THE SOCIAL COST OF LEGAL AND ILLEGAL DRUGS IN BELGIUM

SUMMARY

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This document is an extensive summary of the SOCOST study 'The social cost of legal and illegal drugs in Belgium'. This study was funded by the Belgian Science Policy (BELSPO). The aim of this summary is to provide an overview of the main results and conclusions with an emphasis on the formulated policy recommendations. A full research report is published: Lievens, D., Vander Laenen, F., Verhaeghe, N., Schils, N., Putman, K., Pauwels, L., Hardyns, W., & Annemans, L. (2016). The social cost of legal and illegal drugs in Belgium. Antwerpen: Maklu.

1. INTRODUCTION

The SOCOST study carried out a first estimate of social costs for addictive substances (alcohol, tobacco, illicit drugs, and psychoactive pharmaceuticals) in Belgium for the year 2012. The social cost related to health, crime and traffic accidents are reported.

A social cost study estimates the total cost on the drug problem at the expense of the community (Vander Laenen et al., 2008) and shows how substantial the total social cost of addictive substances is. To this end, it compares the status quo to a hypothetical situation in which substance (mis)use never existed. The standard definition is that social costs are the sum of private costs plus external costs (Stiglitz & Walsh, 2002; Collins, Lapsley, Lecavalier & Single 2000; Single et al., 1998; Varian, 1992). The private costs accrue only to the people engaged in the activity in question, i.e. the consumption of addictive substances (Single et al., 2003). A typical example of a private cost is the payment that the drug user contributes to medical care. External costs are caused by addictive substances that others have to bare, including costs for law enforcement, health care, social services, research, prevention, social security, productivity losses and nonfinancial welfare costs (Moller & Matic, 2010).

2. METHODOLOGY

The SOCOST study can be considered as a societal cost-of-illness study (Bloom, Bruno, Maman, & Jayadevappa, 2001). The aim of the study was to estimate the substance-attributable costs of addictive substances to the Belgian society. Three cost components were considered: (1) the direct costs, (2) the indirect cost, and (3) the intangible costs related to substance (mis)use. Direct costs are those costs related to the resources used dealing with substance use and related medical conditions, accidents or its proximate effects (e.g. hospitalisation, physician consultations, medication use) and substance attributable crime and its consequences (e.g. police investigation, incarceration). Indirect costs are productivity losses due to disability, due to premature mortality (as a consequence of a disease, accident or crime) or due to incarceration. Intangible costs are non-financial welfare costs borne by individuals such as pain or suffering as well as the value of lost life (Moore & Caulkins, 2006; Single et al., 2001).

In this study, a prevalence-based approach was used measuring the consequences of substance misuse in a given time period (in casu the year 2012). The latter is a function of past and current substance misuse (Moore & Caulkins, 2006). The epidemiological concept of substance-attributable fractions (Kleinbaum et al., 1982) was used to quantify the proportion of the total morbidity and mortality of diseases and conditions that are known to be causally related to substance (mis)use. Likewise, substance attributable fractions were also used to determine the proportion of non-

consensual crimes (property crimes, violent crimes and sexual crimes) that can be attributed to substance misuse (Pacula et al., 2013; Caulkins & Kleiman, 2014).

Productivity losses were estimated using the human capital approach measuring current and future productivity losses which can be attributed to the year of investigation. The intangible costs were calculated using the concept of disability-adjusted life years (DALYs). DALYs are a measure to quantify disease burden by taking into account losses of health life years through living with a disease (years lived with a disease – YLD) and/or through dying before a reference life expectancy (years of life lost – YLL)[1].

It should be emphasized that the outcome of social cost studies is strongly determined by methodological choices and the available data, consequently the presented social costs results should be considered as **estimations** and interpreted with care. This study deals with the uncertainty by conducting sensitivity analyses and scenario analyses, furthermore the minimum and maximum of certain costs are presented.

3. RESULTS

In 2012, the direct and indirect cost of addictive substances (illegal drugs, alcohol, tobacco and psychoactive medication) is estimated at **4.6 billion euros** in Belgium or **419 euros per capita** or **1.19% of the GDP**[2]. Legal drugs impose the highest cost to society since 45% (2.1 billion euros) of the social cost on substance misuse can be attributed to alcohol. About 32% (1.5 billion euros) could be assigned to tobacco **and** 5% (215 million euros) to psychoactive medication. Illegal drugs comprise about 16% (726 million euros) of the economic burden. Besides these direct and indirect costs, more than **515,000 healthy years are lost** due to substance (mis)use. This is mainly due to tobacco and alcohol use, both substances are responsible for approximately 91% or 470,000 healthy years lost. In the following paragraphs, we elaborate on each cost category (direct, indirect and intangible cost).

3.1. DIRECT COSTS

Direct costs are the resources for goods or services that are used or delivered to deal with the substance (mis)use or its proximate effects. These costs are directly caused by substance (mis)use in the following three disciplines: (1) health care of substance use disorders and of diseases/conditions (e.g. lung or liver cancer) associated with substance (mis)use (e.g. physician visits, hospitalisation and outpatient care), (2) law enforcement of drug related crimes (at the different levels of the criminal justice system (investigation, prosecution, sentencing, sentence execution), (3) traffic accidents under the influence of substances (e.g. hospitalisation following a traffic accident, breath testing by police).

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[1] DALYs are calculated as follows: DALY= YLD + YLL
The YLD are calculated by multiplying the time living with a disease or condition by a disability weight associated with the disease or condition. Disability weights measure the degree of impact of a disease or condition and vary between zero (no disability) and one (death). The YLL are calculated by multiplying the number of deaths with the life expectancy at the age of death. This information was derived from http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/
[2] The intangible costs are not be compared with GDP, since these costs components have not been included in the conventional national account measurements of GDP (Collins & Lapsley, 2008).

In 2012, the direct costs of substance (mis)use comprised **2.86 billion euros**. Figure 1 illustrates that alcohol (mis)use generates the largest costs (45%, 1290 million euros), followed by tobacco (25.4%, 727 million euros) and illegal drugs (21.2%, 606 million euros). Psychoactive medication accounts for 4.4% (125 million euros) of the costs.

Figure 1: Direct costs by type of substance, 2012
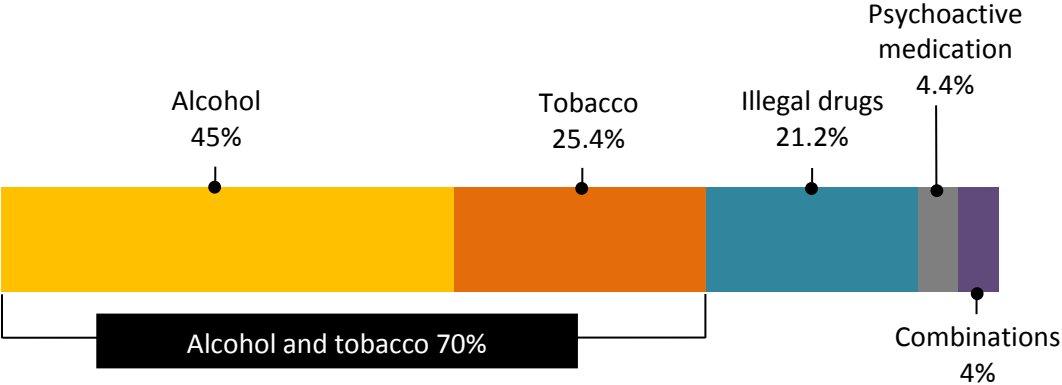
Figure 2 shows that the majority of the direct costs is linked to health care (69%, 1976 million euros), 27% (783 million euros) is linked to law enforcement[3] and 4% (104 million euros) is used to deal with traffic accidents.

Figure 2: Direct costs by cost category, 2012

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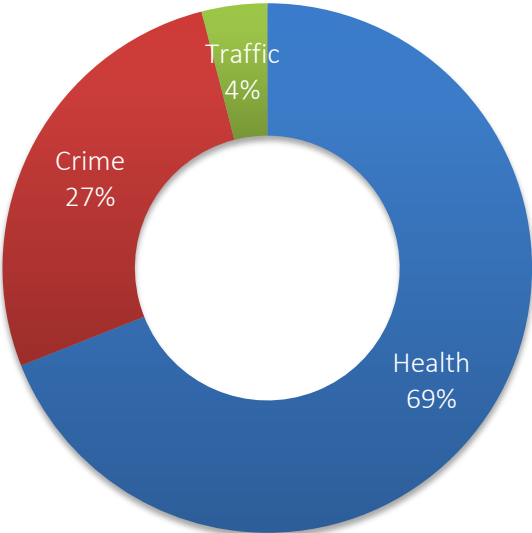
[3] The costs for property losses and anticipation to theft are included in the SOCOST study. These costs have been reported in previous social costs studies (Miller et al., 2006; Wall et al., 2000; Bouchery et al., 2011), however some economists consider these costs as transfer costs (Czabanski, 2008; McCollister, French, & Fang, 2010).

Comparison private – public direct costs

The direct costs have been incurred by the government and by private stakeholders such as patients, victims and offenders. The balance between **public and private financing** of the direct costs is identified: about 80.63% (2.3 billion euros) are public costs and 9.46% (271 million euros) are private costs[4]. Table 1 provides an overview of these private costs.

Table 1: Overview of the private (direct) costs, 2012

	Private cost (million €)	Proportion of the direct cost	Type of private stakeholder
Health			
Hospitalisation	152.56	10.4%	patient (oop)
Sheltered housing and psychiatric nursing homes	0.08	0.6%	patient (oop)
Home-based nursing care	0.35	0.4%	patient (oop)
GPs	107.46	38.2%	patient (oop)
Pharmaceuticals	1.62	15%	patient (oop)
Traffic			
Hospitalisation	3.79	10.4%	patient (oop)
Prevention BIVV	0.43	65%	sponsoring organisations (Assuralia and the Belgian Brewers)
Re-instatement assessments	4.51	100%	offender
Total	**270.73**		

Oop: out-of-pocket

Public direct costs: comparison across sectors and across policy level

An analysis was conducted of the **public direct costs across sector** in order to analyse the policy mix. Table 2: Public direct costs across sector and across policy level (million €), 2012 illustrates that treatment accounts for 75% of the total public direct costs, and enforcement expenditures represent about one-fourth (24%). Prevention (0.5%), harm reduction (0.1%) and other activities such as coordination and research (0.24%) are only minor components of the direct cost category.

The public treatment costs are largely dominated by the hospitalisation costs (general and psychiatric hospitals: 1.5 billion euros). Furthermore, the government spends a substantial part of the law enforcement on substance related police costs (228 million euros) and penitentiary institutions (89-297 million euros).

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[4] The remaining 9.91%, 284 million euros for "anticipation to theft', "property loss because of theft" and "tax refunds burglary prevention", are reported separately since they could be considered as transfer costs.

Table 2: Public direct costs across sector and across policy level (million €), 2012 [5]

	Prevention	Harm reduction	Treatment	Enforcement	Coordination	Research	Total
Federal government	4.24	0.17	1711.19	538.16	0.97	1.24	2255.97 (97.7%)
Flemish government	3.76	0.49	11.70		2.32	0.03	18.3 (0.79%)
Walloon region	0.28	0.70	3.51		0.30	0.05	4.84 (0.21%)
French Community Wallonia-Brussels	1.52	1.00	3.73	19.29	0.01		25.55 (1.11%)
German-speaking community	0.18		0.21		0.002		0.39 (0.02%)
Brussels Capital-region	0.07	0.14	0.81		0.08	0.02	1.12 (0.05%)
Provinces	0.77		0.32		0.37	0.005	1.47 (0.06%)
Other/Not specified	0.42		0.01		0.10	0.03	0.56 (0.02%)
Total	11.24 (0.49%)	2.50 (0.11%)	1731.48 (75.01%)	557.45 (24.15%)	4.15 (0.18%)	1.37 (0.06%)	2308.2 (100%)

[5] The direct costs of cities and municipalities were not included in the SOCOST study, since they could not be estimated with the top-down method.

Table 2 also reports the **public direct costs by policy level** (i.e. federal, state and provincial level). The federal level carries the highest costs, since the federal government is responsible for the biggest cost categories, namely inpatient health care and law enforcement.

The Flemish government reported a direct expenditure of slightly more than 18 million euros on substance (mis)use and Wallonia (Walloon region, French community Wallonia-Brussels and German-speaking community) spent about 30.8 million euros. It is difficult to compare the direct costs of the Flemish government and Wallonia, since the Dutch speaking youth institutions are not included in the SOCOST study[6]. A closer look at the health care costs (prevention, harm reduction and treatment) tells us that Wallonia invested 11.1 million euros[7] and the Flemish government 16 million euros. Finally, the smallest contribution is provided by Brussels Capital region and the provinces.

3.2. INDIRECT COSTS

Indirect costs include lost human productivity due to an individual's (mis)use of substances. These productivity losses are due to disability, premature mortality and incarceration.

Substance (mis)use causes an indirect cost of **1.8 billion euros** in the year 2012[8]. Figure 3 demonstrates that alcohol and tobacco are responsible for 86% of these indirect costs (tobacco: 42% or 746 million euros; alcohol: 44% or 778 million euros). Illegal drugs and psychoactive medication are also an important cost category, with respectively 7% (120 million euros) and 5% (90 million euros).

Figure 3: Indirect costs by type of substance, 2012
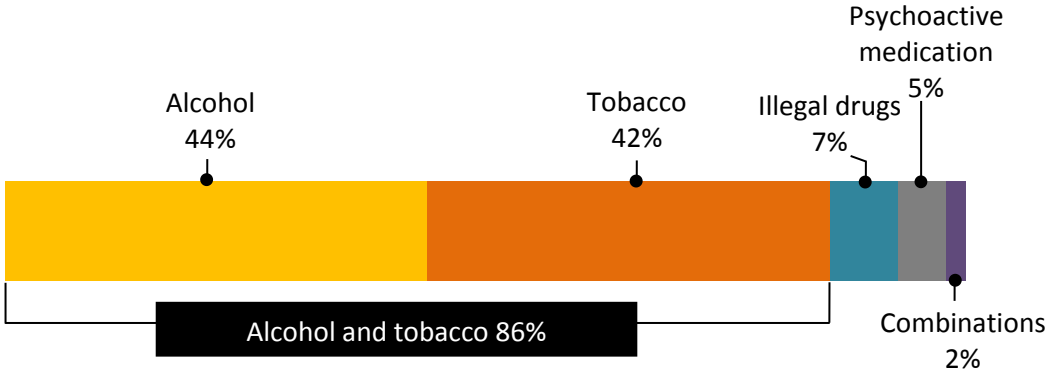
Figure 4 shows that 85% of these indirect costs are related to health (i.e. productivity losses due to disability and premature mortality due to diseases), 5% to crime (i.e. productivity losses due to

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[6] A substance attributable cost of 19,3 million euros was estimated for the French community institutions, however the expenditures for the federal institution of Saint-Hubert (approximately 13% or 2.5 million euros) are included in this cost calculation.

[7] The direct health costs of Wallonia are underestimated due to a lack of data of the mental health care centres (SSM).

[8] The productivity losses due to premature mortality can be assigned to the reference year 2012 and those that arise from productivity losses in future years (the number of life years lost up to the age of 65 years was estimated). The (disability) pensions (after the age of 65 years) are excluded from the calculation, since these are transfer costs that do not affect the amount of resources available to society (Thavorncharoensap et al., 2009).

incarceration of drug related crimes and premature mortality due to homicide[9]), and 10% to traffic accidents (i.e. productivity losses due to premature mortality).

Figure 4: Indirect costs by cost category, 2012
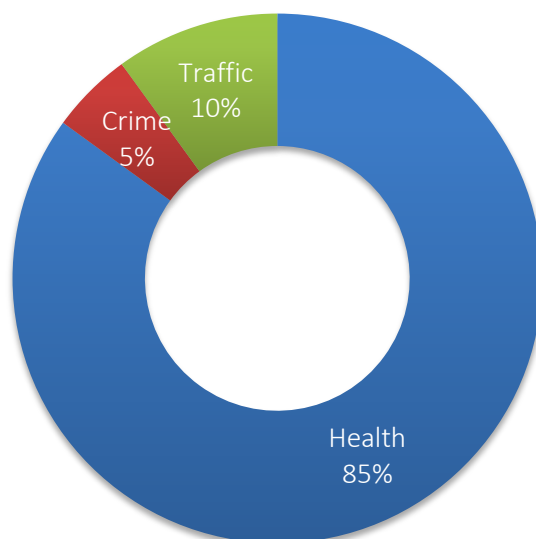
Within the category health, **1.1 billion euros (74% of the indirect health costs) are productivity losses from premature mortality** due to diseases and conditions associated with substance (mis)use. Tobacco is responsible for 60.5% of these productivity losses and alcohol is responsible for 35.8%. Major contributors to alcohol- and tobacco-associated premature mortality were (1) for alcohol: alcoholic liver disease, and cancers [10][11], and (2) for tobacco: trachea, bronchus and lung cancer, and ischaemic heart disease[12]. Furthermore, psychoactive medication represents 2.9% of the productivity losses due to premature mortality and illegal drugs is responsible for 1.3%. Premature mortality due to psychoactive medication is mainly caused by sedative-hypnotic drugs (52.4%) and methadone (33.8%). Major contributors to illicit drug-associated productivity losses due to premature mortality were poisoning by heroin (37.8%), viral hepatitis (27.0%), and poisoning by cocaine (26.8%). HIV was responsible for 4.6% of the illicit-drug attributable indirect costs from premature mortality[13].

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[9] There are only data available to calculate the indirect costs related to homicide. Premature mortality due to other types of crimes, such as sexual crimes, assault or armed robbery, could not be included due to a lack of data.

[10] Cancers: lip, oral cavity & pharynx cancer, oesophageal cancer, rectal cancer, liver cancer, pancreatic cancer, laryngeal cancer, and breast cancer.

[11] Alcohol liver disease: 36.6%; cancers: 28.8%

[12] Trachea, bronchus & lung cancer: 52.7%; ischaemic heart disease: 20.0%

[13] In Europe, an opioid overdose is the most common *direct* cause of death among drug users (Degenhardt et al., 2011; EMCDDA, 2014; UNODC & WHO, 2013). Furthermore, multiple studies have labelled HIV as the most important *indirect* cause of death among drug users (Lappalainen et al., 2015; Mathers et al., 2013). However, in Belgium, the productivity losses are much higher for hepatitis (3.8 million euros) than for HIV (0.8 million euros).

3.3. INTANGIBLES

Intangible costs arise from pain, suffering and loss of life. These are non-financial welfare costs since they do not have an impact on the resources of the community. In the SOCOST study, the intangibles are limited to the value of lost (quality of) life and they were estimated using the concept of 'disability-adjusted life years' (DALYs).

In 2012, approximately **515,000 disability-adjusted life years** (or DALYs) are caused by substance (mis)use. Belgium was confronted with a total loss of 3,259,200 DALYs (due to all causes) in the year 2012. Consequently 16% of the DALYs are caused by substances. Taking into account an economic cost of 40,000 euros per DALY (an amount used by the European Commission, Desaigues et al., 2007), we obtain a societal loss of 20.6 billion euros. Figure 5 shows that the intangible costs are mainly caused by tobacco (57%). Alcohol comprises about 34% of the intangible costs and illegal drug use comprises 7% of the intangible costs.

Figure 5: Intangible cost by type of substance, 2012
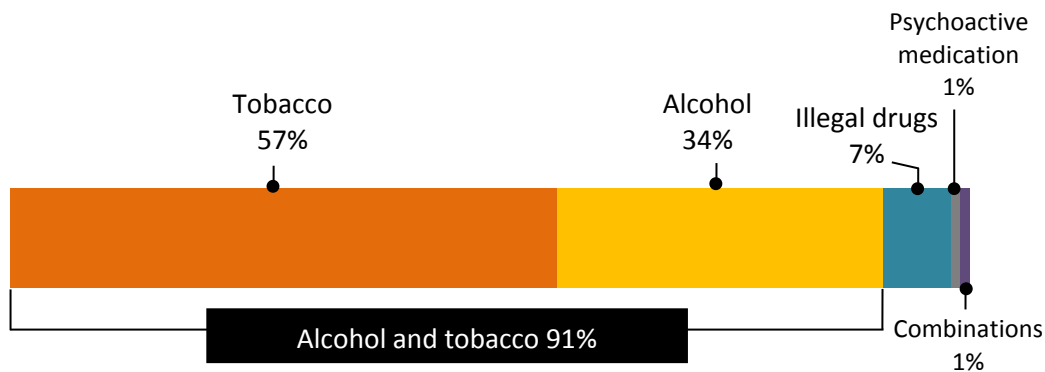
The predominance of tobacco-attributable intangible costs is a result of the high level of morbidity and premature mortality caused by smoking. The major contributors to the tobacco-attributable intangible costs were trachea, bronchus and lung cancer (5.1 billion euros – 43.0%) and chronic obstructive pulmonary disease (2.6 billion euros – 21.8%).

Health care problems are mainly responsible for the high number of DALYs. Figure 6 illustrates that 94% of the intangible cost could be attributed to health, 5% to traffic and 1% to crime. However, it should be stated that the intangibles cost for crime is underestimated since it is limited to the cost for interpersonal violence[14].

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[14] There are only data available on the number of DALYs lost due to interpersonal violence. There are no data available on other types of crime, such as sexual crimes or property crimes.

Figure 6: Intangible cost by cost category, 2012

Crime
1%
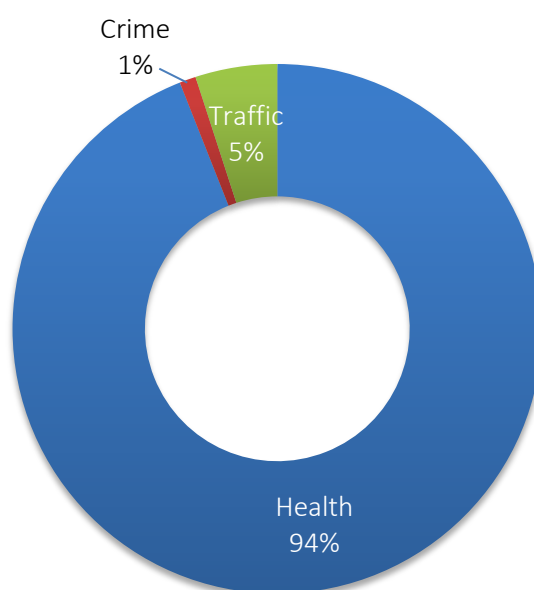
Traffic
5%

Health
94%

3.4. OVERVIEW OF THE SOCIAL COSTS

Table 3 provides an overview of the social costs on alcohol, tobacco, illegal drugs and psychoactive medication.

Table 3: Overview of the social costs (million €), 2012

	Health	Crime	Traffic	Total
Direct cost	1975.82	782.65	104.05	**2862.79**
Indirect cost	1506.18	81.34	176.78	**1764.30**
Intangible cost	484.800 years	4.400 years	25.900 years	**515.100 years**

3.5. BENEFITS

The benefits from substances are restricted to health benefits and economic benefits. The non-financial benefits from substances (such as peer acceptance and social networking) do not fall within the scope of this study.

3.5.1. Health benefits of alcohol

Alcohol may have some preventive health effects for certain diseases (ischemic heart disease, ischemic stroke, hemorrhagic stroke [only in women], cholelithiasis and diabetes mellitus), although the literature is not univocal on this (Fillmore et al., 2006; Papadakis et al., 2000). For this reason, the impact of the beneficial effects on the social costs of alcohol (mis)use were not accounted for in the overall cost calculation. The estimated preventive effects of alcohol use amounted to 127.5 million

euros by a reduction in hospital care episodes in general hospitals (both inpatient care and hospital day care). For the cost category productivity losses from premature mortality, a saving of 86 million euros was calculated. Finally, 67,907 DALYs were avoided assuming preventive effects of alcohol consumption.

3.5.2. Economic benefits

In this SOCOST study, the economic benefits calculated are restricted to revenues from taxes (VAT and excise duties). Table 4 indicates that taxes on tobacco and alcohol make a substantial contribution of nearly 4.5 billion euros to the government revenues in 2012.

Table 4: Overview revenues from taxes on consumption, 2012

	Excise duties (million €) [15]	VAT (million €)	Total revenues (million €)
Tobacco	2004	636	2640
Alcohol	635	1190	1825
		Total	4465

These tax revenues from tobacco and alcohol cannot be compared with direct and indirect costs, since this comparison does not takes into account the value of lost (quality of) life due to substances (i.e. the intangible costs).

3.6. ONE-WAY SENSITIVITY ANALYSES AND SCENARIO ANALYSES

Social cost studies are likely characterized by some degree of uncertainty related to the input parameters (Drummond et al., 2006). In the current research, this uncertainty was addressed by conducting one-way sensitivity analyses and scenario analyses. Sensitivity analyses have been conducted for the direct health, crime and traffic costs. A scenario analysis has also been executed for the direct health costs. It was not possible to conduct a scenario analysis for the crime and traffic results, since an increase or decrease in the prevalence of substance use in the general population will not necessarily affect the number of drug related crimes or traffic accidents.

Health costs

Varying the relative risks associated with cardiovascular diseases were found to be most influential on the alcohol- and tobacco-attributable direct health-related costs. For illicit drugs, this was viral hepatitis. The analysis was not performed for psychoactive pharmaceuticals' use since all diseases included in the research were assumed to be fully attributable to the psychoactive pharmaceuticals' (mis)use.

Assuming a 10% decrease in substance consumption rates would result in direct cost savings of 7.2% for alcohol, 2.5% for tobacco, and 7.8% for illicit drugs and 5.8% for psychoactive pharmaceuticals. Contrary, assuming a 10% increase of substance consumption prevalence would result in additional

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[15] This number represents the actual receipts from excise tax (=gross revenue - refund + simplified rate). The established entitlements are only available for tobacco: 1,922 million euros in 2012 (see European Commission, excise duty tables, http://ec.europa.eu/taxation_customs/index_en.htm).

direct health-related costs of 7.1% for alcohol, 2.9% for tobacco, 7.8% for illicit drugs, and 5.8% for psychoactive pharmaceuticals.

Crime costs

The sensitivity analysis demonstrated the large dependence of the estimated crime costs on the used substance attributable fractions and thus also their sensitivity to changes in these (estimated) SAF's. For example the estimated cost on the investigation level fluctuates between 180 million euro and 272 million euro when fluctuating the attributable fractions on this level with 30%. This indicates it is important to be cautious when interpreting the estimated crime costs in this research. Fluctuating the SAF's will fluctuate the cost estimations on average with the same magnitude. The sensitivity of the results emphasizes the importance of reliable estimates, which is largely dependent on methodological choices and available data-registration.

Traffic accident costs

During the sensitivity analysis the costs increase or decrease with the same magnitude in which the substance attributable fractions (SAF) fluctuate. If the SAF increases or decreases with 30%, than the hospital costs range between 26 million euro and 47 million euros, respectively 70% and 130% of the original cost. This sensitivity analysis demonstrated that hospitalisation costs for traffic accidents are largely determined by the used substance attributable fractions, indicating that these costs are clearly estimations that should be interpreted with caution.

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4. DISCUSSION

Overall merits and limitations of the study

Previous Belgian studies (Degreef, Pacolet and Bouten, 2003; De Ruyver et al., 2004, De Ruyver et al., 2007; Vander Laenen et al., 2011; Tecco, Jacques and Annemans, 2013) have estimated specific components of the social cost of substances. These studies were limited to public expenditures or focused on the social cost of alcohol only. In this SOCOST study, we estimate for the first time the social costs of multiple substances for Belgium. Anno 2016, this research project can be considered as the most **comprehensive analysis** thus far of the costs associated with substance (mis)use. The substance related costs for health, crime and traffic are included in one study. Moreover, the direct, indirect and intangible costs are estimated simultaneously whereby a wide variety of cost items, diseases and conditions are included. More importantly, it is the first study that measured the social cost for four substances: alcohol, illegal drugs, tobacco and psychoactive medication. The inclusion of psychoactive medication (antidepressants, analgesics, anxiolytics, sedatives, hypnotics) could be considered as unique (Johnson et al., 2016). The latter is particularly relevant since Belgium is a country with a high use of anti-anxiety and sedative drugs (Anthierens et al., 2007)[16].

This SOCOST study contextualized the results by presenting the social cost in terms of the proportion of the gross domestic product (GDP) and per capita. In other words, the results are corrected for the economic context and the size of the population. By doing so, the social cost results could be

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[16] Multiple studies confirm high prevalence of psychoactive medication, such as benzodiazepines and antidepressants, in Belgian nursing homes (Bourgeois et al., 2012; Vanderstichele et al., 2006). Furthermore, 12% of the prisoners use sleeping pills and tranquilisers (FPS Justice, 2010).

compared with the results of social cost studies in other countries (Lievens & Vander Laenen, 2016). However, in the international literature, various methods have been employed to estimate the social costs on substance (mis)use. Consequently, the social costs studies in different countries suffer from a lack of comparability. Tremendous variation also occurs due to **cross-national** data **differences** (Single et al., 2003). To allow for a cross-country comparison, each country should use the same methodology (Lievens et al., 2012; Ritter, 2007).[17] Nevertheless, even if a uniform were to be developed and used, a cross-country comparison would necessitate sufficient contextualization, since countries differ in terms of social security systems, institutional structures, cultural traditions, etc.

The common sense notion is that the average social costs generated by one group of substance users may be much higher (e.g. problematic users) than that generated by other users (e.g. non-daily users) (Moore & Caulkins, 2006). This SOCOST study was unfortunately unable to present the social cost per user, since the prevalence rates of the different types of substances are not comparable. For example, the prevalence rates are available for psychoactive medication use in the last 24 hours whereas for illicit drugs the prevalence over the past year is reported in the national Health Interview Survey. Moreover, the presentation of social costs per user would assume that there is a constant "social cost per unit used" for each drug (Caulkins et al., 2002; McFadden & Mwesigye, 2004).

No subgroup analyses were conducted related to socioeconomic variables which are known to be associated with a higher likelihood of substance misuse such as employment status, education, income (Probst et al., 2015, Henkel, 2011), and age (Wu & Blazer, 2011). The findings of the latter study (Wu & Blazer, 2011), a review on illicit and nonmedical drug use among older adults, suggested increasing numbers of people aged 50 to 64 years using such substances. Finally, for illicit drugs and psychoactive pharmaceuticals, no analyses based on particular substances (e.g. cocaine, cannabis, benzodiazepines, antidepressants) could be conducted.

It should also be emphasized that the cost estimates in this study are an **underestimation** of the unknown social costs. Some types of social costs are not included due to missing data: for example, lost productivity through presentism and lost household work. Moreover, social costs studies in general as well as SOCOST are limited to certain costs items due to the complexity of the effects associated with substance (mis)use. Consequently they do not include all the societal harms caused by substance (mis)use (Melberg, 2010). This is also a major challenge for future social cost studies. In fact, it is extremely difficult to quantify certain effects of substance (mis)use such as drug-related corruption on human welfare, institutional instability created by illicit drug production and other adverse effects such as environmental damage caused by control measures (Single et al., 2003). Ideally, social cost studies should estimate costs of environmental pollution due to the cultivation and production of illegal drugs (e.g. the harvesting of illicit crops can lead to soil degradation, Perez-Gomez & Wilson-Caicedo, 2000; UNODC, 1994), costs linked to the illegal economy (e.g. economic effects derived from the manufacture and trafficking of illicit drugs), costs for occupational health risks of working in an illegal laboratory, and costs caused by corruption (Lievens & Vander Laenen, 2016; Singer, 2008). Another example of costs that are not studied in the existing social cost studies are economic harms linked to the fact that some people may avoid certain areas with drug users or dealers and this may influence the local economy of a neighbourhood (Steenbeek et al, 2012).

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[17] In this respect, the EMCDDA has taken the initiative to develop a common EU-wide methodology to estimate drug-related expenditures (EMCDDA, 2008).

Furthermore, the consequences of substance misuse on the life domains such as social inequality, financial difficulties, unstable housing and homelessness (Best et al., 2003; Galea & Vlahov, 2002; Havinga et al., 2014; Sumnall & Brotherhood, 2012) have not been included in cost calculations.

In the following chapter, we discuss the results and the strengths and limitations for the following cost items: (1) health, (2) crime and (3) traffic accidents.

4.1. HEALTH COSTS

Discussion of the results

The substance-attributable direct health costs of alcohol, tobacco, illicit drugs, and psychoactive pharmaceuticals in Belgium for the year 2012 were estimated to be 1.98 billion euros. The total indirect costs, including costs associated with substance-attributable disability and premature mortality, amounted to 1.51 billion euros. Finally, the total intangible costs were estimated to be about 484,800 DALYs (19.4 billion euros) for the year 2012. The majority of the direct substance-attributable costs were associated with alcohol use (906.2 million euros, 45.9%) and tobacco (713.5 million euros, 36.1%). Tobacco (746.4 million euros, 49.6%) was the main cost driver for the indirect costs, followed by alcohol (642.5 million euros, 42.7%).

Within the **direct cost** category, inpatient care was responsible for the majority of the substance-attributable costs (1.52 billion euros, 76.9%), followed by outpatient care with 21.7% (428.3 million euros). Hospital care episodes in general hospitals and in psychiatric hospitals accounted for 52.5% (770.3 million euros) and 47.5% (696.5 million euros) respectively. It is possible that patients admitted to a general hospital received both somatic and mental health care. However, a distinction between pure mental health costs and somatic costs was not possible due to data availability restrictions. Substance-attributable costs associated with the other cost categories (social work services, pharmaceuticals, prevention, research, and coordination) were limited. For example, expenditures for prevention accounted for only 0.4% (8.3 million euros) of the direct health-related costs associated with substance (mis)use.[18] The main cost driver within the cost category 'inpatient care' was hospitalisation (1.47 billion euros or 96.6% of the inpatient care costs).

The findings of the current research are to some extent similar to those from previous social cost studies. Inpatient care was identified as the main cost driver in a study of the social costs of tobacco use in Germany (Neubauer et al., 2006) and of alcohol use in Scotland (Varney & Guest, 2002). Contrary, social service costs accounted for the majority of the direct costs in a social cost study of alcohol use in Sweden. A possible explanation is that a substantial part of the treatment of individuals suffering from alcohol problems in Sweden is done within social welfare services (Jarl et al., 2008). In the study of Konnopka & König in Germany (2007), outpatient direct costs attributable to alcohol were found to be higher than inpatient direct costs. Expenditures for prevention and research were found to be 2.1% in a study of the social cost of alcohol, tobacco, and illicit drugs in France (Fenoglio et al., 2003). Garcia-Altés et al. (2002) identified that 4.5% of the direct cost associated with illegal drug use were for prevention.

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[18] Moreover, harm reduction does only account for 0.11% (2.5 million euros) of the public direct costs.

The substance-attributable **indirect cost** category included costs associated with disability and premature mortality. The majority of these costs were associated with lost productivity from premature mortality (1.110 billion euros, 73.7%), while 26.3% (395.9 million euros) of the costs were due to short-term (≤365 days) and long-term (>365 days) disability. Substance-attributable costs associated with unemployment were not included since the transfer of ownership from the payer to the receiver does not affect the amount of resources available to society (Moore & Caulkins, 2006; Single 2003). The highest costs from premature mortality were associated with tobacco use (672.9 million euros, 60.5%). Major contributors were trachea, bronchus and lung cancer (52.7%) and ischemic heart disease (20.0%).

The **non-financial welfare costs** associated with substance (mis)use were estimated using the concept of DALYs. The use of the substances alcohol, tobacco, illicit drugs, and psychoactive pharmaceuticals were responsible for an estimated 484,807 DALYS for Belgium in 2012. Tobacco use accounted for the largest share (60.9%), followed by alcohol (32.5%). Illicit drugs and psychoactive pharmaceuticals accounted for 6.6% of the total number of substance-attributable DALYs. Intangible costs are seldom taken into account in social cost studies of substance use (with the exception of Jarl et al., 2008; Konnopka & König, 2009). In Jarl et al. (2008), quality of life of consumers, their family and friends was evaluated by calculating the number of quality-adjusted life years (QALYs) for the consumers. Alcohol use resulted in a loss of 121,791 QALYS of which the largest share (68,804 QALYs) affected the consumers. QALYs were also used by Konnopka and König (2009) to assess the impact on quality of life of consuming moderate alcohol levels; a total loss of 179,964 QALYS was found.

Strengths and limitations

A strength of SOCOST was the possibility to obtain the exact number of age- and sex-specific hospital admission cases for the diseases and conditions that could be fully or partially attributed to substance (mis)use. This is important since the substance-attributable costs for hospitalisation accounted for about 75% of the total direct health costs.

A number of **limitations** has to be addressed. Consumption prevalence data for all substances were derived from the Belgian '2013 Health Interview Survey' (Tafforeau et al., 2015). Prevalence data in this survey were self-reported and it is known that such data tend to underestimate the real amount of substance consumption (Chick et al., 2007). For illicit drugs and psychoactive pharmaceuticals, no distinction could be made between occasional and heavy or frequent users, which may have an impact on the risk of developing the diseases associated with the substance use.

Uncertainty around the relative risk data, obtained from international studies, may exist. This uncertainty was addressed in the one-way sensitivity analysis. For a number of cost categories, no specific substance-attributable fractions could be identified. So, for those cost items, SAFs were calculated based on those used in the calculation process of the **general hospital attributable costs**. As a consequence, these SAFs were characterized by a high level of uncertainty.[19]

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[19] The reason for this is that we assumed similar patterns of relative weights of diseases treated in hospitals and in other cost items (e.g. ambulatory physician contacts, home-based nursing care, indirect costs, intangible costs). It is yet unlikely that for example similar patterns of diseases treated in hospital facilities are similar to those seen by GPs.

Interaction effects of combined substance use (e.g. alcohol and illicit drug use) on the relative risks of developing substance-attributable diseases or conditions were not accounted for. This may have resulted in an underestimation of the calculated costs, since relative risks of developing certain substance-attributable diseases or conditions may probably be higher in multiple substance users.

For the calculation of the productivity losses due to premature mortality, an average employment rate of 61.8% was used which is probably an overestimation of the reality because the likelihood of higher unemployment rates among problem substance users was not taking into account (Henkel, 2011).

For certain substance-attributable diseases, the intangible costs could not be calculated due to the lack of DALYs for those diseases[20].

4.2. CRIME COSTS

Discussion of the results

The substance-attributable crime costs of alcohol, tobacco, illicit drugs, and psychoactive pharmaceuticals in Belgium for the year 2012 are estimated at 864 million euros (an average of the minimum and maximum estimation).[21] Those costs can be divided into direct costs of approximately 783 million euros and indirect costs of approximately 81 million euros. In addition, 10,900 life years were lost because of interpersonal violence in the year 2012, of which 3,619 lost life years can be attributed to alcohol and 796 to illicit drugs.

Approximately 64% of the **direct costs**, or 499 million euros, are public costs while 34%, or 271 million euros, are (private) tranfer costs due to property loss and anticipation to crime.[22] Looking at the public costs more closely, it can be seen that 62% is attributable to illicit drug use, 33% to alcohol, 2.73% to tobacco, 2.72% to psychoactive medication, and 0.13% to a combination of these substances. Concerning specific cost categories, the largest share of public expenditures is situated at the investigation level (45%, or 226 million euros) and for the sentence execution level (46%, or 230 million euros). Some minor expenditures could be found for the prosecution level (4.24%), the sentencing level (3.59%), and for prevention (0.71%). The public expenditures on research and coordination are negligible (0.02%). Concerning the **indirect costs**, 59%, or 48 million euros can be attributed to productivity losses due to incarceration (an average of minimum and maximum estimation) and 41%, or 33 million can be attributed to productivity losses because of premature mortality. Of the indirect costs, on average, 53% is estimated to be attributable to illicit drugs, 47% to alcohol, and 0.26% to psychoactive medication.

As discussed, the majority of social costs related to substance misuse are related to health care. Only 783 million euros, or 27% of the total direct costs is attributable to crime. These numbers may create,

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[20] Acute pancreatitis, cardiac dysrhythmia, cholelithiasis, heart failure, laryngeal cancer, oesophageal varices, psoriasis, respiratory tuberculosis, urinary tract cancer, pulmonary heart disease, atherosclerosis, subacute and acute endocarditis.

[21] The costs for the penitentiary institutions are based on the annual number of incarcerations and the population on a given date (March 1, 2012). However, it is possible to be incarcerated for multiple offences at the same time. In order to avoid overlap when calculating the costs, we use a minimum and maximum estimation of the total expenditure. The minimum calculation only takes incarcerations into account for a single offence (e.g., only a violent crime). The maximum calculation takes incarcerations into account for a specific offence among other offences (e.g., a violent crime and a property crime). A similar calculation was used for the costs related to the sentencing courts.

[22] The remaining 2% can be attributed to tax refunds for preventive measures against burglary.

or even confirm, for some, the idea that it is not as important to know the social burden of substance-related crime as it is to know the social burden of substance-related health consequences, a notion that is indeed followed by the majority of social cost studies on substance misuse. They tend to focus solely on health care costs and leave out crime costs. Still, it is important to estimate the costs associated with crime for 3 reasons (Czabanski, 2008). First, it shows the relative importance of the problem. The cost of crime estimates can put crime in a broader perspective of other social problems (Cook & Ludwig, 2000). Second, revealing the seriousness of a particular kind of crime can help prioritise public action (Dominguez-Rivera & Raphael, 2015). The cost of substance-related crime estimates can put substance-attributable crime in perspective compared to other crimes. Third, knowing the costs related to crime will ultimately allow a cost-benefit analysis in the field of criminal justice to be conducted (Brand & Price 2000; Dominguez-Rivera & Raphael 2015). The SOCOST study is one of the first empirical social cost studies on substance misuse that has included such an extensive estimation of the associated crime costs, and the first study to do so for Belgium. With this in mind, some remarks and comments are needed.

Strengths and limitations

As established in the introduction of this summary, social cost studies of substance misuse that include crime most often use a narrow definition of crime, limiting themselves to direct costs in response to crime (i.e., the criminal justice system). The SOCOST study however, drew from the example of previous cost-of-crime studies, followed the conceptualization of Moller and Matic (2010), and included **a broad definition of (substance-attributable) direct costs** in response to, as a consequence of, and in anticipation of crime (Moolenaar et al., 2012; Cohen, 2005). In addition, indirect and intangible costs were included. By using this broad definition, a large array of substance-attributable crime costs could be included, leading to a uniquely extensive and comprehensive cost estimation, especially in comparison to previous social cost estimates of substance misuse. Still, there is room for improvement, as not all cost items as mentioned by Moller and Matic (2010) could be included. This was the case for costs not previously measured in other studies (household services, insurance, offender costs, non-governmental crime prevention programmes, long-term consequences of victimisation, fear of crime, and emotional and psychological harm) and/or for costs that could not be measured due to data limitations (property damage, lost household work, lost school days or work days [victims], private legal expenses, and victim services).

Social cost studies strive to determine **the proportion of non-consensual crimes that are attributable to substance misuse**. Contrary to substance law violations, only a part of these crimes can be attributed to substance misuse. The literature review revealed that, although different methods are employed to estimate SAFs, most studies simply build on previous research and adapt existing numbers to the context under study, making their estimates highly unreliable (e.g., Xie et al., 1998; Mark et al., 2001; Pacolet et al., 2003; Miller et al., 2006; Hansen et al., 2011). The SOCOST study, on the other hand, included not only substance law violations, but also property, violent, and sexual crimes. Attributable fractions were estimated not only for each substance (alcohol and illicit drugs) separately, but also for each crime and for each level of the criminal justice system separately. This allows for a more precise estimate of the amount of crime that can be attributed to alcohol and illicit drug use and therefore, makes the study unique. Still, these calculations have some limitations: 1) the SAFs at the investigation level are based on given estimates and adapted for the other levels of the justice system; 2) contrary to the illicit drug-attributable fractions on the investigation level (De Ruyver et al., 2008), the alcohol-

attributable fractions could not be based on existing Belgian research; and 3) no SAFs for tobacco of psychoactive medication could be calculated. In addition, Pacula et al. (2013) point out that traditional SAFs are only able to include the drug-crime link for direct non-consensual crimes, but overlook the effects of indirect non-consensual crimes (e.g., theft out of poverty because of substance (mis)use).

4.3. TRAFFIC ACCIDENT COSTS

Discussion of the results

In 2012, the substance-attributable traffic costs of alcohol, illicit drugs, and psychoactive medication comprise 281 million euro in Belgium. The direct costs were estimated at 104 million euros and the indirect costs at 177 million euros. In addition, 25.900 healthy life years are lost because of traffic accidents caused by alcohol, illicit drug and/or psychoactive medication.

Within the **direct** cost category, hospitalisation of traffic victims (35% of the direct costs) and police detection of drivers under the influence (31% of the direct costs) were responsible for the majority of the substance-attributable costs.

The **indirect** costs are mainly caused by lost productivity from premature mortality. About 55% of the indirect costs could be attributed to alcohol, 13% to illegal drugs, 15% to psychoactive medication and 17% to the combination of multiple substances.

Strengths and limitations

This SOCOST study estimated the impact of substance related traffic accidents on society and presented these traffic costs in a **separate category**, contrary to previous research where it was not clear to what extent traffic accident-related costs were estimated (Fenoglio et al.*,* 2003; Varney & Guest 2002; Jarl et al., 2008). The SOCOST study is also unique in the sense that the social costs are estimated for traffic accidents caused by alcohol, illegal drugs and psychoactive medication.

It has been difficult, however, to determine the proportion of the total traffic accidents caused by substance (mis)use. Previous social cost studies, for example Jarl et al. (2008) used national data to estimate the alcohol attributable fraction of motor vehicle accidents. Another social cost study of Varney and Guest (2002) had no data from the fire brigades to determine the percentage of road traffic accidents caused by drunk driving. The SOCOST study could not use national police or hospital data for the **substance-attributable fraction** (SAFs). As an alternative, the prevalence rates are used of the DRUID studies for drivers in general traffic and for drivers who have been injured in traffic accidents (Isalberti et al., 2011; Houwing et al., 2011). However, these results should be interpreted with caution since the DRUID studies estimated the prevalence rates for the years 2007-2010 and the representativeness of the samples could be questioned.

5.1. RECOMMENDATIONS FOR FURTHER RESEARCH

In order to deal with the limitations of social cost studies, we formulate recommendations for future (social cost) studies. First, future social cost studies should estimate the social cost of multiple substances (alcohol, tobacco, illegal drugs and psychoactive medication), as was the case in the SOCOST-study. Future social cost studies should include the costs related to new psychoactive substances (NPSs) as well, in view of an increasing number of NPS seizures by law enforcement and a growing number of serious harms to users due to NPS over the past few years in Europe (EMCDDA, 2015a; Plettinckx et al., 2016). Second, social cost studies should perform subgroup analyses. By doing so, social cost studies might be able to formulate specific policy recommendations for different target groups, i.e. *targeted interventions* for at-risk groups. For example, the SOCOST study could be expanded with a subgroup analysis by taking into account the type or the age of the substance (mis)user[23] or distinguishing between particular illicit drugs (e.g. cannabis, cocaine, heroin). Third, each country should use the same methodology in order to conduct cross-country comparison on the social costs (Lievens et al., 2012; Ritter, 2007).[24]

Next to these overall recommendations for future social cost studies, we also formulate research recommendations for the health, crime and traffic accident costs.

5.1.1. Health

Future studies examining the social costs of substance (mis)use in Belgium should ideally deal with the limitations (e.g. calculation of SAFs, interaction effects of combined substance use, missing costs) identified in the current research. Future social cost studies of substance (mis)use should include **subgroup analyses** to assess the impact of socioeconomic variables (e.g. age, employment status, education) on cost outcomes associated with healthcare resource use. In addition, future social cost studies on illicit drugs and psychoactive pharmaceuticals should differentiate between **specific substances** such as cocaine, cannabis, benzodiazepines and antidepressants. The findings of subgroup analyses based on socioeconomic status and particular substances' (mis)use can provide relevant information to governments helping them prioritizing their policies to specific target groups and/or substances. Further studies should also consider the social costs associated with novel psychoactive substances since the use of these substances are also associated with a number of adverse somatic and mental health conditions (Zawilska & Andrzejczak, 2015).

5.1.2. Crime

The SOCOST study was able to estimate SAFs for each level of the criminal justice system and for each type of crime separately. Although this is an important strength of the study, these estimates had to be adapted to the other levels of the justice system, as no reliable estimates for these levels could be found. A separate study is required to determine the **substance attributable fractions** for each type of crime and at each level of the Belgian criminal justice system independently in order to obtain more accurate estimates. A better registration of substance intoxication or involvement on every level of

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[23] For example, Gordon et al. (2006) reported that problem drug users account for 99% of the total cost of Class A drug use in England.
[24] To this end, the European research LEADER (Looking at Economic Analyses of Drugs and the Economic Recession) project tries to develop a guidance kit to estimate the social costs on addiction.

the justice system would facilitate such a study. However, registration of intoxication at the time of offence would not make such a study unnecessary, as substance *attribution* encompasses more than just substance *involvement* or intoxication at the time of offence (e.g., it is possible to commit theft in order to buy drugs while not being sober at the time of the offence). Not only psychopharmacological crimes, but also systemic and economic-compulsive crimes should be taken into account, as well as intoxication of the victim.

In addition, so far there exists no accepted international methodology to estimate these SAFs for crime (Single et al., 2003), as is the case for the calculation of health care costs. Difficulties are observed in determining the SAFs for crime, since there is discussion about the causal link between crime and substance misuse. For the calculation of health care costs, there are generally accepted calculations available that stipulate how much of a given disease (e.g., HIV infection) can be attributed to a certain cause (e.g., illicit drug use). For costs of crime, this kind of calculation method has not yet been properly developed, mainly because there is no methodological standard, and thus no agreement on how to do this (Schils et al., 2015).

Further research should also pay more attention to the **inclusion of costs related to the victims of crime**. First, the calculation of SAFs should include cases were only the victim was under influence at the time of offence.[25] Individuals who (mis)use alcohol and/or illicit drugs are more likely to become victims of crime (Shepherd et al., 2006). Second, the SOCOST study only took the costs for (governmental) victim services into account and only to a limited extent. Although this is an important cost category, our international literature review only counted two studies estimating these costs (Miller et al., 2006; Wall et al., 2000). Thus, future research should pay more attention to estimating these costs for victim services. Third, when calculating certain indirect or intangible costs of crime, it might be necessary to look at the "dark number" of crimes or victimisation studies to obtain more reliable estimates of the actual number of crime victims. Examples are productivity loss due to lost work days, school days, or household work, the long-term consequences of victimisation, emotional harm, and fear of crime.[26] This is also true for some direct private costs such as property loss and damage.

However, when including intangible costs related to victimisation, and more specifically to fear of future victimisation (fear of crime) (Hardyns & Pauwels, 2010), some precaution is necessary. Estimating these intangible costs is a complex undertaking that faces methodological difficulties and data limitations that undermine estimation accuracy (Dominguez-Rivera & Raphael, 2015). If taking these intangible costs into account when designing policy, these methodological flaws should be kept in mind and the normative implications of policy alternatives should be considered as well (Tonry, 2015). There is a risk of exaggerated estimates concerning the monetary valuation for victimisation, which is dangerous when informing strict sentencing and punishment policies solely from the crime victim's point of view (Tonry, 2015).

The SOCOST study presented the results for crime by level of the criminal justice system and by substance, but was not able to present other **subgroup analyses**. Future social cost studies should include such additional subgroup analyses; for example, the crime costs could be presented by

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[25] In the SOCOST study, this was only included in the calculation of the illicit drug-attributable fractions.
[26] These costs could not be estimated within the SOCOST study.

different age groups. This is important, as it is generally known that only a small group of offenders is responsible for the majority of crime, and thus also the crime costs (Farrington, 2003). Although a subgroup analysis will not change the overall picture concerning crime costs, it will allow for more accurate and better targeted crime prevention.

5.1.3. Traffic accidents

Future social cost studies might consider the possibility to present the traffic costs separately, as was the case in the SOCOST-study. Furthermore, studies should systematically take into account the traffic costs related to **illegal drugs and psychoactive medication**, given the impact of these substances on road traffic accidents. In fact, the DRUID study has detected illegal drugs and psychoactive medication in more than 10% of the seriously injured drivers in Belgium (Isalberti et al., 2011). Moreover, multiple studies have proven that benzodiazepine use constitute a problem in traffic safety (e.g. Drummer, 2008; Barbone et al., 1998; Engeland et al., 2007; Movig et al., 2004)[27].

The SOCOST study presented the hospitals costs for traffic accidents by type of vehicle. Further social cost studies might also include **subgroup analyses**, for example, the traffic costs could be presented for different age groups or by level of blood alcohol concentration.

5.2. RECOMMENDATIONS FOR DATA COLLECTION

The SOCOST study uses a conceptual and methodological framework, based upon the international literature, to estimate the social costs of addictive substances for Belgium. Despite this framework, these estimations should be interpreted with caution. A social cost study requires extensive data collection from multiple sources. Data were mainly retrieved from existing registration systems which are often incomplete and/or created for other purposes. Consequently, the costs calculations of health, crime and traffic are affected by flawed or inconvenient data.

A good registration is thus essential for a social cost study (Single et al., 2003). This makes cost studies an excellent device to identify information gaps, research needs and desirable refinements of the national registration systems (Single, 2009). This section discusses the recommendations for data registration in order to improve the health, crime and traffic cost estimations.

5.2.1. Health

For health, a number of gaps in the availability of data were identified, especially related to **ambulatory care**, that could be associated with substance (mis)use. This was the case for ambulatory Accident and Emergency care, ambulatory mental health care centres, ambulatory contacts with physicians, home-based nursing care, and non-medical home-based care. For these categories, no SAFs could be identified. So, alternative calculation approaches (based on the SAFs used for the calculation of the costs for inpatient care associated with substance use) were used to estimate the proportion of ambulatory health care resource use. It is clear that this resulted in a considerable underestimation or overestimation of the reality. The development of more accurate data collection systems for each of these categories should receive priority, since they accounted for about 22% of the total health-related substance-attributable direct costs. These data registration systems should be

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[27] There is still uncertainty about other psychoactive medications (e.g. antidepressants stratified in selective serotonin re-uptake inhibitors) (Ravera et al., 2011)

constructed in such a way that they are able to identify the proportion of cases that could be attributed to substance (mis)use to the total number of cases. For example, for GPs, registration of patients suffering from substance misuse could be embedded within the Belgian network of Sentinel General Practices since the aim of this recording system is to evaluate public health problems and their importance within the population in Belgium[28].

The findings of a recent study (Heyerdahl et al., 2014) identified that, in a number of European countries, data collection on **emergency department** presentations with acute recreational drug toxicity already exists and is being supported by the EMCDDA. However, considerable differences between countries were observed with no such data collection identified for Belgium. So, it is noteworthy to report that, today, a data collection system registering ambulatory emergency department visits in Belgium is being established. In this system – called UREG – information on among others diagnosis (based on ICD-10 codes) is included. Up to the end of 2015, the registration system was voluntary, but from 2016 on it will be mandatory for all approved emergency department services in Belgium. One of the variables included in the UREG-registration is the reason for admission to the emergency department. Within this variable, several categories are considered such as traffic accident, fire and/or explosion, forensic intervention, but also 'substance misuse'. For certain of these categories further details can be provided. For example, for the category 'traffic accidents', these are 'pedestrian', 'driver', and 'passenger'. For substances however, no further subdivisions exist. So, for the variable 'substance misuse', we propose to add the possibility to differ between the specific substance categories (alcohol, tobacco, illicit drugs, psychoactive pharmaceuticals).

The possibility of **linking information** from different sources such as Health Interview Survey data, Minimum Hospital Data, Minimal Psychiatric Data and data from the Intermutualistic Agency (IMA) should be considered because evidence suggested that linking for example administrative data to disease registries significantly increased the ability to analyse the costs of treating specific conditions (Riley, 2009). It is obvious that several issues such as privacy, ethical challenges, added value, data ownership should be accounted for. Linking different data sources also faces a number of logistical challenges. So, designing an effective software solution is one of the most challenges tasks (Wang & Krishnan, 2014). We can refer to the mission of the Belgian e-Health platform reporting the 'organisation of cooperation with other public services working on the coordination of electronic services'[29]. Potential relevant electronic platforms are 'Vitalink'[30], and 'hubs'[31].

5.2.2. Crime

Within the included cost categories of crime (Bowles, 2009), **not all relevant cost items could be calculated**, due to missing data. This was the case for tobacco and psychoactive medication-attributable fractions, the Jury for Ethical Practices in Advertising, closed (at the time) federal youth institutions, Flemish community youth institutions, civil services and fire departments, Houses of

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[28] This information was derived from https://www.wiv-isp.be/epidemio/epien/prog10.htm on 22/02/2016
[29] This information was derived from
http://health.belgium.be/eportal/Healthcare/Telematics/Links/eHealth/17878721?ie2Term=ehealth&ie2section=9126#.Vs8IqP7VyHs on 24/02/2016.
[30] Vitalink is a digital platform of the Flemish Government aimed at safely sharing health care and social care data (this information was derived from http://www.vitalink.be/VitaStart.aspx/ on 24/02/2016).
[31] Hubs enable the consultation of hospital-based data by health care providers. There are currently 5 hubs: 'Abrumet' (Brussels), 'ARH' (Antwerp), 'COZO' (Ghent), 'RSW' (Wallonia), and 'VZNHUB' (Leuven). This information was derived from https://www.healthconnect.be/en/blog/alles-op-een-rijtje-ehealthbox-vitalink-en-hubs on 24/02/2016.

Justice (victim support, primary legal assistance, social surveys, and advisory reports), and the National Institute for Criminalistics and Criminology. In addition, data limitations resulting from incomplete data registration has caused incomplete and flawed calculations. This was the case for the data on alcohol and illicit drug-attributable fractions, the Federal Agency for Medicines and Health Products, the Public Prosecutor's Office, the general courts, penitentiary institutions, and French community youth institutions. In other words, improving data registration will result not only in a more complete, but also in a more precise and accurate substance-attributable crime cost estimate.

Four areas of data registration demand more attention. First, to enable a more accurate estimate of the SAFs, **case registration on all levels of the criminal justice system** should be required to include registration of substance intoxication and substance involvement. This should be done for every substance separately. At present, this registration is already possible on the investigation level (in the police reports of the integrated police), although it is not mandatory. Second, **illicit drug crimes should be systematically registered in more detail** on all levels of the criminal justice system, making a distinction between drug possession and other types of drug law violations, such as trafficking and dealing.[32] Third and ideally, **vertical integration of data registration** between the different levels of the criminal justice system would make it possible to use a uniform definition of relevant cases on all levels of the justice system (Van Dael & De Bruycker, 2014). Fourth, there should be a **consistent registration of the number of new (and reopened) cases by type of offence** on all levels of the criminal justice system and for all services within each level. More specifically, the following items were missing in the SOCOST study. On the level of the Public Prosecutor's Office, the number of civil versus criminal cases were missing. The number of new (and reopened) cases by type of offence (with specific attention to alcohol law violations) were not available at the level of the police prosecutor's office. In addition, no new and reopened cases by type of offence were available at the level of the juvenile prosecutor's office. Likewise, on the level of the general courts, all criminal courts should made available the new (and reopened) cases by type of offence. On the sentence execution level, the budget allocated to the different youth institutions on the individual or community level should be clearly registered, as should the number of new cases by type of offence for all youth institutions. The number of social surveys, advisory reports, victim support, and primary legal assistance should be registered by the Houses of Justice by type of offence. The economic activity of the prison population prior to detention (no legal income, income through labour, or income through social security payments) should be registered as well. Finally, the civil services and fire departments should ensure a complete registration of the number of fires and other interventions by cause.

5.2.3. Traffic accidents

The SOCOST study estimated the social costs for traffic accidents caused by alcohol, illegal drugs and psychoactive medication. However, not all relevant cost items could be calculated due to missing data. This was the case for ambulatory accident and emergency care, public prosecutor's office, a community service sentences project and the civil service and fire department[33]. For the recommendations on the data collection of ambulatory accident and emergency care, the public

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[32] This is already possible at the level of the integrated police. Since 2012, the public prosecutor's office has also made progress. Amongst others, a new detailed list with nomenclature codes have been created and the link between the statistics of the public prosecutor's office and the police have been improved.

[33] Furthermore, the substance attributable costs of the community service sentences project (safe bicycle riding training of Pro Vélo) could not be calculated since there was no information about the traffic violations of the offenders (e.g. alcohol intoxication, speed violation).

prosecutor's office and the civil service and fire department we refer to the paragraphs of health and crime (section 5.2.1. and 5.2.2.). It is noteworthy to report that the cost calculation of emergency departments will be possible in the near future with the UREG registration system.

Furthermore, for the hospital costs, it was difficult to determine the correlation between substance (mis)use and traffic accidents due to limitations of the existing databases. The possibility of **linking information** from different sources such as hospital and police data should be considered. It should be stressed though, that in particular when linking health and criminal justice data, ethical and privacy issues should be taken into account.

Firstly, the number of road traffic accidents is underreported in the police statistics. Depending on the severity of the accident and on the injury of the victim, the police will be informed of the traffic accident. Furthermore, the current official accident statistics in Belgium[34] make a distinction between minor, serious and deadly injuries, however, the severity of injuries is subjectively assessed by the police officer without any medical criteria. Consequently, the number of *seriously* injured road traffic victims are mainly underreported in the official accident statistics. In 2011, the hospitals recorded 2.5 times more seriously injured road traffic victims than the police (Nuyttens & Van Belleghem, 2014; Nuyttens, 2013). A more complete picture would emerge if the variables of police and hospital records would be linked. The European Commission (2013) proposed a link between police and hospital data in order to have the most complete set of information at disposal, and to reduce the risk of underreporting and misreporting[35].

Secondly, it is difficult to determine the percentages of drivers under the influence. We are confronted with "under testing" of substance use in the police registration in the case of traffic accidents. In 2012, 63% of the drivers involved in a traffic accident have been submitted to an alcohol test (Focant, 2013). Ideally, all drivers involved in road traffic accidents are **systematically tested** for **all substances**, and not just for alcohol, in order to determine the association between substances and road traffic accidents.

5.3. POLICY RECOMMENDATIONS

SOCOST: one element in informing the debate on substance policy and resource allocation

Social cost studies can play an important role in the establishment of a substance policy. However, caution must be applied when using the results of a free-standing social cost study for policy (decision making) purposes. For example, social cost studies do not allow to cover questions related to regulation or legalisation, nor can they evaluate the costs and health gains of drug treatment interventions (Moore & Caulkins, 2006). The added value of social cost studies lies exclusively in the fact that these cost estimates help us to understand the scale of problems issuing from substances and to target specific problems and policies (Bhattacharya, 2016).

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[34] In most European member states (including the Netherlands) the police decides on a subjective assessment whether a road traffic victim has suffered serious or minor injuries.

[35] The method to link between police and hospital data might take different forms between Member States, and the link between these data sources requires the development of various technical or procedural solutions. Moreover, the principles of integrity and data protection must be kept in mind during the linking of these databases (European Commission, 2013).

Legal drugs impose the highest cost to society since 45% (2.1 billion euros) of the social cost on substance misuse can be attributed to alcohol and about 32% (1.5 billion euros) to tobacco. Illegal drugs comprise about 16% (726 million euros) of the economic burden and psychoactive medication 5% (215 million euros). It is clear that **alcohol and tobacco** costs far exceed those of illicit drugs and psychoactive medication. Taking into account the social costs of the different types of substances, it is recommended to prioritize the development of a Belgian alcohol and tobacco plan. For the development of such a plan, the 2006 EU Alcohol Strategy (European Commission, 2006) and the 2014 Tobacco Directive on the manufacture, presentation and sale of tobacco and related products offers guidance (EU, 2014).

Next, the SOCOST study identified different costs categories, confirming that the substance phenomenon is multidimensional. Various sectors (welfare, public health, policing and judicial authorities, transport, etc.) are confronted with the problem of addictive substances. Therefore, the Belgian government should continue the implementation of an integral and integrated substance policy (De Ruyver et al., 2009). **The need for an integrated approach** is raised in the Joint Declaration of the Interministerial Conference on Drugs (2010) and in the Flemish vision statement 'towards an integrated and recovery orientated care for people with addiction problems'.[36]

Moreover, extensive consultation between the **different levels of government** will be especially important after the communisation of the competencies regarding treatment from the national level to the states. This SOCOST study presented the public direct costs (by policy level) for the year 2012, and calculated that approximately 97.7% of these public costs are paid by the federal government and 2.2% by the states. The composition of the public direct costs changes after the full implementation of the sixth state reform in Belgium. For example, the specialised drug treatment services (day centres, crisis intervention centres, medical-social care centres and therapeutic communities), tobacco cessation and the federal addiction fund subsidised by the Belgian National Health Insurance Institute all became a state competency. Moreover, houses of justice, mental health consultation platform and other parts of treatment such as sheltered housing, psychiatric nursing homes and parts of the competencies for psychiatric hospitals have been communized as well. It has been calculated that approximately 85.4 million euro will transfer from the national level to the states (based on social cost results of the year 2012) (Vander Laenen, in press).

Clearly, a social cost study has its merits. It allows decision makers to monitor the resource allocation in accordance with the economic burden of the different health problems (Bhattacharya, 2016). Social cost studies do not inform though what the optimal allocation shares should be. In general, what is an 'appropriate' or desired (balance in) budget allocation will depend on the criteria deemed to be essential in (drug) policy decision making. It could mean that the governments need to strive for budget allocation in accordance with the relative burden of the different types of substances. It could mean allocating the resources to cost-effective programmes (McDonald, 2011). There are thus multiple meanings of the word balanced, and it is interpreted differently by academics and politicians (Vander Laenen, 2012).

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[36] Caring for people with addiction problems should include screening and early intervention strategies in primary care, client participation, and locally and regionally embedded integrated care that is adapted to the health care needs of the user (Vandeurzen, 2015).

It is clear that evidence-based policy making needs a full policy evaluation which can only be completed by **combining information** about social costs with a range of other types of information and studies (e.g. epidemiological data about new trends in substance use and groups of (problem) substance users, data about target groups in prevention, early intervention, harm reduction and treatment, evaluation and cost-effectiveness studies). Consistent with WHO (2012), OECD (2015) and the EMCDDA (2011), we formulate policy recommendations based upon existing **evidence for cost-effectiveness**. In fact, the EU drugs strategy (2013-2020) also supports this evolution by stating that actions must be evidence-based and cost-effective. It is important for policy makers in particular to be aware of the cost-effectiveness of possible programmes as well as the longer term impact on the community (Pawson & Tilley, 2004).

A balanced substance policy, however, cannot be solely based on social cost and cost-effectiveness studies. Tonry (2015), for example, criticized the use of intangible "social costs of criminal victimisation" to legitimize unjust 'though on crime approaches'. Fundamentally, social cost studies run the risk of begin misused for policy means because money is the common metric to place various benefits and costs on a common footing (Dominguez-Rivera & Raphael, 2015). In practice, it is clear that policy formation is a process influenced by a **combination of factors and different interest groups**. Babor et al. (2010) refer to this as the "policy arena". Substance policy is influenced by the public opinion and the public support for (cost-effective) interventions.[37] It has been proven that not only cross-cultural differences occur in the social acceptance of alcohol use (and drunk driving), but also regarding the attitude towards alcohol countermeasures (Beullens & Schepers, 2013). Furthermore, other groups such as the alcohol, tobacco and pharmaceutical industry or public interest groups influence the policy debate. For example, the alcohol industry may obstruct the implementation of initiatives that influence the alcohol price or availability. Next, industry actors emphasise the economic importance of their product (as employers and through tax revenue generated) (Caswell & Maxwell, 2005; Hope, 2006; McCambridge, Hawkins & Holden, 2014). Moreover, other criteria such as political feasibility and ideological opinions determine (the) policy (debate). The tension between individual rights, the restriction of these rights and public health becomes clear if the government imposes interventions that restrict the liberty of its citizens in order to serve the common good (Bayer, 2007). For example, interventions that reduce the availability of alcohol might not be politically popular in a society influenced by free markets and consumer rights (Jernigan et al., 2000). Next, the current illegal status of a substance will influence the substance policy as well. From a health perspective it has been argued for many years now that the legal status of a drug is irrelevant (Bell & Campion, 1979); from a law enforcement perspective, this status is highly relevant. In this respect, the reinforcement of social norms might be a determinant to retain, non-cost-effective, interventions such as incarcerations of substance using offenders (Freudenberg & Heller, 2016).

Finally, in the policy (debate), different views towards the accessibility of health care may exist. At one end of a wide spectrum, an individual is responsible for his own health and pays for his own medical care like for other consumer goods. At the other hand of the spectrum are those who see health as special so that society should be responsible for ensuring everyone has access to care, regardless of their ability to pay (Mariner, 2007). Further complicating matters is that governments and health

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[37] The Eurobarometer provides insights on the citizen's attitude towards alcohol interventions. This survey shows that the majority of EU citizens support random police checks for drunk driving and a lower blood alcohol concentration limit for young drivers (European Commission, 2010).

systems are confronted with a number of problems such as increasing costs while available financial resources are under pressure (Bhattacharya, 2016). In this context, affordable and equal access to healthcare for citizens can be under threat.

In this final section, we repeat the main conclusions of each cost category (health, crime and traffic accidents) and formulate recommendations for the Belgian substance policy based on the social costs results. We discuss which psychoactive substances involve the greatest economic costs in order to target specific problems and policies (WHO, 2014). In addition, we evaluate the drug policy mix, by looking at the components of the direct costs such as health care, law enforcement and prevention.

Policy recommendations are formulated based on these social cost results. Furthermore, we provide *examples* of (cost-)effective substance policy interventions. However, for Belgium, overall there is a lack of research that examines the (cost-) effectiveness and feasibility of interventions. The examples given are thus based on predominantly international research. So, further research is needed to address the applicability and (cost-) effectiveness of these measures to the Belgian context and the target population.

5.3.1. Health

The majority of the direct health-related direct costs associated with substance (mis)use were due to hospitalisation admissions to general and psychiatric hospitals (1.47 billion euros – 74%). Half of the hospitalisation costs (general and psychiatric) were associated with alcohol (mis)use, followed by tobacco (34%). Hospitalisations due to illicit drug and psychoactive pharmaceuticals' use accounted for about five per cent each. This accounted for 128,689 care episodes in general hospitals and 42,359 care episodes in psychiatric hospitals that could be attributed to substance (mis)use. The main cost driver associated with hospitalisations in general hospitals for alcohol and tobacco were admissions due to circulatory diseases. For illicit drugs and psychoactive pharmaceuticals, the main cost driver of substance-attributable hospitalisations in general hospitals were mental disorders and injury and poisoning respectively. Substance-attributable costs resulting from admissions to psychiatric inpatient facilities were essentially associated with admissions due to alcohol (mis)use (498 million euros, 71.5%). Psychiatric hospital admissions due to multiple substance use accounted for 58.8 million euros (8.4%). In the SOCOST study, only 0.4% (8.3 million euros) of the direct substance-attributable costs were aimed at prevention. These results are still in accordance with the findings reported in the public expenditure study Drugs in Figures III (Vander Laenen et al., 2011), which revealed that prevention was also only a fraction (1.24%) of the public expenditures on illegal drugs, alcohol and psychoactive medication in the year 2008.

Preventing care episodes in hospitals

To prevent the number of care episodes in (psychiatric and general) hospitals, the role of general **ambulatory health care services in the detection, diagnosis, early intervention and care** for people with addiction problems should be strengthened.[38] In the context of this recommendation, we concur with the recommendations of the recent BELSPO research project 'Up to date. Use of psychoactive

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[38] The shift from institutional care to more community-based care is also ongoing in mental health care through the 'Psy107' project. The aim of this project is to reduce the number of inpatient beds in psychiatric hospitals and use the available resources for mental health care delivery in the community. It is yet clear that inpatient facilities will continue to be needed since a number of patients will need inpatient treatment.

substances in adults: Prevention and treatment by general practitioners and occupational physicians' (Vanmeerbeek et al., 2015). In this report, it is suggested that educational programmes for GPs should include strategies aimed at the detection, brief interventions and referral possibilities for alcohol and other drug problems. It was also recommended that more support (e.g. intervision, training, individual support) is required for GPs treating patients with substance misuse. In addition, collaboration between GPs and **occupational physicians** should be supported. According to the report, today there is a lack of best practices regarding the collaboration between GPs and occupational physicians. This is important since in the SOCOST-project, the substance-attributable costs associated with productivity losses were found to be substantial. In line with this study, the findings of a study across 31 European countries suggested that a strong primary care is associated with better population health and lower unnecessary hospital admissions (Kringos et al., 2013). According to the findings of an Expert Panel Report on effective ways of investing in health, effective primary care can improve health and prevent diseases at earlier stages, but also stimulates people to engage in healthier behaviours (EXPH, 2014). So, **primary care health care services** can play **a substantial role** in the care for people suffering from addiction problems **in close collaboration with other health care services. Social care organisations** can also play an important role in the care for people with addiction problems. For example, social care organisations that intervene at home (e.g. Familiehulp, Familiezorg, Centrale de Services à Domicile, Aides familiales) can play a substantial role in detecting and referring individuals with addiction problems, while others (e.g. Centrum voor Algemeen Welzijnswerk, Services de Santé Mentale) can focus more on prevention and counselling. One of the findings of the above mentioned BELSPO study about substance misuse management by Belgian GPs was that multidisciplinary management including both residential and ambulatory services appears as a facilitator for the engagement of GPs (Vanmeerbeek et al., 2015). A recent KCE-report also concluded that the treatment gap for persons with problematic alcohol use is a multi-layered problem. Effective interventions to lower the treatment gap do exist, but to obtain maximal effectiveness measures have to be taken at all levels in a simultaneous way. Therefore, adequate financing in the primary and secondary care is required for an integrated and multidisciplinary care (Mistiaen et al., 2015).

In the SOCOST-study, the importance of **avoiding heavy alcohol consumption** in particular was confirmed in a scenario analysis in which only moderate alcohol consumption (0-39.99 g alcohol/day for males, 0-19.99 g alcohol/day for females) was considered. This resulted in a total saving of 560 million euros and 241 million euros for the direct and indirect costs respectively.

Preventing and reducing the burden of substance (mis)use
There is evidence supporting the **effectiveness and cost effectiveness** of particular strategies aimed at preventing or reducing the burden of substance (mis)use. Below, some examples to illustrate this are provided. This is however not a comprehensive overview.
The WHO identifies a number of 'best buys' interventions to tackle the burden of alcohol and tobacco. Best buy interventions are strategies that have significant public health impact, are highly cost-effective, inexpensive and feasible to implement. For alcohol, these are 'increase taxes', 'restrict access to retailed alcohol'**, and 'enforce bans on alcohol advertising'**, while for tobacco, 'raise taxes', 'protect people from tobacco smoke', **'warn about the dangers of tobacco',** and 'enforce bans on tobacco advertising' are considered as best buys (WHO, 2011). According to a WHO-report on the effectiveness and cost-effectiveness of interventions to reduce alcohol-related harm, an increase of alcohol selling prices results in a decrease of alcohol selling and alcohol consumption (WHO, 2009). An

evaluation of several interventions for smoking cessation (increased tobacco taxes, mass media campaigns, GP support, counselling strategies) identified that all of these strategies were cost-effective compared to current practice (Feenstra et al., 2006).

Some studies particularly examined the effectiveness of interventions aimed at **young individuals**. For example, based on the findings of a recent systematic review of interventions aimed at lowering the burden of substance use in young people, taxation, public consumption bans, advertising restrictions, and minimum legal age were found to be effective strategies. Evidence on the effectiveness of other measures for young people such as for example sales restrictions, mass media campaigns, self-help interventions with peers remains unclear (Stockings et al., 2016). Another example can be in the overview of Strang et al. (2012). This study identifies three interventions aimed at illicit drug use prevention for which supportive research evidence exists. These programmes include (1) **strengthening Families Programme** for young people aged 10–14 years and their parents, (2) **social or life skills training**, and (3) the **Good Behaviour Game**. These interventions do not focus exclusively or specifically on drug or alcohol use, but they aim to develop **pro-social behaviour and social skills** more generally. Carney & Myers (2012) conducted a systematic review and meta-analysis of the effectiveness of early interventions for substance-using adolescents. It was found that **early interventions** resulted in significant reductions in alcohol and other drug use. The review of Angus et al. (2014) also identified **screening and brief interventions** as a cost-effective option to tackle the burden of alcohol misuse in primary care. [39]

Moreover, **interventions in the workplace** might also be useful given the high productivity losses due to alcohol (778 million euros), tobacco (746 million euros) and to a lesser extent to illicit drugs (120 million euros) and psychoactive medication (90 million euros). In Belgium, many companies are unaware of the impact of substance misuse, or underestimate this problem (Tecco et al., 2013). [40] Since 2010, the Collective Labour Agreement 100 (CLA 100) [41] serves as the framework for an alcohol and substance use prevention policy at the work place. However, the study of Vanmeerbeek et al. (2015) recommends an evaluation of CLA 100 since only a minority of companies implemented a well elaborated policy. Moreover, the CLA 100 should also be implemented in the public sector. Another feature for the prevention of substance misuse at work relates to the occupational physician. This physician might play an important role in the field of substance misuse as health and safety promoter in the workplace. Studies indicate that workplace interventions such as health and life-style checks, psychosocial skills training and peer referral might produce beneficial results. However, there are mixed results concerning the effectiveness of these interventions (Webb et al., 2009).

The consensus in many cost-effectiveness studies is that "**illicit drug treatment** works" and that treatment produces social benefits that exceed its programmatic costs (Gerstein et al., 1994; Rajkumar & French, 1997; Cartwright, 2000; Harwood et al., 2002; Strang et al., 2012). **Screening and**

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[39] Further research to examine the (cost-) effectiveness of different screening and brief intervention strategies aimed at reducing the burden of alcohol misuse is required. In such studies, long-term effects and optimal 'intervention dose' of those strategies in terms of acceptability, effectiveness and cost-effectiveness should be accounted for.

[40] In this regard, the Securex study found that *13%* of the Belgian employees use *alcohol* in an unsafe way, furthermore more than 1% of the workers is not able to work once per month due to being under the influence of alcohol (Securex, 2008).

[41] Convention collective de travail n°100 de 1 avril 2009 concernant la mise en oeuvre d'une politique préventive en matière d'alcool et de drogues dans l'entreprise / Collectieve arbeidsovereenkomst nr.100 van 1 april 2009 betreffende het voeren van een preventief alcohol- en drugbeleid in de onderneming. Available at: http://www.nar.be/cao-COORD/cao-100.pdf

brief intervention programmes to reduce the burden of illicit drug use have, on average, only small effects, but can be widely applied and are probably cost-effective (Strang et al., 2012). Furthermore, we recommend to invest more in harm reduction in order to avoid costs in the more expensive sectors treatment and enforcement (Vander Laenen, 2012). In the SOCOST, study, expenditures related to harm reduction were limited to 0.11% of the total public direct costs. It has been proven that interventions such as **needle syringe programmes, opioid substitution therapy and drug consumption rooms** are cost-effective (Strang et al., 2012; Wilson, Donald, Shattock, Wilson & Fraser-Hurt, 2015; Rhodes & Hedrich, 2010). The findings of a health economic evaluation of supervised injection facilities in Ottawa (Canada) suggested that such a strategy appeared to be an efficient way of using financial resources (Jozaghi et al., 2014). Moreover, from the SOCOST-study, it was found that productivity losses due to premature mortality from hepatitis associated with illegal drug use amounted to 3.8 million euros (27% of the total illegal drug attributable premature mortality costs). Furthermore, in Europe, injecting drug use accounts for on average 64% of all HCV diagnoses (EMCDDA, 2014). This underlines the importance of screening, prevention, and treatment, in particular for hepatitis C in illicit drug users. In this context, we can refer to the Belgian integrated national HIV-plan 2014-2019[42] (B.S./M.B. 21.11.2013) (FPS Health, 2013).

Unfortunately, no cost-effectiveness research of prevention campaigns aimed at reducing the burden of **psychoactive pharmaceuticals** misuse was found. In accordance with Anthierens et al. (2007), we recommend that general practitioners need to be more aware of the addictive nature of benzodiazepines, and a non-pharmacological approach should be promoted as the best first approach. In accordance with the Belgian Psychotropics Experts Platform (BelPEP), a public media campaign is suggested to reduce inappropriate use of psychoactive pharmaceuticals (BelPEP, 2014). This prevention campaign could improve the attitude of the general practitioners towards a decrease of the prescription of psychoactive medication (by analogy with the campaign on antibiotics), ideally this campaign also focuses on the patients (target population of people aged 75 years and older). However, the cost-effectiveness of this intervention is unknown.

5.3.2. Crime

The total social cost of substance-related crime as estimated in the SOCOST study amounts to 864 million euros. If we take only the minimum direct and indirect estimations into account, we can adjust this number to 735 million euros. Approximately 54%, or 396 million euros of these social costs are direct public expenditures. Of those direct public expenditures on substance-related crime (minimum estimate), 57% goes to investigation and 32% goes to sentence execution while only 0.9% goes to (substance-attributable) crime prevention.

Thus, following the SOCOST results, the first general policy recommendation is that more attention should be given to the prevention of crime, since from a societal point of view it is better to prevent crimes from taking place in the first place rather than having to act upon them through the criminal justice system. In addition, the costs of preventive programs have shown to be lower in the long run than those of criminal justice interventions, even if the long-term social and economic costs are not taken into account (UNODC, 2010).

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[42] In this HIV-plan the link with (intravenous) drug use is clearly made (WHO, UNODC & UNAIDS, 2012). Moreover, in this plan harm reduction strategies for drug users are identified as one of the most important strategies to limit the risks associated with drug use (Vander Laenen, 2014).

In what follows, we shall specify some of the SOCOST results on the investigation and sentence execution level, link them to crime prevention recommendations as identified in the existing crime prevention literature, and give, where possible, examples of relevant effective and/or cost-effective measures. The focus lies on illicit drugs and alcohol-related crimes, as they generate the largest costs.[43]

Investigation level

Approximately 78%, or 196 million euros of direct public expenditures on the investigation level is attributable to the activities of the integrated police. If we look at these costs more closely, we see that the largest expenses are linked to substance-attributable property crimes, illicit drug law violations, and alcohol-attributable violent crimes. This indicates that attention should be given to the prevention of property crimes, with special attention to the link with illicit substance misuse, and the prevention of violent crimes, with special attention for the link with alcohol misuse (Bennet et al., 2008; Hope, 2014).

Research has shown that a criminal past and previous substance misuse reinforce each other in predicting future negative outcomes, such as recidivism (Walters, 2015). This suggests that both crime and substance misuse are, or become, part of a general criminal lifestyle. Those involved in a criminal/deviant subculture are at elevated risk of developing drug dependency problems, and those with drug problems are at elevated risk of becoming involved in crime (EMCDDA, 2007).

First, there is a need for more investments in targeted crime prevention programmes. Knowledge about the factors that put populations, communities, and individuals at risk of crime enable targeted prevention at these risk factors and strengthen resilience (UNODC, 2010; Bjørgo, 2015; Welsh & Farrington, 2010). Regarding drug-related crime, situational crime prevention, family support, and drug treatment are cost-effective measures (Stevens et al., 2005). Additionally, alternative sentences, accompanied with drug treatment, are promising (see below), as opposed to drug law enforcement and imprisonment, which are generally not very effective (Mazarolle et al., 2007; Werb et al., 2011; Freiburger & Lannacchione, 2011). Regarding violence, some studies identify aggression-training for violent offenders as an effective measure (Denson et al., 2011).

Second, many interventions, such as employment support, childhood intervention, or drug treatment are not earmarked as crime prevention although they indirectly prevent crime (UNODC, 2010; Robert et al., 2015), and it seems that activities that reduce the overall levels of problematic drug use have the greatest potential for reducing drug-related crime (Stevens et al., 2005). Therefore, the solutions to drug-related crime will involve wider social and economic policies. Drug-related crimes and nuisance specifically could be prevented by increasing treatment and harm-reduction initiatives. The goal of such initiatives is to guide substance misusers in such a way that, despite the substance

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[43] The costs related to tobacco and psychoactive medication are limited to substance law violations, as no tobacco or psychoactive medication-attributable fractions could be calculated to determine the proportion of non-consensual crimes attributable to these substances. Tackling these kinds of crimes might demand a different approach, as they are often systemic in nature (e.g., smuggling). For example, recommendations concerning tobacco law violations can be found in the EU Commission's action strategy to reduce illicit trade in tobacco products: European Commission (2013). *EU strategy to step up fight against illicit tobacco trade*. Brussels: European Commission. http://europa.eu/rapid/press-release_IP-13-512_en.htm

misuse, crime is no longer a consequence and the development of criminal careers can be avoided. Examples are night and day care centers and drug consumption rooms (Bayoumi & Zaric, 2008; Zurhold, 2003; Enns et al., 2015). Drug consumption rooms are especially promising in tackling nuisance while advancing users' health and well-being (Wood et al., 2004). According to some studies, they might even reduce property crimes in the surrounding areas (Wood et al., 2006).

Sentence execution

Approximately 70%, or 89 million euros of the direct public expenditures on the sentence execution level (minimum estimation) is attributable to incarceration, and the majority of costs is attributable to illicit drug law violations As the last step in the criminal justice system, if possible, incarceration has to be avoided, especially since it is rarely an effective measure in reducing criminal behaviour and recidivism (Smith et al., 2002). The only way the costs for incarceration can be reduced is by limiting the number of people who enter and stay in incarceration facilities by investing in alternatives to imprisonment on the different levels of the criminal justice system (Henrichson et al., 2015; EMCDDA, 2015b).

Based on previous research, the alternative handling/sentencing of substance-related crime, and more specifically crime that is linked to problem illicit drug use, should be continued and expanded. Not only does imposing an alternative sanction or measure on illicit drug users reduce criminal activity, this crime reduction also goes hand-in-hand with progress in several other relevant life spheres (De Wree et al., 2009; Cid, 2009; Plettinckx et al., 2014). Within the Belgian criminal justice system, some effective interventions are already being applied within the framework of judicial alternative sanctions and harm reduction. Examples are the Proefzorg project (diversion of drug-using offenders from prosecution level to [drug] treatment services) on the prosecution level and the drug treatment court (Gent) on the sentencing level (Eibner et al., 2006; Lind et al., 2002, Wittouck et al., 2012; Vander Laenen et al., 2013). On the sentence execution level, some alternative sanctions and measures are available, focusing on substance misuse, non-consensual crimes, and/or the link between substance misuse and the crimes committed (National Projects and projects within the Global Plan). However, most of these projects are financed on a project base, limiting the possibilities for structural financing, and with it also the continuation of expertise and need and opportunity for evaluation.

Finally, drug programmes and drug treatment during incarceration should be strengthened to avoid relapse in substance misuse and criminal behaviour once released from prison (EMCDDA, 2003; Mitchell et al., 2012). Many incarcerated offenders have substance (mis)use problems, and without drug treatment, these offenders are likely to persist in offending.[44] The period of incarceration offers an opportunity to intervene in the cycle of drug misuse and crime, address the (substance-related) issues contributing to criminal behaviour, and enhance the possibilities for rehabilitation. However, illicit drug treatment is provided to a very limited extent for Belgian detainees. The lack of drug treatment during detention is a well-known problem that so far has not resulted in a real solution (Vanhex et al., 2014). Belgian prisons do organise some promising but small projects and activities regarding illicit drugs, such as CAP/Step by Step; B-leave, and Prévenez-vous, but these projects do not include any real drug treatment programmes. In 2012, the DG EPI spent only 828,454 euros on these

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[44] For Belgium, an estimated 2/3 of all prisoners have already used illicit drugs in the past, and 1/3 still use illicit drugs in prison (Van Malderen, Vander Laenen & De Ruyver, 2009). See also
http://justitie.belgium.be/nl/themas_en_dossiers/gevangenissen/leven_in_de_gevangenis/drugsbeleid.

projects for the all of the 32 Belgian prisons. Not only should detainees have sufficient access to substance misuse prevention and care, they should also be sufficiently prepared for their release, aftercare, and continuation of their treatment in order to maximise results (Hedrich et al., 2012).[45] Offering a continuation of treatment has the greatest potential to reduce incarceration among substance-abusing offenders (McCollister et al., 2003).

5.3.3. Traffic accidents

Driving under the influence of substances is a major cause of traffic accidents (Reynaud et al., 2002). The social cost of traffic accidents caused by substances in Belgium is estimated to be 281 million euros, 65% of this cost could be attributed to alcohol, 11% to illegal drugs, 13% to psychoactive medication and 11% to combinations of multiple substances. The general **preventive measures** discussed above in the health recommendations to prevent **alcohol** use (e.g. higher prices, reduction of availability and advertising ban) could also prevent alcohol use in traffic. In this part, policy recommendations are especially formulated in order to prevent traffic accidents under the influence of substances, and to decrease the social costs in the future.

The fight against driving under the influence of *alcohol* requires a **change in attitude** to discourage alcohol use in relation to driving. Since 2003, the Belgian Institute for Road Safety (BIVV/IBSR) has conducted regular assessment of the DUI percentage among Belgian drivers (Riguelle, 2014). For the year 2012, the 'driving under the influence of alcohol' behavioural study reported that 2.4% of all vehicle kilometres driven in Belgium are driven under the influence of alcohol (>.22 MG/L). Belgium has a poor track record when it comes to driving under the influence in comparison to other countries (Riguelle, 2014). Additional efforts should be made to convince drivers that driving under the influence of alcohol is unacceptable. General education measures could raise the awareness of the dangers of drunk-driving. **Public awareness raising campaigns** seem to be effective in reducing alcohol-related crashes (Elvik et al., 2009; Elder et al., 2004; Delhomme, 1999).

To discourage drinking and driving, the government may choose to forbid the slightest amount of alcohol in the blood for all road users. To this end, a **BAC-limit of 0 g/l** might be a solution. The effectiveness of reduced BAC limits has been proven in multiple studies conducted in several countries (Mann et al., 2001; Asbridge et al., 2004; Fell and Voas, 2009). For example, Norström (1997) concluded that the implementation of 0.02% BAC in Sweden resulted in a reduction of fatal crashes of 6%. However, it should be mentioned that implementing a 0 g/L legal BAC-limit might entail that the enforcement system has to spend too much time on drivers with a BAC between 0 and 0.5 instead of focussing on drivers who are involved in most of the alcohol related crashes since they drive with levels far above the legal limit (Ecorys, 2014). As a result of this, the Belgian Institute for Road Safety (BIVV/IBSR) proposes, based on the high accident risk for young drivers, to implement a BAC-limit of 0.2 g/l for young drivers[46]. Significant beneficial effects of **lowered youth BAC** limits have been reported (Wagenaar et al., 2001; Zwerling & Jones, 1999). However there is no agreement on this measure, since opponents of lower BAC policies have argued that lowering the BAC limits is less effective for higher risk drivers such as young drivers (Babor et al., 2010).

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[45] See, in this regard, the National Plan for HIV, which also outlines some recommendations and points of action regarding drug use and health care in prison. http://www.breach-hiv.be/media/docs/HIVPLan/NationalPlanDutch.pdf
[46] Since January 2015, Belgium has implemented a 0.2 g/l alcohol limit for professional drivers.

Furthermore, the police could **increase the number of random roadside breath testing**. Multiple effect studies showed reductions in the number of drink-driving offenders (reduction of 25% after doubling the number of random breath test in the Netherlands, Mathijssen, 2005) and in the number of road crashes (reduction of 14%, Elvik et al., 2009) due to an increase in checkpoints. The Belgian Institute for Road Safety (BIVV/IBSR) attitude survey reported that only 14% of the drivers had been given a breathalyser test for alcohol one or more times by the police in the last 12 months (Meesmann & Boets, 2014), however this number significantly increased to 20% in 2015 (Meesmann & Schoeters, in press). The BIVV/IBSR suggests to annually test minimum one driver out of three, and these alcohol checks should be conducted at any time during the week in order to reach as many drivers as possible (Riguelle, 2014). Besides police enforcement, one should also evaluate the effect of sanctions. For example, a meta-analysis has proven that driving licence suspension is very effective to reduce traffic accidents (18% reduction of all crashes, Elvik et al., 2009).

In order to prevent traffic accidents due to *psychoactive medication*, it is recommendable to invest in **sensitisation and education** of patients, physicians and pharmacists (Meesmann, Houwing and Opdenakker, 2015). An adequate measure is to distribute information about the possible side effects of medicines, and provide solutions to deal in a safe manner with medicines while driving (Schulze et al., 2012). Within the DRUID project most available psychoactive medicines have been classified according to their effect on driving, and patient information letters where developed. In a pilot study this information was integrated into the existing software of physicians and pharmacists in Belgium. This intervention is recommended as good practice since positive intervention effects were found for pharmacists (Touliou et al., 2011; Legrand et al., 2012). However, further research is required on effective risk communication strategies to inform patients and health care provides on psychoactive medication and road traffic safety (Schulze et al., 2012).

The traffic accidents under the influence of *illegal drugs* and psychoactive medication could be prevented if **roadside testing is drastically increased.** The detection of illegal drugs (and psychoactive medication), however, is confronted with several problems such as insufficient sensitivity of saliva test devices (Verstraete, 2005). The Royal Decree of 27 November 2015 (B.S. 30.11.2015) will allow the analysis of illegal drug concentrations with saliva (without a blood test), allowing the police to intensify the number of roadside tests on illegal drugs.

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