multiplying the number of cases of each disease by the same attributable fraction.

For tobacco-attributable mortality, we used the number of deaths and attributable fractions provided by Ribassin-Majed and Hill [5] for the year 2010. Data on passive smoking comes from Dautzenberg (2001), which is the

Table 1 The components of social cost

Type of cost	Type of savings	Economic definition	Assignment to a component of cost
Losses in life quality Losses in years of life		Costs affecting actors in the drugs markets (*Intrapersonal externalities*)	
Losses in productivity for business and public administrations		Costs affecting actors outside the drugs markets (*Externalities*)	External cost
Spending on public care Public expenditure on prevention and law enforcement	Savings in civil servants' pensions Tax revenue on legal drugs (alcohol, tobacco)	Drug-related net expenditure = costs − savings	Impact on welfare of the public expenditure = Drug-related net expenditure × (1 + α)
Total costs	Total savings		

most recent study available. For morbidity data, we used the national statistics from the healthcare branch of the French social security system AMELI [6] in 2010. For alcohol-attributable mortality, we used the number of deaths and attributable fractions provided by Guérin et al. [7] for the year 2009. Finally, data for illegal drugs come from multiple sources. Morbidity and mortality data for AIDS and for overdoses have been obtained from the French observatory for drugs and substance abuse (OFDT) [8]. For overdoses, the average number of deaths in the period 2000–2010 was used. We also used Laumon et al. [9] for the number of fatal traffic accidents due to cannabis. HIV total morbidity is estimated by using the Morlat [10] report, and it is multiplied by the attributable fraction based on the ANRS-Vespa [11] survey in order to obtain illegal drug/HIV morbidity. Accident morbidity due to cannabis in 2010 is obtained by multiplying, according to INSEE,[1] the number of fatal accidents by 10. HCV morbidity is derived from Dhumaux's [12] estimation that 40 % of HCV cases reported in the same document are due to a drug-related contamination and, by his estimation, that 8 % of people with HCV have a chronic liver disease (Table 2).

Age at death and years of life lost

To estimate the value of life and production losses, data on the age at death per disease are necessary. For tobacco, we use Ribassin-Majed and Hill [5]. For alcohol, Guérin et al. [7] provide numbers of death for each cause by age groups. We use these data to compute a weighted average by summing the products of each mid-point class and the corresponding number of deaths. Average age at death due to an illegal drug overdose is based on an estimation of Jansen and Palle [13]. For AIDS, we use INVS data for 2009 [14]. For accidents, Laumon et al. [9] estimate that the majority of deaths in traffic accidents caused by cannabis are in individuals under age 25, so we take 25 as an estimation.

External cost

The external cost includes the values of life and production losses due to death and the values of loss in quality of life due to disease. Those components are calculated for each combination of drug and disease. More information is provided in Table 2.

Value for lives lost

The value for one life lost refers to the actualized sum of the value for one living year over the amount of years lost. This annual value is fixed by Quinet's [1] report at €115,000, regardless the individual's position and age. The discounting rate, also retrieved from this source, is fixed at 4 %. Years of life lost are obtained by the difference between 80, which is the average life expectancy, and the average age of death for a given drug and disease. Total value for lives lost is the value of one life lost multiplied by the corresponding mortality.

Production loss

For each combination of drug and disease, production loss is obtained by multiplying the number of deaths by the amount of years lost and by the actualized annual production loss induced by one death. The latter is provided by INCa [15], who estimated actualized production losses due to cancers based on the human capital method, which estimates production losses as the current earnings plus a discounted rate of future earnings. Assuming that the production loss is dependent on the amount of years of life lost and not on the disease, we applied the results from INCa [15] for all diseases. The estimation for actualized production loss is discounted by 5 % and takes into account both the paid production before retirement and the unpaid production after retirement.

Loss in quality of life

An individual suffering from a disease experiences a loss in quality of life during and after treatment. The annual loss in quality of life induced by a disease is obtained by multiplying the value of 1 year of life by a coefficient of deterioration in quality of life, provided by Lopez et al. [16] and used by the World Health Organization [17].

Effect on public expenditure

The drug-related public expenditure is equal to cost of care plus public spending for research, prevention, and law enforcement, minus tax revenue from alcohol and tobacco and minus the unpaid public pensions due to premature deaths.

Cost of care

The cost of health problems caused by drugs is the sum of the costs reimbursed by the social security system and the non-reimbursed costs. The external cost includes only costs reimbursed that are public expenditures. The non-reimbursed costs are private costs and are not taken into account in the present estimation.

In 2013, the centers for addiction prevention and care (Centres de Soins, d'Accompagnement et de Prévention en

[1] http://www.insee.fr/fr/themes/document.asp?reg_id=24&ref_id=18715.

Table 2 Social cost calculations

Disease	Number of cases (a)	Deterioration in life quality (b) (%)	Annual cost of care (€) (c)	Number of deaths (d)	Average age of death (e)	Years lost (f)	Valued lives lost (€M) (g)	Production loss (€M) (h)	Loss in life quality (€M) (i)
Tobacco									
Lung cancer	70,754	75	13,243	28,260	69	11	28,471	3839	6103
Other cancers	86,120	75	13,243	18,588	72	8	14,392	1836	7428
Cardiovascular	387,956	30	38,224	20,788	69	11	20,943	2824	13,384
Respiratory disease	138,566	30	64,375	11,331	79	1	1253	140	4781
Addiction centers	–	–	–	–	–	–	–	–	–
Hospital units	–	–	–	–	–	–	–	–	–
Total tobacco	683,396	–	129,085	78,967	–	–	65,059	8639	31,696
Alcohol									
Cancer	143,080	75	8268	15,200			18,448	1651	12,341
Digestive cancer [a]	34,646	75	14,123	12,221	67	13	14,034	1220[a]	2988
Larynx cancer [a]	12,458	75	9141	781	63	17	1093	106[a]	1075
Breast cancer [a]	95,976	75	6045	2199	61	19	3321	325[a]	8278
Cardiovascular (-hypertension)	288,915	30	5421	9947	67	13	11,423	1597	9968
Hypertension	311,632	25	4051	2286	69	11	2303	311	8959
Digestive	55,230	13	2454	7772	59	21	12,539	2016	826
Other	607,537	15	5410	4075	54	26	7490	1308	6666[b]
External causes	10,230	30	9185	8154	63	17	11,408	1712	353
Ill-defined	1613	30	9185	1613	59	21	2602	418	56
Addiction centers	–	–	–	–	–	–	–	–	–
Hospital units	–	–	–	–	–	–	–	–	–
Total alcohol	1,418,237	–	–	49,048	–	–	66,213	9013	39,169
Illegal drugs									
Overdose	–	0	–	300	34	46	721	170	–
HIV	13,600	13	15,377	–	–	–			203
Aids	6300	50	10,000	75	55	25	135	23	362
Accidents	2300	30	9185	230	25	55	585	156	79
HCV	92,000	13	9000		–	15[c]		–	1375
Complicated hepatitis	7360	75	9224	1000	65	15	1279	185	635
Substitution treatment	150,000	–	1747	–	–	–	–	–	–
Addiction centers	–	–		–	–	–	–	–	–
Hospital units	–	–	–	–	–	–	–	–	–
Total illegal drugs	271,560	–	54,533	1605	–	–	2720	534	2654

Table 2 continued

Disease	Total cost of care (€M) (j) = (a) × (c)	Pensions not paid (€M) (k)	Public expenditure (€M) (l)	Tax revenue (€M) (m)	External cost (€M) (n) = (g) + (h) + (i)	Net public expenditure (€M) (o) = (j) − (k) + (l) − (m)	Social cost (€M) (p) = (n) + 1.2 × (o)
Tobacco							
Lung cancer	937	784	–	–	38,412	153	38,596
Other cancers	1140	396	–	–	23,656	744	24,549
Cardiovascular	14,829	576	–	–	37,151	14,253	54,255
Respiratory disease	8920	34	–	–	6173	8886	16,836
Addiction centers	54	–	–	–	–	54	65
Hospital units	7	–	–	–	–	7	8
Total tobacco	25,887	1790	182	10397	105,392	13,882[d]	122,050[d]
Alcohol							
Cancer	1183	508	–	–	32,440	675	33,250
Digestive cancer [a]	489	386	–	–	18,242	103	18,366
Larynx cancer [a]	114	30	–	–	2273	84	2,374
Breast cancer [a]	580	91	–	–	11,924	489	12,511
Cardiovascular (-hypertension)	1566	314	–	–	22,987	1252	24,489
Hypertension	1262	63	–	–	11,573	1199	13,012
Digestive	136	321	–	–	15,380	−186	15,157
Other	3287	139	–	–	15,464	3148	19,241
External causes	94	314	–	–	13,473	−220	13,209
Ill-defined	15	67	–	–	3076	−52	3,014
Addiction centers	121	–	–	–	–	121	145
Hospital units	32	–	–	–	–	32	38
Total alcohol	7696	1726	283	3204	114,392	3049[d]	118,051[d]
Illegal drugs							
HIV	209	–	–	–	203	209	454
Aids	63	3	–	–	520	60	592
Accidents	21	3	–	–	820	19	842
HCV	828	–	–	–	1375	828	2,369
Complicated hepatitis	68	35	–	–	2099	33	2,138
Substitution treatment	–	–	–	–	–	–	–
Addiction centers	262	–	–	–	–	262	314
Hospital units	7	–	–	–	–	7	8

Table 2 continued

Disease	Total cost of care (€M) (j) = (a) × (c)	Pensions not paid (€M) (k)	Public expenditure (€M) (l)	Tax revenue (€M) (m)	External cost (€M) (n) = (g) + (h) + (i)	Net public expenditure (€M) (o) = (j) − (k) + (l) − (m)	Social cost (€M) (p) = (n) + 1.2 × (o)
Total illegal drugs	1458	46	913	–	5908	2326[d]	8,698[d]

[a] For digestive, larynx, and breast cancer, we directly use the production loss per case data from INCa [15] (respectively €99,875, €135,836, and €147,873)

[b] For other diseases, loss in life quality obtained does not take into account psychiatric comorbidities (221, 131 cases) due to a lack of methodology to value them. Therefore, loss in life quality for other diseases is obtained by subtracting 221,131 from 607,537 and by multiplying it by the coefficient of deterioration in life quality (0, 15) and by the value for 1 year lost (€115,000)

[c] Patients do not die from HCV, but from cirrhosis

[d] For columns (o) and (p), the totals does not correspond to the sum of the detailed results in the lines above. This is due to the fact that totals take into account the public expenditure [column (l)] and tax revenue [column (m)]

For (g), (h), (i), and (k), computations are detailed below

For valued lives lost: $(g) = (d) \times 0.115 \times \sum_{i=1}^{(f)} (1 + 0.04)^{-i}$

For production loss: $(h) = (d) \times (f) \times 0.12349$

For loss in life quality: $(i) = (a) \times (b) \times 0.115$

For pensions not paid: if $\begin{cases} (f) < 20 : (k) = (d) \times 0.21 \times 0.15072 \times \sum_{i=1}^{(f)} (1 + 0.04)^{-i} \\ (f) \geq 20 : (k) = (d) \times 0.21 \times 0.015072 \times \sum_{i=(f)-20}^{(f)} (1 + 0.04)^{-i} \end{cases}$.

Addictologie CSAPA) had a €330 million budget [18], 20 % for tobacco, 45 % for alcohol, and 35 % for illegal drugs. In 2010, the hospital units specialized in drug-related disease care (Equipes de Liaison et de Soins en Addictologie ELSA) had an endowment of €46 million—16 % for tobacco, 70 % for alcohol, and 14 % for illegal drugs.

For tobacco, we use actualized data from Kopp and Fenoglio [19].[2] For alcohol, the cost of care by disease is provided by AMELI [20], except for digestive diseases and for external and ill-defined causes. The cost of digestive-diseases care comes from the DREES [21], and the cost for external and ill-defined causes was estimated as the average cost of care. For the "other diseases"—diabetes, acute alcoholic intoxication, and hospitalizations related to alcohol dependence—we use estimations of Paille et al. [22]. For illegal drugs, HIV data come from Medic'AM [23] statistics. The last available study on HCV cost of care [24] is for year 1998, but the unitary cost of care has been multiplied by two since the introduction of Interferon alpha and Ribavirine (Medic'AM data [23]). Therefore, we multiplied Ducret's estimation of the annual cost of care by two. Finally, data from Vallier et al. [25] are used for chronic complication. As for substitution treatments, their cost is also estimated on the basis of Medic'AM data [23] and by making additional hypotheses. Medic'AM data indicate that substitution-treatment spending stands at €93.5 million. We supposed that 50 % of CSAPA endowment for illegal drugs (€60 million) is devoted to substitution treatments. ELSA spending for substitution prescriptions is presumed equal. Finally, medical prescriptions in the context of ambulatory medicine are estimated by considering that patients who receive buprenorphine (103,000 in 2010) need a monthly prescription, whereas those who receive methadone (41,000) need two prescriptions per month. A visit to a doctor cost €22 in 2010, and consultation for a substitution-treatment prescription cost €93 million. Consequently, the cost of substitution treatments stands at €262 million.

Unpaid civil servants' pensions

The death of a civil servant puts an end to the payment of the pension, generating savings for the government. In France, the average year of retirement is assumed to be 60. According to the National Bureau of Statistics [INSEE[3]], the average yearly pension was €15,072 in 2011. The sum of the unpaid pensions is then actualized, as previously, using a discounting rate equal to 4 % [1] over the future years of unpaid pensions. Here we use the amount of years lost instead of the amount of retirement years lost, since, if an individual dies at 45 or 59, there will be 20 years ($80 - 60 = 20$) of pensions unpaid in both cases, but the discounted value of those unpaid pensions will be different. In the first case, the first year of unpaid pension occurs 15 years later, and this first year is discounted accordingly, whereas in the second case, the first year of unpaid pension is discounted by 1 year. The total found for unpaid pensions is multiplied by 21 %, which corresponds to the proportion of civil servants in the workforce.

Public spending on law enforcement and prevention

To estimate public spending related to drugs, we use the OFDT [8] report, which relies on French drug-related *Documents de Politique Transversale* [26] describing different public policies. The missions related to fight against drugs listed in those documents are then assigned to each drug type. When expenditure concerns more than one drug type, it is assumed that it is equally allocated to the drugs concerned. According to this document, it appears that the proportions of public spending on law enforcement and prevention are 13, 21, and 66 %, respectively, for tobacco, alcohol, and illegal drugs.

Tax revenue: net of VAT—in millions of EUR

The consumption of legal drugs generates tax revenue. The French public-accounts commission report for 2011 [27] provides the tax revenue net of VAT for alcohol and tobacco in 2010.

Results

For each type of drug, social cost calculations and results are presented in Table 2.

Social cost

The tobacco- and alcohol-estimated social costs, respectively €122 and €118 billion, are similar, whereas the social cost of illegal drugs, €8.7 billion, is 14 times smaller. These costs represent 6 % of the €2000 billion gross domestic product (GDP) for alcohol and tobacco, and 0.4 % of GDP for illegal drugs.

[2] The average figure calculated in a very detailed manner by Kopp and Fenoglio [19] has been kept as the basis for calculations. In order to take into account the increase in the number of people receiving care for pathologies caused by tobacco, it has been posited that the number of people receiving care rose at the same rate as the number of deaths. A second corrective has been brought into take account of inflation, which was 18.9 % between 2000 and 2010.

[3] http://www.insee.fr/fr/themes/tableau.asp?reg_id=0&ref_id=NATTEF04571.

For each of the three substances, the social cost can be divided by the number of daily users who incur most of the costs. In 2010, there were 13.4 million daily smokers [28], 5 million users of alcohol at risk [29], 0.28 million regular users of opiates and stimulants and/or IV users [8], and 20,000 dependent users of cannabis.[4] In 2010, the social cost per daily user was €9108 for tobacco, €23,612 for alcohol, and €15,820 for illegal drugs.

Dominance of external cost

The external cost represents 86, 96, and 68 % of the social cost for tobacco, alcohol, and illegal drugs, respectively. The large number of lives lost (79,000, 49,000, and 1600, respectively) and the value for each year of life lost (€115,000) explains this.

The largest part of social cost for each drug is made up by the losses in human lives, which account for 53.3, 56.1, and 31.3 %, respectively, for tobacco, alcohol, and illegal drugs. In second place comes loss in life quality, accounting for 26.0, 33.2, and 30.5 %, respectively. Far below, losses in production stand at 7.1, 7.6, and 6.1 %, respectively.

The external cost of alcohol is 8.5 % higher than that for tobacco, despite the fact that the number of deaths from smoking is higher than that for alcohol. The reason for this is that the average age of death due to alcohol is earlier than that of tobacco (63 versus 71) and the fact that many accidental deaths caused by alcohol occur earlier. Moreover, illnesses caused by alcohol are numerous and very debilitating over a long period of time, therefore, they are very costly.

The burden of drugs on public expenditure

Unlike external cost, the net public expenditure is made up of spending that actually has to be disbursed by the State. Each year, €13.9, €3.0 and €2.3 billion, respectively, are spent for tobacco, alcohol, and illegal drugs. Net spending linked to drugs was €19.2 billion, or 1 % of the GDP.

Among the public-expenditure components, the cost of care represents the largest share of the social cost: 21.2, 6.1 and 16.8 %, respectively. Despite the revenue generated by taxes on tobacco and alcohol, and despite the savings on civil servants' pensions not paid due to premature deaths, the cost of care is greater than the income from those revenues. Drugs represent a cost to the public purse and make the collective poorer. By comparing the tax revenue from tobacco and alcohol (€10.4 and €3.2 billion, respectively), we find that taxation on alcohol only makes up 41.6 % of the cost of care and that taxation on tobacco is also insufficient to cover cost of care, making up 40.1 % of that amount. Thus, the notion that drugs such as tobacco and alcohol bring in money for the state is therefore unfounded.

Discussion

The present study of social cost of drugs relies on international standards for social cost studies [30] and uses parameters recommended by the French government [1].

However, its result depends on some partly arbitrary decisions. Contrary to the proponents of the theory of rational addiction [31, 32], we did not consider intrapersonal externalities (i.e., consumer's illness) as a private cost, under the argument that the addiction dominates the information [2]. We have chosen to ignore the private costs of drug purchases and of fines, under the assumption that the utility derived from the drug consumption is at least equal to its price; and health expenditures not reimbursed by the Public Health Insurance, possibly reimbursed by private insurances, were also ignored.

Intangible costs usually enter a cost-benefit analysis as a theoretical but non-measurable construct. Those costs refer to costs that concern the direct victim (pain, fatigue, suffering in the relation to the disease or the intervention) and the relatives (who have to take care of the victim). Here we have chosen to take into account some costs that affect the direct victim of drugs (second-hand smoking and victims of drug-related traffic accidents), even if some authors recommend not doing so [33].

The estimation of production loss also depends on the method. Human-capital approach, used in the present study [15], is opposed to the friction-cost method that consists of analyzing production loss from the employer's point of view [34]. The loss depends on the duration of internal reorganization that is necessary for the firm to go back to its initial production level, by hiring a new person or via an increase in productivity. The frictional method provides a lower estimation than the human-capital method. Human-capital method is preferred to the frictional cost to respect the hypothesis of full employment of resources, but also because the frictional-costs method implies complex calculations. Thereby, the results are potentially overestimated. Moreover, INCa [15] uses a 5 % discount, whereas the discount used for other calculations of the social cost is 4 %, generating lower estimations.

There were some necessary approximations. For alcohol mortality and attributable fractions, we used data for 2009 [7] as an approximation for 2010. We also assumed equal attributable fractions for mortality and morbidity for each combination of drug and disease.

[4] Unpublished figure calculated by the OFDT.

Moreover, as attributable fractions that determine the value of lives lost—and thus, the main part of social cost—do not take comorbidities into account, one global social cost of drugs has not been computed. Indeed, some people who die due to alcohol are also smokers or illegal-drug consumers, and vice versa. The last approximations used in the present document concern passive smoking: data rely on a study from 2001 [35], which leads to possible errors of estimation, passive smoking exposure having decreased during the last decade with the help of smoking bans.

Finally, the choice to fix life expectancy at 80 (instead of 81) and retirement age at 60 (instead of 61) in 2010 also introduces small changes in the results but simplifies calculations.

The present cost estimations of €122 billion for tobacco, €118 billion for alcohol, and €8.7 billion for illegal drugs are much higher than the past estimations for year 2000 [19], which were €47 billion for tobacco, €37 billion for alcohol and €3 billion for illegal drugs. The increase is due to improved estimations of the health consequences of drug use and to changes in the economic parameters officially adopted by the government. The present study is based on estimations of 78,967 deaths attributable to tobacco instead of 42,000 in 2000, and 49,000 deaths attributable to alcohol instead of 44,000 in 2000. The increase in deaths due to tobacco is explained by a better accounting for causes of death, notably for deaths from cardiovascular disease and cancer caused by tobacco. Moreover, the value of human life, as well as the discounting rate used for the 2000 report, was based on the Boiteux report [36]. The result also depends on the estimated values of 1 year of life and of the discounting rate. Whereas a decade ago, Boiteux [36] chose a value based on discounted gross-household disposable income that provided a value for a life of €1.5 million, Quinet [1] recommends a figure of €3 million, corresponding to €115,000 per year, independent of persons' ages or positions. The discounting rate was 6 % in our report for year 2000, versus 4 % in the present study. This increases the long-term consequences of present deaths, but it also increases the savings from civil servants' pensions; however, the savings are small compared to the cost of years of life lost. Thereby, the estimation for 2010 of the social cost of drugs is considerably larger than the estimation for 2000. The increase in the estimated social cost of drugs is not due to increased consumption or ineffective public policies.

Concerning the social cost comparisons between countries, there is a consensus on avoiding this type of comparison [37], as the conventions used for calculation vary from one country to another (for instance, the value of a human life and the discounting rate). Furthermore, the available studies do not relate to the same scope for social costs; some take intangible costs into account [16], while others do not. Finally, social systems differ greatly from one country to another. In particular, the distribution of spending on care between public and private expenditures depends on the organization of the system for healthcare funding (individual insurance versus social charges). Public accounting rules are also quite different in different countries, even within the European Union. This report has adopted a broad conception of the scope of the state by including social accounts. Each social cost study has faced the problem of delineating the perimeter of public and private costs and the specific relationship between public expenditure and social accounts.

Acknowledgments The paper presents the conclusions of a report to the Health Ministry (Direction Générale de la Santé). It has been subsidized following a call for tenders from the French observatory for drugs and substance abuse (OFDT).

Compliance with ethical standards

Conflict of interest None declared.

References

1. Quinet, E.: L'évaluation socioéconomique des investissements publics [Internet]. Centre d'Analyse Stratégique. http://www.strategie.gouv.fr/sites/strategie.gouv.fr/files/archives/CGSP_Evaluation_socioeconomique_17092013.pdf (2013). Accessed 19 May 2016
2. Collins, D., Lapsley, H. M.: The social costs of drug abuse in Australia in 1988 and 1992. Australian Government Printing Services: Commonwealth Department of Human Services and Health. Report No.: Monograph n°30 (1995)
3. Rice, D.P., Hogson, T., Sinsheimer, P., Browner, W., Kopstein, A.: The economic costs of the health effects of smoking. Milbank Q. **64**(4), 489–547 (1986)
4. Drummond, M. F., Stoddard G. L.: Methods for the economic evaluation of health care programs. Torrance: Oxford University Press; 1987. 182p. p
5. Ribassin-Majed, L., Hill, C.: Trends in tobacco-attributable mortality in France. Eur. J. Public Health **25**(5), 824–828 (2015)
6. AMELI.: Répartition et taux pour les principales maladies (CIM-10) des personnes en affection de longue durée (ALD 30 ou 31) pour l'année 2010 [Internet]. http://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/donnees-statistiques/affection-de-longue-duree-ald/prevalence/prevalence-des-ald-au-31-decembre-2010.php (2011). Accessed 19 May 2016
7. Guérin, S., Laplanche, A., Dunant, A., Hill, C.: Alcohol-attributable mortality in France. Eur. J. Pub. Health **23**(1), 588–593 (2013)
8. OFDT.: Drogues et addictions, données essentielles (2013) [Internet]. Saint-denis: OFDT. p. 399p. http://www.ofdt.fr/publications/collections/rapports/ouvrages-collectifs/drogues-et-addictions-donnees-essentielles/ (2013). Accessed 19 May 2016
9. Laumon, B., Gadegbeku, B., Martin, J. L.: Stupéfiants et Accidents Mortels (Projet Sam) [Internet]. Paris: OFDT. (Analyses Epidémiologiques). http://www.ofdt.fr/BDD/publications/docs/epfxblr4.pdf (2011). Accessed 19 May 2016
10. Morlat, P.: Prise en charge médicale des personnes infectées par le VIH. Recommandations du groupe d'experts. La Documentation Française. 478pp. http://social-sante.gouv.fr/IMG/pdf/

Rapport_Morlat_2013_Mise_en_ligne.pdf (2013). Accessed 19 May 2016
11. Jauffret-Roustide, M., Weill-Barillet, L., Lucie, L., Le Strat, Y., Brunet, S., Benoit, T., et al.: Estimation de la séroprévalence du VIH et de l'hépatite C chez les usagers de drogues en France—Premiers résultats de l'enquête ANRS-Coquelicot 2011. Bulletin Épidémiologique Hebdomadaire **39–40**, 504–509 (2013)
12. Dhumeaux, D.: Prise en charge des personnes infectées par le virus de l'hépatite B ou de l'hépatite C. Rapport de recommandation. Paris : ANRS, AFEF . 537 p. Available from: http://www.sante.gouv.fr/IMG/pdf/Rapport_Prise_en_charge_Hepatites_2014.pdf (2014). Accessed 19 May 2016
13. Janssen, E., Palle, C.: Les surdoses mortelles par usage de substances psychoactives en France. Tendances **70**, 4 (2010)
14. Institut de Veille Sanitaire.: Surveillance du VIH-sida en France [Internet]. http://www.invs.sante.fr/publications/2009/vih_sida_donnees_septembre2008/sida_vih_france_30septembre2008.pdf (2009). Accessed 19 May 2016
15. INCa.: Analyse économique des coûts du cancer en France [Internet]. INCa p. 146p. http://doc.hubsante.org/opac/doc_num.php?explnum_id=677 (2007). Accessed 19 May 2016
16. Lopez, A. D.: Global Burden of Disease and Risk Factors. World Bank Publications. 511 p (2006)
17. WHO.: Global Burden of disease 2004 update: disability for disease and conditions. World Health Organization (2004)
18. Hesse, C., Duhamel, G.: Evaluation du dispositif médicosocial de prise en charge des conduites addictives. Inspection générale des affaires sociales. Report No.: 2013-119R (2014)
19. Kopp, P., Fenoglio, P.: Le coût social des drogues en 2003, Les dépense publiques dans le cadre de la lutte contre les drogues en France en 2003, réactualisation du rapport OFDT [Internet]. Paris: OFDT p. 60p. http://www.ofdt.fr/publications/collections/rapports/rapports-d-etudes/rapports-detudes-ofdt-parus-en-2006/le-cout-social-des-drogues-en-2003-les-depenses-publiques-dans-le-cadre-de-la-lutte-contre-les-drogues-en-france-en-2003-avril-2/ (2006). Accessed 19 May 2016
20. AMELI.: Répartition et taux pour les principales maladies (CIM-10) des personnes en affection de longue durée (ALD 30 ou 31) au 31 décembre 2012 pour le régime général [Internet]. Paris: Assurance Maladie. http://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/donnees-statistiques/affection-de-longue-duree-ald/prevalence/prevalence-des-ald-au-31-decembre-2012.php (2012). Accessed 19 May 2016
21. DREES.: Comptes Nationaux de la Santé [Internet]. INSEE. (Comptabilité Nationale). http://drees.social-sante.gouv.fr/IMG/pdf/comptes_sante_2011.pdf (2011). Accessed 19 May 2016
22. Paille, F., Menu, C., Anglade, C., Raynaud, M.: L'alcool, une des toutes premières causes d'hospitalisation en France. Bulletin Epidémiologique Hebdomadaire. (24–25) (2015)
23. Medic'AM.: Données mensuelles et annuelles sur les médicaments remboursés par l'Assurance Maladie [Internet]. http://www.ameli.fr/l-assurance-maladie/statistiques-et-publications/donnees-statistiques/medicament/medic-am/medic-am-2008-2013.php (2014). Accessed 19 May 2016
24. Ducret, N., Mercier, S., Colin, C., Vergnon, P., Laroche, C., Bailly, F., et al.: Etude nationale des pratiques de dépistage de l'hépatite C chez les patients hémodialysés. Néphrologie **19**(4), 217–222 (1998)
25. Vallier, N., Salanave, B., Weill, A.: Coût des trente affections de longue durée pour l'assurance maladie [Internet]. AMELI. http://www.ameli.fr/fileadmin/user_upload/documents/Points_de_repere_n__3.pdf (2006). Accessed 19 May 2016
26. Document de politique transversale.: Politique de lutte contre les drogues et les toxicomanies [Internet]. http://bdoc.ofdt.fr/doc_num.php?explnum_id=11956 (2011)
27. Sécurité Sociale.: Rapport de la Commission des comptes de la Sécurité Sociale [Internet]. Paris. (La Documentation Française). http://www.securite-sociale.fr/IMG/pdf/rapport_ccss_10-2012.pdf (2012). Accessed 19 May 2016
28. Beck, F., Tovar, M.L., Spilka, S., Guignard, R., Richard, J.-B.: Les niveaux d'usage des drogues en France en 2010, exploitation des données du Baromètre santé. Tendances **76**, 6p (2011)
29. INPES. 5 millions de français ont un problème avec l'alcool. Et si c'était vous? Dossier de presse. 7p. http://inpes.santepubliquefrance.fr/70000/dp/06/dp060427.pdf (2006)
30. Single, E., Easton, B., Collins, D., Harwood, H., Lapsley, H., Maynard, A.: International Guidelines for Estimating the Costs of Substance Abuse, p. 97p. Canadian Center on Substance Abuse, Ottawa (1995)
31. Becker, G.S., Murphy, K.M.: A theory of rational addiction. J. Polit. Econ. **96**(4), 675–700 (1988)
32. Walker, D.M., Kelly, S.M.: The roots of modern "social cost of gambling"estimates. Econ. Aff. **31**(1), 38–42 (2011)
33. Jeanrenaud, C.: Le coût social de la consommation de tabac. Dépendances. **4**, 20–22 (1998)
34. Koopmanschap, M.A., Rutten, F.F.H., van Ineveld, B.M., van Roijen, L.: The friction cost method for measuring indirect costs of disease. J. Health Econ. **14**(2), 171–189 (1995)
35. Dautzenberg, B.: Rapport du groupe de travail DGS tabagisme passif. (La Documentation Française) (2001)
36. Boiteux, M.: Transports choix des investissements et coût des nuisances [Internet]. (La Documentation Française). http://www.ladocumentationfrancaise.fr/var/storage/rapports-publics/014000434.pdf (2001). Accessed 19 May 2016
37. Reuter, P.: Are economic calculations of the economic costs of drugs abuse either possible or usefull? Addiction. **94**(5), 635–638 (1999)