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Cost of disorders of the brain in Switzerland: with a focus on mental disorders

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Abstract: QUESTIONS UNDER STUDY: This study aims at estimating the costs of disorders of the brain in Switzerland based on the published epidemiological and economic evidence. **Methods:** the data presented for Switzerland are derived from the "cost of disorders of the brain in Europe" study of the European Brain Council (EBC). Available Swiss data were integrated. **RESULTS:** There are an estimated 2 million people currently living with a brain disorder in Switzerland. This number amounts to about 25% of all people living in Switzerland. The total annual costs are estimated to amount to 8.9 billion Euros corresponding to 1200 Euros per inhabitant and per year. Direct medical expenditure accounts for 33% of all expenditure, while indirect costs add up to 49%. Mental disorders account for approximately 2/3 of the total costs of brain disorders, ie, 5.6 billion Euros. This cost estimate comes very close to the current expenses for mental health in Switzerland with 5.3 billion Euros constituting 16% of total health care costs. : The present study probably underestimates the full economic burden of brain and especially mental disorders in Switzerland. In order to better understand the impact of brain disorders on Swiss society prospective field studies are needed in all disorders of the brain.

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Cost of disorders of the brain in Switzerland

With a focus on mental disorders

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Summary

Questions under study: this study aims at estimating the costs of disorders of the brain in Switzerland based on the published epidemiological and economic evidence.

Methods: the data presented for Switzerland are derived from the “cost of disorders of the brain in Europe” study of the European Brain Council (EBC). Available Swiss data were integrated.

Results: there are an estimated 2 million people currently living with a brain disorder in Switzerland. This number amounts to about 25% of all people living in Switzerland. The total annual costs are estimated to amount to 8.9 billion Euros corresponding to 1200 Euros per inhabitant and per year. Direct medical expenditure ac-

counts for 33% of all expenditure, while indirect costs add up to 49%. Mental disorders account for approximately 2/3 of the total costs of brain disorders, ie, 5.6 billion Euros. This cost estimate comes very close to the current expenses for mental health in Switzerland with 5.3 billion Euros constituting 16% of total health care costs.

Conclusions: the present study probably underestimates the full economic burden of brain and especially mental disorders in Switzerland. In order to better understand the impact of brain disorders on Swiss society prospective field studies are needed in all disorders of the brain.

Key words: brain disorder; mental disorder; cost; cost of illness; economic burden; Switzerland

Introduction

In a study based on WHO data, brain disorders as a whole were estimated to account for 35% of the total burden of disease in Europe [2]. Neuropsychiatric diseases have been estimated to account for 27% of disability adjusted life years (DALYs) in European countries and have thus more impact on the global burden of disease than cardiovascular diseases (17%) or neoplasms (17%) [41]. While specialisation in many medical disciplines progresses, a number of similarities and shared interests between psychiatry and neurology have developed over the last decades. Most importantly, basic brain research (neuroscience) is equally relevant to neurology and psychiatry. In addition brain disorders are preferably viewed together because politicians and other decision makers prefer to deal with broader fields of activity.

The European Brain Council (EBC) is an example of this development to keep brain disorders together for certain analyses. It is a co-ordinating

council formed by European organisation in psychiatry, neurology, neurosurgery, basic neuroscience, as well as European patient organisations in psychiatry and neurology. The brain-related pharmaceutical industry is also represented.

Without knowing the size of a problem and its economic impact, it is difficult to make clear recommendations about initiatives in research, teaching and public awareness. Thus, the EBC has, as its first major task, analysed the burden and cost of brain disorders in Europe. The major objective of the “Cost of Disorders of the Brain in Europe” study has been to present best possible estimates of the cost of disorders of the brain in Europe based on the existing literature. The main results were published in June 2005 [1]. The aim of the present study is to provide data in particular for Switzerland and to discuss these data in the light of the national literature focussing on mental disorders.

¹ On behalf of the “Cost of Disorders of the Brain in Europe” Study Group. For names see [1].

Material and methods

The methodology of the European study that forms the basis of the current publication has been described in detail previously [1]. In brief, twelve different disorders (or groups of disorders) of the brain were selected because they were believed to be associated with the highest cost and because a preliminary survey indicated that at least some relevant data were available for these disorders. Other disorders that might have been equally costly or relevant were left out because they were too heterogeneous and/or the data basis was too small. The disorders selected were: addiction, affective disorders, anxiety disorders, brain tumours, dementia, epilepsy, migraine and other headaches, multiple sclerosis, Parkinson's disease, psychotic disorders, stroke and trauma. A steering committee comprising Jes Olesen, Hans Ulrich Wittchen, Bengt Jönsson and Patrick Andlin-Sobocki appointed several groups of experts for each of these disorders. These persons were considered to be the leading European experts in the epidemiology of the respective disorder. In parallel, the steering committee selected a health economic panel to govern the health economic studies, which were performed by the Stockholm Health Eco-

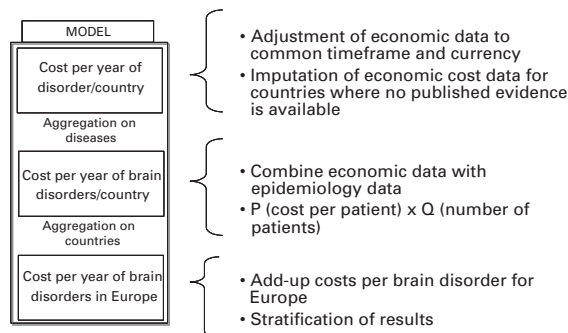
nomics Institute under contract with the EBC. The epidemiological data used were based on a systematic review of published epidemiological evidence in Europe. These reviews have been published separately [3–10, 40].

The main source used for the reviews were electronic databases (Medline and Web of Science) complemented by national registries and the Internet. 12 months prevalence data were collected in all disorders by country and stratified according to age, gender and disorder severity where published evidence allowed it. In cases where no national data were available, best possible estimates or extrapolated data were used.

In parallel, the economists collected all publications from Europe in English using Medline and HEED (Health Economic Evaluation Database). These data are presented in reviews published separately [11–22]. It was attempted to present all relevant costs including direct medical costs, direct non-medical costs and indirect costs. Direct costs include all costs for goods and services used in prevention, diagnosis, treatment, and rehabilitation, eg, costs for medical visits, hospitalisation and drugs. Direct non-medical costs comprise all other resources used related to a disease, eg, transportation, social services, sheltered accommodation. Indirect costs are grossly defined as the value of output that is lost due to absence from work, early retirement and reduced productivity of the affected persons and their caregivers. So-called intangible costs such as suffering, loss of quality of life etc. have not been calculated. All economic data were transformed to Euros (€'s) for 2004.

The epidemiological and health economic data were then entered into a health economic model as indicated in figure 1. The data presented in this paper are the aggregated results for Switzerland which are imputed from data observed in other European countries.

Figure 1
Health Economic Model.



Results

Total prevalence

The total number of people with any brain disorder in Switzerland amounts to 2.0 million in 2004, constituting more than a quarter of all Swiss inhabitants. This figure is an aggregate of the prevalence estimation for each brain disorder included in the study. However, the prevalence estimates in mental disorders, migraine and epilepsy are all based on the European patient populations aged 18–65. The estimates in dementia and Parkinson's disease are limited to the population aged 65 or older, and concerning stroke restricted to the age group 25 years or older. In this respect our estimate is conservative. When correcting for co-morbidity, still one fifth of the Swiss population have a brain disorder.

The number of cases with addiction in Switzerland amounts to 140'000 (including illicit drug dependence and alcohol dependence). If we were to add nicotine dependence to this estimate, the total number of cases would be approximately 610'000. Affective disorders (depression and bipolar disorder) affect 370'000 persons and anxiety disorders (panic, phobias, obsessive compulsive

disorder and generalised anxiety disorder) 710'000. 40'000 persons are affected by psychotic disorders. The most prevalent neurological disorder was migraine, with an estimated 630'000 cases. The distribution of estimated cases with brain disorders in Switzerland across specific disorders are presented in figure 2. Among the less prevalent brain disorders multiple sclerosis and brain tumour comprise an estimated 8000 and 1700 cases respectively.

Cost per patient

Based on a review of economic data in Europe, the costs per case per disorder for 2004 are calculated for Switzerland. Sporadic economic studies in Switzerland have not been integrated in the European data set. From these data, data for Switzerland have been used. The cost per patient for each of the 12 brain disorders is shown in figure 3. Most costly per case are brain tumours and multiple sclerosis, each with a relatively low prevalence rate. Anxiety disorders and migraine, on the contrary, have a low cost per case but are very prevalent.

Figure 2

Estimated number of cases of brain disorders in Switzerland
 Note: the number of cases of stroke and trauma are based on incidence data owing to the lack of appropriate prevalence data in the literature. Results on addiction omit nicotine dependence.

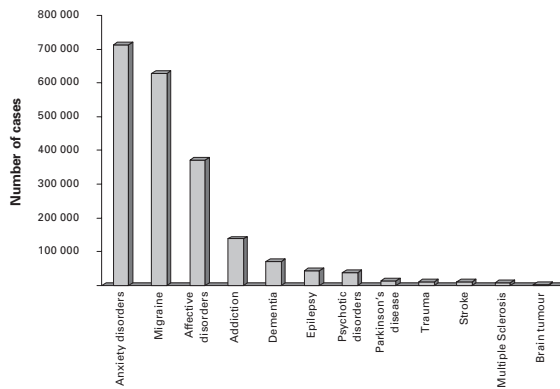


Figure 3

Cost per case of specific brain disorders in Switzerland (€PPP 2004).

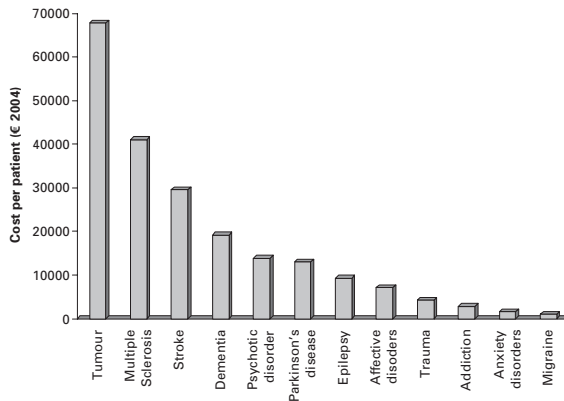
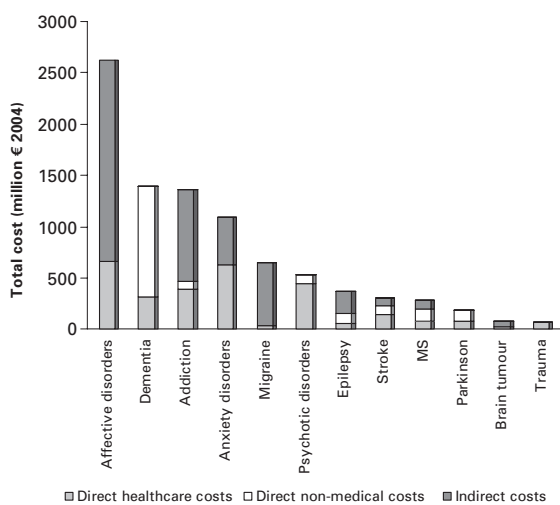


Figure 4

Total cost of brain disorders in Switzerland (€PPP million, 2004)



Total cost of brain disorders

The estimated total cost of all the brain disorders included in Switzerland is 8.9 billion Euros. Affective disorders are the most costly brain disorder followed by dementia and addiction. Among the neurological disorders migraine is the most costly followed by epilepsy and stroke. Note that important cost categories are missing for several of the disorders. Indirect costs and direct non-medical costs are, for example not included for trauma and direct non-medical costs are not included for anxiety disorders, migraine and affective disorders. Indirect costs are not included for psychotic disorders and alcohol dependence. The cost of stroke is based on incidence because of lack of prevalence data and thus grossly underestimated.

Cost of brain disorders per inhabitant

It is of interest to estimate how much brain disorders cost each individual citizen in Switzerland. These data are given in table 1. Taken together, cost of brain disorders amount to €1200 per year for each citizen of Switzerland.

Cost of brain disorders distributed by resource items

These data are presented in detail in table 2 and also as a diagram in figure 5. Direct health care costs amount to €2.9 billion and constitute 33% of the total cost. Direct non-medical costs account for €1.7 billion, ie, 19%, and indirect costs €4.4 billion (49%) mainly because of productivity loss due to sick leave. As previously mentioned, important cost categories are missing for several of the disorders.

Brain disorders constitute 13% of the total direct health care cost in Switzerland. Out of total drug sales in Switzerland, 17% are used for treatment of brain disorders [23]. The total cost of brain disorders (direct and indirect combined) constitute 4% of the gross national product of Switzerland.

Cost of brain disorders distributed by medical speciality and disorder

Attributing disorders to one speciality is potentially misleading. Brain tumours and brain trauma are not only cared for by neurosurgeons but also by neurologists and other medical disciplines. Similarly, stroke, dementia, and most other disorders are cared for by more than one medical discipline and not the least by general practitioners. However, for certain purposes an attempt to split up cost into several disciplines might be useful. We assigned the different brain disorders to different specialties in table 3. Dementia has been kept separate, because the responsibility is equally shared between psychiatry and neurology. The biggest neurosurgical disorder, herniated disc, was not included in our study. Mental disorders (excluding dementia) account for 63% (€5.6 billion) of the total cost of brain disorders in Switzerland.

Cost of psychiatric disorders – direct Swiss data

Direct healthcare costs of mental disorders

The total direct expenditure for healthcare in Switzerland amounted to €29 billion in 2003 [27]. In Switzerland the primary sources of mental health financing in descending order are social insurance, tax based and out of pocket expenditure by the patient. There are no budget allocations for mental health.

The total costs of psychiatric hospitals in Switzerland in 2004 were €0.9 billion which are 10.8% of the costs of all hospitals [28]. The cost of outpatient private psychotherapy was €365 million in 2000 [29]. Out of total drug sales in

Table 1

Cost per inhabitant of specific brain disorders in Switzerland (€PPP, 2004).

Brain disorder	Direct healthcare	Direct non-medical	Indirect costs	Total
All brain disorders	401	228	598	1226
Affective disorders	91	0	268	359
Epilepsy	44	147	0	191
Addiction	54	10	122	186
Anxiety disorders	86	0	64	150
MS	5	0	84	89
Stroke	61	11	0	72
Migraine	8	13	29	51
Trauma	20	12	10	42
Parkinson's disease	10	17	12	40
Psychotic disorders	11	16	0	27
Dementia	3	1	8	12
Tumour	9	0	0	9

Table 2

Distribution of total cost of brain disorders in Switzerland by resource use components.

€ million	Cost	%
Direct healthcare costs	2922	33%
Hospitalisation	1716	19%
Drugs	213	2%
Outpatient care	958	11%
Medical devices	35	0%
Direct non-medical costs	1661	19%
Social services	1144	13%
Informal care	366	4%
Adaptations	125	1%
Transportation	26	0%
Total indirect costs	4357	49%
Sick leave	3019	34%
Early retirement	679	8%
Premature death	660	7%
Total costs	8941	100%

Switzerland, 17% were used for the treatment of brain disorders that is €364 million without the drugs used in hospitals because they are counted in the total costs of running the psychiatric hospitals [23]. The amount of these direct health costs is €1.7 billion amounting to 5.9% of total direct healthcare expenditure.

Direct non-medical costs of mental disorders

Disability benefits due to mental disorders amount to €1.3 billion in 2005 based on the fig-

ures for January 2005 [30]. 8 out of 1000 inhabitants of Switzerland received disability benefits for mental disorder [31]. Direct non-medical costs in Switzerland also include social services, opportunities of housing as well as home care for people with mental disorders. The total costs of home care in Switzerland amounted to €0.63 billion in 2004 [32]. The proportion of home care due to mental disorders was estimated at ¼ of the total costs, thus €158 million [27]. These figures amount to €2.1 billion for direct non-medical costs. The costs of supported housing and psychiatric rehabilitation and reintegration in work are not included.

Indirect costs of mental disorders

The total costs due to distress at workplace in Switzerland amount to €2.6 billion, thereof medical costs €0.9 billion, non-prescribed medication €219 million, sick leave and lost productivity €1.5 billion [33]. An international study in 5 European countries concludes that the indirect health care cost due to mental disorders amounts to 3 to 4 percent of GDP (gross domestic product). Two-thirds account for lost productivity, one-third due to sick leave [34]. In Switzerland the GDP in 2005 was €286 billion [35]. Thus the indirect mental health costs would amount to €11.5 billion.

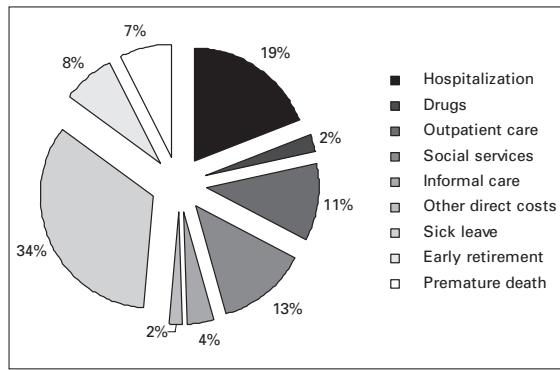
Discussion

Overall, this study shows that brain disorders are extremely costly and cause a substantial economic burden to Swiss society. These disorders consume 4% of the gross national product and cost each Swiss citizen an estimated €1200 per year. The costs of the mental disorders amount to €722 per inhabitant. The disorders that are traditionally regarded as mental disorders account for

approximately ⅓ of the total costs while disorders traditionally regarded as neurological/neurosurgical account for the remaining ⅓ of the cost of brain disorders. Another general trend is that the highly prevalent disorders such as anxiety and migraine are inexpensive per case but, due to their high prevalence, are very costly to society. Affective disorders are the most costly brain disorders

Figure 5

Distribution of total cost of brain disorders in Switzerland by resource item components. Note. Direct non-medical costs are missing for the following disorders: affective disorders, anxiety disorders, migraine and trauma. Indirect cost is missing for psychotic disorder. Only indirect costs due sick-leave were included in anxiety disorders.



because they are both rather prevalent and costly per case. This is also in line with the general costing picture of brain disorders in Europe.

Direct prospective studies conducted in Switzerland would of course have been the best way of estimating the cost of brain disorders in Switzerland. However, to our knowledge no comprehensive studies have been conducted. The imputed data of the present study can be compared to direct Swiss data obtained from public authorities, social services and national literature regarding costs of several brain disorders. In the following we focus on mental disorders. A study by Schopper, Pereira et al. (2000) found that the proportion of total disease burden expressed in disability adjusted life years (DALYs) due to mental disorders (depression, alcohol abuse, suicides, obsessive-compulsive disorder and schizophrenia) was 21% in the canton of Geneva. Ischaemic heart disease and cerebrovascular diseases contributed to DALYs with 11%, neoplasms (respiratory system and breast) with 5%, AIDS with 5% [24].

Prevalence of mental disorders in Switzerland

The overall one-year prevalence of any mental disorder including addiction is 24% correspon-

ding to 1.75 million inhabitants [25]. This finding is consistent with a study by Wittchen & Jacobi that 27% of the adult EU population, 18-65 of age, is affected by at least one mental disorder in the preceding 12 months [26]. The imputed data presented here, demonstrate that 1.25 million people in 2004 equivalent to 17% of the population suffer from addiction, affective, psychotic or anxiety disorder. These figures suggest an underestimation of the prevalence of mental disorders by the present study and as such an underestimation of costs. One further reason for having underestimated the cost might be that the present study only counted the four major groups of mental disorders.

Costs of mental disorders in Switzerland

The total direct healthcare costs for psychiatric disorders in Switzerland according to direct Swiss data amount to €1.7 billion. This figure is close to the present estimate of €2.1 billion. The estimate based on Swiss data does not include outpatient treatment other than psychotherapy. However, the Swiss data includes the costs of all mental disorders while the estimated data presented here only comprise psychosis, addiction, affective and anxiety disorders.

The total direct non-medical costs for psychiatric disorders in Switzerland according to direct Swiss data amount to €2.1 billion. In the present study direct non-medical costs for mental disorders were estimated to be €157 million. However, this figure is not comparable with the direct Swiss data because the latter includes all psychiatric disorders while the present estimate only includes addiction and psychotic disorders. Furthermore, the imputed data do not include the cost of disability benefits.

According to direct Swiss data the indirect

Table 3

Cost of brain disorders in Switzerland by disorder area (€PPP million).

Disorder Area	Healthcare costs	Direct non-medical costs	Indirect costs	Total cost
Neurosurgical disorders	88	5	57	150
Brain tumour	22	5	57	84
Trauma	67			67
Neurological disorders	391	427	987	1804
Epilepsy	58	98	214	371
Migraine and other headaches	34		613	647
Multiple sclerosis	76	127	84	288
Parkinson's disease	78	116		193
Stroke	144	85	75	304
Neurological/mental disorder	320	1072		1392
Dementia	320	1072		1392
Mental disorders	2124	157	3314	5595
Addiction	391	74	893	1358
Affective disorders	664		1954	2618
Anxiety disorders	625		467	1091
Psychotic disorders	445	83		527
All brain disorders	2922	1661	4357	8941

mental health costs due to sick leave and lost productivity in Switzerland amount to €1.5 billion. In the present study the indirect costs were dominant cost components, particularly in mental disorders. These are primarily due to reduced productivity and premature retirement caused by both morbidity and mortality. In the present study indirect costs for mental disorders were estimated at €3.3 billion without psychotic disorders. As the above-mentioned figures show a great variability in composition it is difficult to compare these figures.

However, the total costs of mental disorders based on direct Swiss data amount to €5.3 billion which is close to the estimates of the present study that indicates that mental disorders cost €5.6 billion per year.

Restrictions of the present cost estimates

There are many reasons why the present cost estimates are extremely conservative. Firstly, many important brain disorders have not been included in this study because data are lacking. Thus, mental retardation, developmental disorders, eating disorders and neuromuscular disorders are not included. We also have not included tobacco addiction, which would add a significant amount to the cost of addiction. Many cost categories are missing, for example indirect costs for psychotic disorders and alcohol dependence and direct non-medical costs of affective and anxiety disorders. One of the main difficulties encountered in the present study was a lack of good studies in Switzerland and Europe, making extrapolations relatively uncertain. Furthermore, studies were done at different times, using different methodology, focusing on different segments of the population and using different health economic categories or principles. For all these reasons, they have been difficult to put together. Furthermore the cost categories of the direct Swiss data were not consistently equivalent with the categories of the present estimation contributing to the difficulty in comparing the cost data of both sources.

The external validation of the results of the present study applied to the European population as a whole, shows that it is in relatively strong concordance with previous research findings in the literature [1]. The comparison indicates possible underestimation in mental disorders, first and foremost due to missing data. Further critical methodological issues have been described and discussed previously [1].

Nevertheless the present study presents the best possible estimate of the cost of brain disorders, especially mental disorders in Switzerland.

Cost data are, however, extremely important for decision makers. It makes sense that costly disorders should receive more attention than less costly disorders. Furthermore, exact cost data are important to analyse effects of interventions and to calculate whether increased research effort or increased clinical effort would pay off. The present study strongly indicates the need for further research in brain disorders both in terms of epidemiology and health economics at European and at national level.

Comparison with cost and burden of other disorders

We are not aware of other Swiss studies summarising the epidemiology, burden and cost of other major groups of disorders such as heart disorders, cancer or diabetes. Even at the European level and in the USA such data are scarce. Data on diabetes, cancer and heart disorders from foreign sources indicate that brain disorders constitute the most costly group. This is in accordance with the burden of disorders of the brain study showing that, in Europe, brain disorders are responsible for 35% of the total burden of all disorders [2].

In Switzerland few studies concerning the burden of different groups of disorders have been conducted. One study estimated the total annual costs caused by overweight and obesity to €1.7 billion [36]. The burden of illness of severe sepsis was estimated to range from €0.3 to 0.8 billion per year [37]. Asthma is considered to be a major healthcare cost factor in Switzerland, amounting to approximately € 0.8 billion per year [38].

Corresponding to the WHO data on the burden of disease in Europe, the costs of brain disorders are bigger than the costs of cancer and diabetes combined [2]. It also has been shown that the burden of brain diseases and therefore also the costs of brain disorders will increase markedly during the next two decades due to the ageing population in Europe. In the 5th framework programme of the EU (FWP, 1998–2002) only 8% of research funding was allocated to brain research. Clearly, there is a need for an increase in this relatively small amount considering the huge cost and burden of brain disorders.

However, it should be remembered that health care expenditure must not necessarily equal the burden of disorder. It must also reflect available treatment possibilities. The problem of whether or not sufficient resources are allocated to the care of brain disorders cannot be solved using the present data, but needs a much more penetrating analysis.

Conclusions and recommendations

In Switzerland with a population of 7.3 million, an estimated 2 million inhabitants currently suffer from one or more brain disorders. Brain disorders figure amongst the leading causes of death and disability. Yet, the knowledge of the epidemiological and economic impact of brain disorders has been relatively little researched in Switzerland. The present study estimated the total cost of brain disorders in Switzerland to €8.9 billion in 2004, which corresponds to a cost of €1200 per capita. Direct medical expenditure alone totalled €2.9 billion, comprising hospitalisation (€1.7 billion), outpatient care (€1.0 billion) and drug costs (€0.2 billion). Attributable indirect costs resulting from lost workdays and productivity loss due to permanent disability and mortality amounted €4.4 billion. Direct non-medical costs (social services, informal care and others) totalled €1.7 billion in 2004. These estimates include the most prevalent brain disorders. Due to scarcity of data the results only partially include direct non-medical cost and indirect costs and omit intangible costs completely.

This study has exclusively evaluated the published evidence. As such data were largely missing in Switzerland the total costs of the several brain disorders were estimated through a model based on available data in other countries.

The present estimates for mental disorders were compared with available data in Switzerland. The present imputed data estimated the total costs of mental disorders at €5.6 billion thereof direct healthcare costs €2.1 billion, direct non-medical costs €0.2 billion and indirect costs €3.3 billion. The review of direct Swiss data resulted in

the following cost estimations. Direct health care costs amounted to €1.7 billion, direct non-medical costs were estimated at €2.1 billion including disability benefits, indirect costs at €1.5 billion. These figures amount to €5.3 billion which is very close to the present estimates of the extrapolated data. With respect to the many restrictions of the cost estimates both the imputed data as well as direct Swiss data, the total costs of mental disorders in Switzerland seem to amount to €5.3 to 5.6 billion corresponding to 16 to 17% of the total costs of the health system in Switzerland (€32.5 billion, [39]).

The present study probably underestimates the full economic burden of brain disorder in Switzerland because of major shortcomings in the epidemiologic and economic knowledge of brain disorders in Switzerland. Furthermore, treatment patterns and care provided to patients change over time. In order to better understand the impact of brain disorders to Swiss society prospective field studies are needed in all disorders of the brain. These efforts need to be done in close collaboration between epidemiological experts and health economic experts in the field.

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