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The Economic Costs of Alcohol Misuse in Portugal

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Abstract

Aim: This study estimates the total economic burden of alcohol misuse in Portugal. Specifically, it reports estimates of morbidity and co-morbidity treatment costs and assesses the value of lost productivity related to alcohol misuse, for the year 1995.

Methods and Sources: The study examines health care costs focusing on the nine most frequent diseases associated with alcohol misuse. The societal perspective was adopted and the prevalence-based Cost-of-Illness studies used to evaluate annual costs. The study is based on data obtained from different appropriate sources. Medical records from 88 public short-stay hospitals, provided by the Financing Management Institute in the Portuguese Ministry of Health. Hospital discharges, death causes and consultations obtained from Health Statistics and Mortality Statistics, published by the National Statistical Institute. And data on crime and motor vehicle crashes reported in the Sixth United Nations Survey on Crime Trends (UNICRI) and in the General State Account, published by the Ministry of Finance.

Results: Approximately 19 878 discharges from alcohol misuse, representing 2.3% of total discharges, were estimated to occur in public short-stay hospitals. In public and private psychiatric hospitals 2 613 alcoholic discharges were estimated (18% of total mental health discharges in that year). The annual costs of health care services amounted to €33 million. Of this, 63% was due to inpatient care and 24% to ambulatory care. The criminal justice system and prison administration were estimated to cost €19 million whilst property damages due to motor vehicle crashes amounted to €57 million. Indirect costs were estimated to be €325 million. Of this, €76 million was due to the human cost of premature mortality.

Conclusions: It is concluded that, in 1995, alcohol misuse imposed a burden of €434 million on the Portuguese economy, representing 0.6 % of Gross Domestic Product and a per capita cost estimate of €52. In examining the share of each component in total costs, both criminal justice and hospital care systems appear to have similar burdens, imposed by alcohol misuse. However, the greatest burden arises from losses in productivity resulting from illness and premature death.

Keywords: alcohol, cost, burden of disease

JEL Classification: I12

1. INTRODUCTION

Alcohol abuse and alcohol addiction constitute a risk behaviour that has an impact on health, health care resources, and the economy. In fact, in the area of alcohol abuse, individual studies have found that high alcohol-consumption prevalence rates are usually associated with health disorders (e.g., alcoholic cirrhosis, alcohol dependence syndrome, and traffic accidents), social problems (e.g., violence, crime, robbery) and economic problems (e.g., sick leave, lost productivity due to premature death).

Heavy alcohol consumption is a major public health problem in Portugal. The alcohol-consumption high prevalence is well documented in a study, conducted by Aires Gameiro, reporting that 10 percent of the Portuguese population (i.e., 700 000 alcohol abusers plus 700 000 dependent drinkers) has serious alcohol-related health disorders. The author also reports that about 60 percent of the adults consume alcoholic drinks regularly, and includes the alcohol abusers in this group. According to the author's estimates, only 15 to 20 percent of adults are abstinent or occasional drinkers (Gameiro, 1996). The percentage of alcohol dependent and abuser adults is likely to be related to the fact that Portugal is the ninth wine worldwide producer and the third worldwide alcohol consumer, with 10.8 litres of per capita pure alcohol consumption, after Luxembourg (12.1 litres) and France (10,9 litres). Indeed, the Portuguese per capita alcohol consumption is four-folds higher the level considered to have negative impacts on heath (the consumption of 3 litres per capita) and well above the 2015 target of the World Health Organization (the yearly alcohol consumption of 6 litres per capita).

Moreover, the prevalence of alcohol consumption varies with gender and across the country. According to the 1995/1996 National Health Survey, consumption is higher in the North of the country, especially in the North Region. Besides, men have reported to drink more than women during the week preceding the interview. Furthermore, 44 percent of all adults were drinking more than 2.5 dl of wine per day, an excessive level usually associated with a considerable number of health problems.

The burden of alcoholism, as a chronic disease, can be measured in different ways, including number of deaths related to alcohol misuse, hospitalization rates, and potential years lost. However, in this article, we intend to assess the total economic burden of alcohol misuse using the "cost of illness" framework. In particular, it reports

estimates for morbidity and co-morbidity treatment costs, and for the value of lost productivity resulting from alcohol-related illness or premature death.

It has to be acknowledged that a number of alcohol cost-of-illness studies have been developed for different countries and, yet, no study to date has analyzed the cost impact of alcohol misuse in Portugal. To this extent, it is expected that this research will contribute to a better knowledge of the impact of alcohol misuse on the entire society, by identifying and measuring the main alcohol-related problems.

2. METHODS AND SOURCES

To undertake this study a bibliographic search was made of studies that have estimated costs for alcohol abuse. The descriptors "alcohol", "costs", and "burden of disease" were used in the biomedical database MEDLINE.

To estimate costs we have adopted the societal perspective and the prevalence-based cost of illness studies that identifies the direct, indirect and intangible annual costs of a disease incurred in a given year, regardless of the time of its onset.

The methodology to obtain cost estimates is based on the "opportunity cost" definition, a measure of resources that could be used for other purposes if individuals choose not to be alcohol abusers. Assuming that resources used in prevention, treatment and rehabilitation of alcoholics can not be used for other purposes and also that, because of death and disability, potential resources are lost, the estimated costs represent a burden imposed on the whole nation by the abusing population.

Implicit, in the methodology we have followed, is the concept of total social costs including private or internal costs (those born by alcohol abusers and their families) and external costs (cost of damages inflicted on third party victims by the alcohol abuse population). Unlike Heien and Pittman, 1993 we do not differentiate between private and external costs and compute total social costs instead. Therefore, the methodology adopted rests on the work done in different countries by authors who have estimated the monetary social costs of heavy alcohol consumption (Heien and Pittman, 1989, Nakamura et al. 1992, and Single et al. 1998), and allows for the possibility of comparing Portuguese cost estimates with other countries.

According to Rice et al. 1991, Nakamura et al. 1992 and Heien and Pittman 1993, we classify costs into two major categories: the core costs and other related costs. The core costs are those resulting directly from illness, and the related costs are those associated with secondary nonhealth effects of illness. Both categories are divided into

direct and indirect costs. Direct costs comprise those costs for which resources are consumed and payments actually made. Indirect costs are those arising from morbidity and mortality for which resources are lost. Morbidity costs comprise lost earnings, resulting from lost or reduced productivity as, because of illness, people can be away from work or unable to perform usual tasks at full effectiveness. Mortality costs include lost earnings due to productivity lost by premature death. Examples of core direct costs are treatment and support costs. The related costs category includes costs associated with motor vehicle crashes, social work and criminal justice system.

2.1 Alcohol Abuse Disorders

Diagnoses, included in this study, are those associated with alcohol abuse and listed in the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM). They comprise illnesses directly associated with alcohol misuse and also those in which alcohol only partly causes death, illness or injury. Our research found about 27 medical conditions wholly or partially attributable to alcohol abuse.

Diagnoses in which alcohol abuse is sufficient to induce the disease, injury or death are: alcoholic psychosis (291), alcohol dependence syndrome (303), alcohol abuse (305.0), alcoholic polyneuropathy (357.5), alcoholic cardiomyopathy (425.5), alcoholic gastritis (535.3), alcoholic liver cirrhosis (571.2), excessive blood level of alcohol (790.3), toxic effects of ethyl alcohol (980.0) and alcoholism (V113). Medical condition in which alcohol abuse is a contributory cause (i.e., which only partly causes illness) include: tuberculosis (011-013, 017, 018), lip and oropharagyeal cancer (140-141, 143-146, 148-149, 230.0), oesophageal cancer (150, 230.1), liver cancer (155, 230.8), laryngeal cancer (161, 231.0), breast cancer (174, 233.0), epilepsy (345), hypertension (401-405), cardiac dysrhythmias (427.0, 427.2, 427.3), heart failure and ill-defined (428-429), stroke (430-438), oesophageal varices (456.0-456.2), gastro-oesophag. lac.haemorrhage (530.7), pancreatitis (577.0, 577.1), psoriasis (696.1), and noxious influences via placenta/breast milk (760.7).

2.2 Alcohol Abuse Cost Estimation

2.2.1 Direct Core Costs

In what concerns direct treatment costs, medical care are provided in different facilities: acute general hospitals, psychiatric hospitals, alcoholic specialized institutions and health centres. To assess hospital alcohol abuse-related illness costs we have used

nationwide medical records of 88 public short-stay hospitals, provided by the Financing Management Institute in Ministry of Health. Each record includes diagnoses (reported by ICD-9 codes), length of stay, DRGs codes and also demographic and geographical information. All hospital discharges that had a primary diagnosis or one of the six secondary diagnoses that fell within any of the first ten ICD-9 codes, listed above, were extracted from the 1995 National Acute Hospital Discharge Survey. A total of 19 878 discharges (81% of men and 19% of women) were extracted, representing 2,3% of total discharges in that year. The greatest number of admissions (79,4%) occurred in people between 30 and 75 years old.

The methodology, used to compute treatment costs, includes the epidemiologic tool population attributable risk (PAR) to derive the percentage of total disease cases attributed to alcohol consumption. This epidemiologic tool is calculated with the following formula

$$PAR = \frac{p(r-1)}{p(r-1)+1} * 100$$

where p is the estimated prevalence of alcohol consumption in the population and r the relative risk of a particular disorder at different levels of use (i.e., an alcohol-abuser increased risk of acquiring an illness relative to that of a non-alcohol abuser). Relative risk (r) is obtained by dividing disease incidence, in alcohol abuse group, by disease incidence in non alcohol-abuse group (Fox et al, 1995).

One of the difficulties, encountered in this study, was the estimation of the proportion of morbidity causes attributed to alcohol consumption, due to the lack of detailed Portuguese prevalence rates for different age and gender groups. Thus, we have used the Canadian PARs for morbidity reported in Single et al., 1996. Conditions, wholly attributable to alcohol abuse, have an attributable fraction equal to one (PAR=1.0) and, as a result, all expenditures incurred by the patient during his hospital stay were considered. Therefore, hospital costs were obtained from price scheduled for each patient's diagnosis group, adjusted for the number of days the patient stayed in the hospital.

For conditions, with substance abuse as a contributory cause, the Canadian attributable fractions for different age and gender groups were used. These proportions (with PAR<1.0) are displayed in Table A3 in Single et al., 1996. Regarding costs, they were obtained by first multiplying the proportion by the number of days each patient

stayed in the hospital and, then, by the DRG daily price in which each patient was classified.

For public and private psychiatric hospital costs, as patients are not classified by DRGs, we multiply the number of discharges with alcoholic psychoses (ICD 291) and alcohol dependence syndrome (ICD 303) by the price of DRG 435 (alcoholic dependence). Data on discharges were collected in Health Statistics, published by the National Statistical Institute, 1996.

Inpatient costs for Alcoholic Regional Centres and Psychiatric Departments of District Hospitals were also obtained. But, unlike alcoholic centres where all inpatient days were considered, for psychiatric departments only 18 percent of all inpatient days were multiplied by the price per day. This percentage came from the ratio of alcoholic discharges to total discharges in public and private psychiatric hospitals, as district hospital psychiatric departments do not report medical reasons for admission.

Cost estimates for external and emergency consultations in hospitals and medical consultations in primary care health centres were also computed. Estimates were obtained by applying 18 percent or 2.3 percent to the total number of consultations, depending on whether they were provided, respectively, in psychiatric setting or in acute hospitals and health centres. Numbers were, then, multiplied by consultation prices fixed by the government in official document (i.e.in Diário da República, 1994).

Drug prescription costs for medical consultations were estimated enquiring a panel of psychiatric doctors about the more commonly prescribed drugs in alcoholic appointments. As drugs prescribed differ between doctors, a range of prescription costs was obtained and the average cost selected. Thus, the cost estimate for a psychiatric hospital consultation was €125. For appointments in health centres the lowest average costs was adopted (i. e., €75) as, according to the panel, general practitioners are not so accurate in diagnosing illness as psychiatrics and prescribe less quantities of drugs and with reduced therapeutic power. Opinion for prescription in emergencies was more consensual and an average of €5 was fixed.

2.2.2 Indirect Core Costs

Indirect costs of productivity losses due to alcohol abuse comprise morbidity and mortality costs. Morbidity costs reflect reduced productivity from poor performance and lost employment due to alcohol related problems. Alcohol impaired workers, as

they are disabled, tend to be less efficacious in performing their jobs and to be more often ill and absent from work. Therefore, they tend to earn less income than non-alcohol abusers. Using the human-capital approach, we have estimated the costs of this reduced productivity adapting, to the Portuguese case, the methodology followed by Heien and Pittman (1989), Rice et al. (1991) and Nakamura et al. (1993).

For noninstitutionalized persons, the value of reduced productivity was obtained by the following 4-factor product: (1) the number of labour force and household members by age-sex groups, (2) the prevalence rate for each age-sex group, (3) the yearly average full-time personal earnings, and (4) the rate of earnings impairment (i.e., the percentage of income lost due to alcohol abuse). Summing the product over all age-sex groups provides an estimate of the amount workers would have earned if they were not disabled. Data for labour force and household members came from the National Statistical Institute; prevalence rates were based on data from the National Health Survey 1995/96; the yearly earnings were estimated from the monthly personal earnings as reported in the 1995 Labour Statistics by the Qualification and Employment Ministry, and, finally, the rate of impairment of 21 percent was adopted from Rice et al. (1991), and Heien and Pittman (1989).

The value of productivity loss for institutionalized persons was based on the number of patient days related to persons admitted with alcohol abuse diseases in acute and psychiatric institutions. This figure was, then, transformed in person-years of patients and multiplied by the yearly average wage times the labour force participation rate.

Mortality costs are the value of lost productivity owing to alcohol abuse premature death. This value was estimated as the present value of future earnings of those who died due to alcohol abuse. First, data were selected on the total number of deaths with primary and secondary diagnoses related to alcohol abuse, adjusted for sex and age. Death causes, based on certification of death and coded by ICD-9-CM, are provided in Mortality Statistics by the National Statistical Institute. The number of sex and age group alcohol related deaths was estimated by multiplying the number of deaths by the Canadian population attributable factors for mortality (reported in table A4 of Single et al., 1996). However, for road traffic accidents we have used the most conservative proportion estimate of Portuguese motor vehicle crashes where alcohol is involved (i.e., the rate of 12 percent estimated for crashes occurring in the second semester of 1995, by Santos, L., 1997). An estimate of the number of working years of

life lost for sex and age group was, then, obtained using the mean age of death for each sex and age group, the number of alcohol-related deaths, the assumption of a working life of 65 years for men and women (the usual retirement age) and labour force participation rates. Finally, these totals were multiplied by the yearly wage for both gender groups and a discount rate of 5 percent was used to convert the stream of future earnings into its present value.

2.2.3 Other Related Costs

Other related costs of alcohol abuse include also direct and indirect costs. The indirect related cost category reflects the value of time lost by persons incarcerated and victims of crime associated with alcohol abuse. Direct related costs comprise costs of crime (e.g., police, court and correction costs) social work administration, motor vehicle crashes and destruction of property.

Given the information currently available, two crime costs were determined: correction costs and court costs. In both, we used the proportions of jail sentences due to particular crimes committed under the influence of alcohol. The percentages, as reported in a Portuguese study by M. Castelão et al., were: 4.2 percent for homicides, 37.2 percent for theft, 2.6 percent for robbery and 1.3 percent for rape (Castelão et al., 1987). In order to obtain correction costs, these percentages have been applied to the number of different types of arrests, and this figure was then multiplied by the cost per arrest (computed dividing total correction operating expenditures by the number of arrests). The same procedure was followed for court costs using, in this case, the number of offences and total court operating expenses. In both cost estimates we assumed the average cost per arrest and offence and, therefore, the average sentence length per offence, were the same for drunken offenders as for other cases. Data for these calculations were collected from the Sixth United Nations Survey on Crime Trends (UNICRI) and from the General State Account published by the Ministry of Finance (Ministry of Finance, 1995).

The value for motor vehicle property damage was computed multiplying the average cost of property damage compensations, resulting from traffic accidents and reported by the Portuguese Insurance Association, by the percentage of 12 percent. Compensation costs were collected from a Portuguese study on vehicle property damage costs conducted by A. Reis (Reis, A., 2001). The attributable ratio of 12 percent is the same we have used above for alcohol related deaths from traffic accidents.

Finally, administrative costs for criminal justice social work, associated with alcohol abuse, were estimated multiplying total administrative expenditure on social work by 2.3 percent (i.e., the ratio obtained for patients admitted in acute hospitals with alcohol related diseases).

3. RESULTS

In 1995, alcohol misuse imposed a burden of €434 million on the Portuguese economy, representing 0.6 percent of Gross Domestic Product and a per capita cost estimate of €52 for every person over 14 years old living in Portugal. Estimates, summarised in Table 1, include both the costs of treating health disorders due to alcohol abuse (€33 million) and the various adverse consequences of alcohol consumption (i.e., losses in productivity accounting to €325 million and crime, traffic accidents and social work accounting for €75.6 million).

Table 1 – Economic costs of alcohol abuse in 1995 by types of costs

Type of Costs	Annual Cost (€ million)	Percent of total costs	Percent distribution within categories
Direct Core Costs			
inpatient care	€20.8	4.8%	63.1%
ambulatory care	€7.9	1.8%	24.2%
emergency care	€4.2	1%	12.7%
subtotal	***€33.0***	***7.6%***	*100.0%*
Indirect Core Costs			
morbidity			
noninstitutionalized persons	€245.8	56%	75.6%
institutionalized persons	€3.4	0.7%	1.06%
mortality	€75.8	17%	23.3%
subtotal	***€325***	***74.9%***	*100.0%*
Direct Related Costs			
judicial system and prison administration	€18.8	4.3%	24.9%
property damages due to accidents	€56.7	13%	74.9%
criminal justice social work administration	€0.05	0.01%	0.06%
subtotal	***€75.6***	***17.4%***	*100.0%*
Total Annual Cost of Alcohol Abuse	**€433.6**	**100.0%**	-
per capita cost estimate (age >14) (€)	€52		
per alcoholic cost estimate (€)	€310		
percentage of GDP	0,8%		

In core costs category, direct treatment costs account for about 8 percent of total costs and indirect costs (i.e., morbidity and mortality indirect costs) for the greatest percentage (75%). Morbidity indirect costs, including reduced and lost productivity, represent 57 percent of the total. Mortality indirect costs, the value of lost productivity from premature death, account for 17 percent. Finally, other direct related costs including judicial system, property damages, and criminal justice social work administration account for 17 percent of total economic costs.

Direct Core Costs

Health care costs to treat alcohol use disorders and the medical consequences of alcohol consumption are estimated at €33 million, representing 0,5 % of total health expenditures and resulting in a per alcoholic cost estimate of €24. However, about 63 percent of health care costs of alcohol abuse (€20.8 million) are inpatient costs in acute public hospitals (see Table 1). The results in Table 2 show inpatient days, admissions and costs of inpatient care provided to alcohol abusers.

Table 2 – Estimated number of bed days and inpatient costs due to alcohol-related illnesses in 1995/1996

	Episodes	Bed Days	Inpatient Costs	
			€ million	percent of total
Acute general hospitals				
Morbidity	9 643	124 090	€17	82%
Co-morbidity	-	6 742	€1.3	6%
Psychiatric hospitals	6 613	35 862	€0.2	1%
Alcoholic Regional Centres	1 193	19 417	€0.8	4%
Psych. depart. of district hospitals	-	36 838 (a)	€1.5	7%
Total	**13 449**	**222 949**	**€20.8**	**100%**

(a) Figure corresponding to 18% of psychiatric departments total bed days.

An amount of €17 million (i.e., 82 percent of total inpatient costs) account for the cost of treating 9 643 patients, with health disorders directly due to alcohol misuse as primary diagnoses who spent 124 090 days in acute hospitals. Health disorders where alcohol is a contributory case account only for €1.3 million (i.e., 6 percent of acute hospital inpatient costs). The remaining €2.5 million (12 percent of inpatient costs) is the estimated inpatient cost for psychiatric hospitals, alcoholic regional centres and psychiatric departments of district hospitals.

Evidence, summarized in Table 3, regards admissions and inpatient costs related to diagnoses wholly attributable to alcohol abuse.

Table 3 – Number of hospitalisations and inpatient costs, directly due to alcohol-misuse, in acute general hospitals (1995/1996)

Diagnosis	Episodes	Bed Days	Inpatient Costs	
			€ thousands	percent of total
Alcoholic psychosis	***1 348***	***12 659***	***1 125***	***6,6%***
Alcohol dependence syndrome	***1 581***	***22 450***	***1 219***	***7%***
Alcohol abuse	164	538	47	0,2%
Alcoholic polyneuropathy	43	914	139	0,8%
Alcoholic cardiomyopathy	126	2 048	309	1,8%
Alcoholic gastritis	18	117	20	1%
Alcoholic cirrhosis	***6 195***	***84 644***	***13 964***	***82%***
Excessive blood level of alcohol	105	585	138	0,8%
Toxic effects of alcohol	62	129	36	0,2%
Alcoholism	1	6	1	0,005%
Total	**9 643**	**124 090**	**€16 998**	

The number of 9643 hospitalizations, directly due to alcoholic illness, accounted for 1,2% of total general acute hospital admissions in 1995. Yet, most acute hospital admissions were due to alcoholic cirrhosis, accounting to 82% of costs, followed by alcoholic psychosis and alcohol dependence syndrome, both accounting to 7% of costs.

About one-fourth of direct costs (i.e., 7.9 million) are expenditures for care in specialized institutions, including external consultations in psychiatric settings and

alcoholic regional centres and also consultations in health centres as well as drugs prescribed in all these institutions. Detailed figures for consultations and emergencies are displayed in Table 4.

Table 4 – Estimated number of consultations, emergencies and costs due to alcohol misuse in 1995/1996

	Consultations			Emergencies		
	Number	Cost (€ thousand)	percent of cost	Number	Cost (€ thousand)	percent of cost
Alcoh. Reg. Centres	16 151	2.183 (c)	27,3	-	-	-
Psychiatric hospitals	25 627 (a)	3.464 (c)	43,3	2 697 (a)	42 (d)	1
Psych. Dep. d. hosp.	16 818 (a)	2.273 (c)	28,4	-	-	-
Central Hospitals	-	-	-	46 366 (b)	1.943 (d)	46,2
District Hospitals	-	-	-	90 649 (b)	2.215 (d)	52,7
Health Centres	809 (b)	67 (c)	0,8	-	-	
Total	59 405	**€7.987**		139 712	**€ 4.200**	

(a) Figure corresponding to 18% of total external consultations in psychiatric hospitals.
(b) Figure corresponding to 2,3% of total consultations in health centres, central hospitals and district hospitals.
(c) Figure corresponding to the product of the number of consultations by its price (i.e., €10,47 in psychiatric hospitals and €7,98 in health centres) plus the product of the number of consultations by its prescription price (i.e., €124,69 in psychiatric hospitals and €74,81 in health centres).
(d) Figure corresponding to the product of the number of emergencies by its price (i.e., €10,47 in psychiatric hospitals, €36,91 in central hospitals and €23,44 in district hospitals) plus the product of the number of emergencies by its prescription price (i.e., €4,98).

External consultations in psychiatric hospitals account for the bulk of costs (i.e., 43 percent of total consultation costs); psychiatric departments of district hospitals expend 28 percent (an amount of €2.2 million); alcoholic regional centres account for 27 percent (€2.1 million) and finally, health centres spent only 0,8 percent (i.e., €67 thousands).

The final component of direct costs pertains to emergencies in psychiatric and acute hospitals, accounting for about 13 percent of total direct costs (i.e., €4.2 million). Most of this expenditure, including consultation and drug prescription costs, is related

to care provided in central and district acute hospitals, accounting for 99 percent of emergency costs (i.e., €4.1 million).

Indirect Core Costs

Morbidity costs were estimated at €249 million, more than three-fourths of total indirect costs. Reduced productivity of non-institutionalized persons (about 154 thousand people), based on age and gender group prevalence rates of alcohol abuse and a rate of impairment of 21 percent, account for the most of morbidity costs. The value of lost productivity, for people admitted in acute and psychiatric settings, account only for 1 percent of indirect costs (see Table 1).

The results, in Table 5, show annual production losses for alcohol abuse in working population.

Table 5 – Annual cost of alcohol related reduction in productivity (1995/1996)

Non-institutionalized persons			Institutionalized persons	
	Males	Females		
Average annual wages	€7.632	€5.841	Inpatient days	222 949
Alcohol abuse preval. rates	(a)	(a)	Person-years of inpatients	885
Abusers in working population	122 003	31 615	Average annual wage	€6.738
Rate of impairment	21%	21%	Labour force partic. rate	58%
Annual product. loss (€1000)	***€195.530***	***€50.315***	***Annual prod. loss(€1 000)***	***€3.459***

(a) The various alcohol-abuse prevalence rates computed were: Males – 2% from age 15-24; 5% from age 25-44; 6% from age 45-64; 6% from age 65-74, and 4% for age >75. Females – 1% from age 15-14; 1,7% from age 25-44; 1,7% from age 45-64; 1,7% from age 65-74, and 1% for age >75.

Combining prevalence rates of alcohol abuse with working population, and considering average annual wages and a rate of impairment of 21% produces estimates of production losses of about €195 million for men and of €50 million for women. Annual production loss for non-institutionalised men is about four-fold higher than for

women, as men are in majority in working force and have higher wages and alcoholic prevalence rates than women. Regarding institutionalised population, annual production loss of €3. 459 thousand was obtained by combining average annual wage with labour force participation and the person-years of inpatients. To calculate the latter estimate we assumed a total of 222 949 working days were lost due to hospitalization and divided it by 252 yearly working days.

Mortality costs for 1995 were estimated at €75.847 thousands. As 3.495 alcohol related deaths occurred in 1995, there was an estimated productivity loss of €21.701 per death. Table 6 presents estimates of productivity losses considering labour force participation rates of 68,5% for men and 49,6% for women.

Table 6 – Number of deaths, person-years lost, and productivity lost due to alcohol misuse in 1995/1996

Gender groups	Number of deaths	Total working-years lost	Working-years lost per death	Total lost (€ million)	Euros lost per death
males	1 834	36 057	19,6	€62.9	€34.297
females	405	7 711	19	€12.9	€31.965
Total	**2 239**	**43 768**	**19,5**	**€75.8**	**€33.875**

A total of 1834 men (82 percent of total alcohol related deaths) died due to alcohol related illnesses and road traffic accidents, accounting to a productivity loss of €34.297 per death, an amount 7 percent higher than women. This difference is explained by the higher incidence of alcohol abuse deaths for men, and also as men earn higher salaries and have higher labour force participation.

Direct Related Costs

Direct related costs amount to €75.6 million, representing 17 percent of total economic costs. The largest component (a value of €56.7 million) is property costs of alcohol-related motor vehicle crashes expenditures which accounts for 75 percent of total direct related costs. The value of judicial system and prison administration expenditures of alcohol-related crime is also high, amounting to €18.8 million (25 percent of total related costs) (see Table1).

Table 7 displays estimates for various types of crime related to heavy drinking. Costs pertaining to the police action have not been quantified as data on alcohol-related cases concerning the maintenance of order, searches and investigations by the police were not available.

Table 7 – Alcohol-related costs of criminal justice system and prison administration, 1995/1996

	Criminal Justice System		Prison Administration	
Type of crime	Persons convicted in criminal courts (a)	Costs (€ million) (b)	Persons incarcerated (a)	Costs (€ million) (c)
Homicide	333	€395	551	€3.424
Theft	3 878	€4.603	1 275	€7.924
Robbery	39	€46	13	€80
Rape	1	€1	1	€6
Drug offences	-	-	386	€2.398
Total	**4 251**	**€5.045**	**2 226**	**€13.834**

(a) The reported figures are based on the percentages, computed by Aires Gameiro, 1996, for person incarcerated who committed an offence under the influence of alcohol.
(b) Amount for cost was obtained by multiplying the number of persons convicted in criminal courts by the cost per offence (i.e., €1.187).
(c) Figures for cost were obtained by the product of the cost per arrest (€6.215) by number of persons incarcerated.

An examination of Table 7 shows that theft has the largest contribution for costs, followed by homicide, in both criminal justice and prison administration cathegories.

4. DISCUSSION

The results, produced in this study, provide evidence about patterns of resource use associated with heavy alcohol consumption in Portugal, and gives insight whether it is worth discussing the opportunity of a public intervention. However, it should be noted we have only tried to measure the magnitude of the problem and the relative share of different areas involved. Indeed, we do not intend to suggest the burden imposed on Portuguese society by alcohol misuse will justify the implementation of programs to reduce alcohol related problems. To inform decisions, cost-utility and cost-effective analyses will be the appropriate devices and not the cost-of-illness methodology adopted in this study.

There are no previously published studies on social costs of alcohol abuse conducted for Portugal. Therefore, we will compare the results of this study with others undertaken in other countries on this subject (see Table 8).

Table 8 – Comparison of cost structure for various countries

Study	Country	Year of data	Type of Cost (% of total cost)			
			indirect	direct	health care	application of law
Single et al., 1998	Canada	1992	55%	45%	17%	18%
Varney &Guest, 2002	Scotland	2001	58%	42%	9%	25%
Salomaa, J., 1995	Finland	1990	78%	22%	3%	7%
Brecht et al., 1996	Germany	1990	74%	26%	26%	-
This study, 1995	***Portugal***	***1994***	***75%***	***25%***	***7%***	***4%***

In the Canadian study by Single et al. (1998), the economic cost of alcohol abuse was about 1,09% of Gross Domestic Product, indirect costs (productivity losses) accounted for 55% of the total and, in direct cost category, health care accounts for 17% of the total while application of the law made up 18%. Varney and Guest (2000), in the

study conducted for Scotland, found that 58% of total costs were indirect costs, 9% health care costs while 25% were application of the law. In Finland, indirect costs were also a significant share of total costs (78%), while the contribution of direct costs was 22%, health care 3%, and application of law 7%. Finally, in Germany, costs computed indicate that indirect costs represent 74% of total social costs and direct costs (arising from heath care) 26% of the total.

An examination of the cost components of the studies in Table 8 shows that, despite the variation in the methodology adopted by different authors to compute costs, all the studies have a large contribution from indirect costs, ranging from 55% in Canada to 78% in Finland. Consequently, direct costs range from 22% in Finland to 45% in Canada. More variation is exhibited by health care costs, ranging from 3% in Finland to 26% in Germany and by application of law ranging from 4% in Portugal to 25% in Scotland. Overall, the results, produced in this study, are in line with the findings in other countries.

The estimates obtained also suggest that, despite the emphasis usually placed on medical care costs of alcohol abuse, the largest proportion of direct costs imposed on society by heavy drinking stems from property damages due to accidents. Moreover, hospital costs arising from alcohol abuse are very close to the judicial system and prison administration estimates. Furthermore, the inclusion of police costs in the judicial system and prison administration component would have placed this cost estimates very close to the medical care costs.

Given the lack of detailed statistics, the results produced in this study are based on the most conservative assumptions and estimates and, therefore, undervalued. For instance, criminal justice system costs are underestimated as, owing to the lack of detailed data, we have not included the costs of police action. Likewise, inpatient costs

were based on administrative price schedules and, therefore, the estimated costs are substantially lower than annual expenditures incurred by public hospitals.

Other costs we have not considered in our estimates are those incurred by social work departments supporting children and families of heavy drinkers. Additionally, domestic violence, pain and suffering imposed by alcohol abusers on themselves and their family, as they are intangible costs, could not be quantified.

Moreover, our estimates of social cost were not adjusted for taxes levied on alcoholic products which should have been subtracted from the total cost of alcohol abuse, under the assumption that as long as alcohol taxes are paid by heavy drinkers, the burden they impose on society is partially offset by the tax amount they pay. However, we can also think of taxes as external costs imposed by the abusers on nonabusers in that, as they increase market price, alcohol consumption will be below the optimal level. Therefore, under this assumption, alcohol taxes should be added to total costs and it is likely this latter adjustment will compensate for the former.

Finally, although there is no published study on economic costs of alcohol misuse in Portugal, three studies have been conducted on depression (Ramos et al., 1994), cerebrovascular event (Gonçalves et al., 1994) and obesity (Pereira et al., 1999). Bearing in mind the methodology adopted can limit the comparability of the studies, we could infer, by comparison, that alcohol direct and indirect cost estimates were the third in order of magnitude, after obesity and depression. However, for medical care costs only, alcohol abuse seems to be the least expensive treatment.

5. CONCLUSION

Several conclusions, concerning the issue of alcohol misuse in Portugal, emerge from this study. In 1995, approximately 19 878 discharges from alcohol misuse,

representing 2.3% of total discharges, were estimated to occur in public short-stay hospitals. In public and private psychiatric hospitals 2 613 alcoholic discharges were estimated (18% of total mental health discharges in that year). The annual costs of health care services amounted to €33 million. Of this, 63% was due to inpatient care and 24% to ambulatory care. The criminal justice system and prison administration were estimated to cost €19 million whilst property damages due to motor vehicle crashes amounted to €57 million. Indirect costs were estimated to be €325 million. Of this, €76 million was due to the human cost of premature mortality.

Overall, the present study suggests that, in 1995, alcohol misuse imposed a burden of €434 million on the Portuguese economy, representing 0.6 % of Gross Domestic Product and a per capita cost estimate of €52. In examining the share of each component in total costs, both criminal justice and hospital care systems appear to have similar burdens, imposed by alcohol misuse. However, the greatest burden arises from losses in productivity resulting from illness and premature death.

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