

The Global Costs of Schizophrenia

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Abstract

Schizophrenia is a chronic disease associated with a significant and long-lasting health, social, and financial burden, not only for patients but also for families, other caregivers, and the wider society. Many national and local studies have sought to estimate the societal burden of the illness—or some components of it—in monetary terms. Findings vary. We systematically reviewed the literature to locate all existing international estimates to date. Sixty-two relevant studies were found and summarized. Within- and between-country differences were analyzed descriptively. Despite the wide diversity of data sets and methods applied, all cost-of-illness estimates highlight the heavy societal burden of schizophrenia. Such information helps us to understand the health, health care, economic, and policy importance of schizophrenia, and to better interpret and explain the large within- and across-country differences that exist.

Keywords: Schizophrenia, cost-of-illness, burden of illness, economics.

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Schizophrenia can be a devastating disease with wide-ranging and long-lasting impacts not only for people with the illness, but also for their families and the wider society. A number of studies have sought to gauge the overall magnitude of these impacts by calculating the individual, group, or national burden of illness in cost terms. “Cost-of-illness” calculations of this kind have now been carried out for a number of countries; the purpose of this article is to collect, summarize, and compare these studies through a systematic review of the international literature.

Methods

Cost-of-Illness Methods. Cost-of-illness studies identify and measure the total societal burden of a disorder or dis-

ease. Estimates of costs are based on prevalence or incidence data. Prevalence-based studies estimate the economic burden to society during a given period of time, usually a year, generated by every prevalent case. The value of resources used or lost during a specified time period is measured, irrespective of the time of onset. Incidence-based studies, on the other hand, estimate the lifetime costs resulting from an illness or disorder for all cases with onset in a given base year.

Cost-of-illness studies could identify three main categories of costs: (a) direct costs, for which payments are made, (b) indirect costs, for which resources are lost, and (c) intangible costs, which describe the drawbacks of an illness such as pain or depression. The latter are usually missing from cost-of-illness measures as they cannot be directly quantified in monetary terms. Direct costs cover expenditures for hospital and nursing home care, physician and other professional services, drugs, and appliances and are generally estimated as the product of the number or amount of services used and the unit price or charge. Indirect costs are wholly dominated by the value of lost productivity due to morbidity and premature mortality. Mortality costs are the product of the number of deaths from the disorder and the discounted value of average expected future earnings. Life expectancy for different age and gender groups, earnings at successive ages, and workforce participation rates are taken into account, and an appropriate discount rate is used to convert future earnings to their present value. Morbidity costs include production losses by patients and their caregivers due to the illness. These costs are estimated either by the expected mean earnings of an individual without the disorder multiplied by the number of days lost from work (the so-called human capital method) or the number of

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days necessary to fill the vacant position (the friction cost method) plus the mean earnings of caregivers multiplied by the number of days lost in performing their main activity.

Literature Review. A systematic search was conducted using Medline, PsycINFO, EMBASE, and NHS EED data bases in order to identify any studies across the world that have estimated the total and/or component costs of schizophrenia. There were no limitations on publication date, publication status, or language. Bibliographies of eligible papers were checked for further studies. Unpublished studies were also sought. After removing duplicates, 62 articles were selected as relevant to the topic and included in the review.

Estimates of total, direct, and indirect costs were derived mainly from full cost-of-illness studies. Some data on specific components of costs such as inpatient costs, drug costs, legal costs, employment costs, and costs to families were extracted from other kinds of studies as well.

Most of the identified studies were conducted in Europe and North America, with only a few exceptions (Mexico, Nigeria, and Puerto Rico). No attempt was made to make purchasing power parity adjustments or to carry out statistical intercountry comparisons. Instead, the findings are summarized in a narrative discussion and in simple tables. The currencies used in the original papers are retained here, and costs are at the price levels used by authors. Our interest here is rarely in the absolute levels of costs but in their proportional contributions to, for example, total health care expenditure or gross domestic product, and the proportional importance of their main components. Dollars are U.S. unless otherwise indicated.

Comparing costs among countries with different socioeconomic, cultural, and epidemiological backgrounds and different systems for organizing and funding health care is necessarily difficult (De Hert et al. 1998a; Pang 2002). Nonstandardized criteria used in different studies for the calculation of costs make comparison particularly problematic. Even within countries, different studies can produce divergent estimates of costs: There can be differences in estimation techniques, data sets, changing demographics, changing disease classification systems, and changing patterns of health care utilization. International comparisons among studies are yet more complicated than within-country comparisons. In the case of intercountry comparisons, we should be aware of the underlying differences in sociodemographic composition and psychiatric morbidity; different data availabilities, disease coding systems, and ways of costing services; and various pathways to, availabilities, and organization of care for people with psychiatric disorders. Relative price differentials should be considered as well. Despite the

limitations on comparability, the national estimates provide interesting information when read alongside contextual information and draw a useful picture about the health, health care, health policy, and economic importance of a disorder in each country. However, these difficulties should certainly caution against making any detailed cross-country comparisons of estimates.

Results

Comparison of international cost findings are grouped by countries under the following headings:

- national total, direct, and indirect costs
- direct, indirect, and total costs per patient per year
- costs of inpatient services
- costs of drugs
- costs of lost productivity
- mortality costs
- family impact costs
- criminal justice system costs

National Total, Direct, and Indirect Costs. Total, direct, and indirect cost calculations aim to evaluate all illness-related costs and to reveal the countrywide financial burden. Table 1 summarizes the findings.

United States. In the United States, Gunderson and Mosher (1975) provided one of the first estimates of the costs of schizophrenia, calculating minimum and maximum values of each cost component. The annual direct cost was estimated to be between \$2 and \$4 billion in 1975, while the indirect cost estimate was between \$8.5 and \$11.4 billion. Rice and Miller (1996), in their prevalence-based study, provided one of the most comprehensive cost estimates for schizophrenia internationally and a reminder that this disorder has wide-ranging impacts. Their estimation of the total cost of schizophrenia was \$22.8 billion in 1985. Direct treatment (institutionalization and ambulatory visits) and support costs (research, training, and administration) constituted 49 percent of the total, amounting to \$11.1 billion. The indirect costs forgone as a result of patients' morbidity and mortality comprised 40 percent of the total (\$9.1 billion); while other related costs such as crime, social welfare administration, and the cost of family caregiving accounted for most of the other 11.1 percent and are part of the indirect costs provided in table 1. Warner and de Girolamo (1995) caution that indirect costs may be overestimates because of reporting errors.

These estimates were updated to 1990 by Rice and Miller (1996), taking into account changes in the indexes related to the illness and the economic data. Total costs of schizophrenia in 1990 were estimated to have risen by 43 percent in 5 years, to \$32.5 billion. Direct costs of \$17.3

Table 1. National total, direct, and indirect costs of schizophrenia

Country	Source	Year of costing	Total National currency units	Costs Direct ¹		Indirect National currency units
				National currency units	As percent of national health expenditure	
Australia	Hall et al. 1985	1976 ²	\$139 million	\$24.6 million	-	\$114.3 million
	Andrews 1991	1990 ³	\$69.5 million	\$12.8 million	-	\$56.7 million
Belgium	De Hert et al. 1998 ^b	1994	-	\$304.0 million	1.9	-
Canada	Goeree et al. 1999	1996	\$2.35 billion	\$1.12 billion ⁴	-	\$1.23 billion
Denmark	Lund 1994	1992	\$562 million	-	-	-
France	Rouillon et al. 1997	1992	Fr17.6 billion	Fr12.4 billion	2.0	Fr5.2 billion
Germany	Pietzcker 1987	1987	DM8 billion	DM4.1–8.7 billion	-	-
	Osterhelder et al. 1998	1993	DM12.3–26 billion	-	-	-
	Kissling et al. 1999	1995	DM8.5–18 billion	DM1.1–2.4 billion	-	DM7.4–15.7 billion
Hungary	Rupp et al. 1999	NA	Ft25.63 billion	Ft8.81 billion	-	Ft16.82 billion
Netherlands	Evers and Ament 1995	1989	843.7 million Guilders	778.0 million Guilders	2.0	65.6 million Guilders
	Meerding et al. 1998	1994	-	800.0 million Guilders	1.4	-
Norway	Rund 1995	1994	NOK3.5 billion	NOK1.8 billion	-	NOK1.7 billion
	Rund and Ruud 1999	1994	-	NOK1.2 billion	-	-
Puerto Rico	Rubio-Stipec 1994	1994	\$266.1 million \$60 million ³	\$36.1 million ⁵ \$19.58 million ⁶	-	-
Sweden	Jönsson and Walinder 1994	1990	SEK12 billion	-	-	-
U.K.	Davies and Drummond 1994	1990/91	£2.1 billion	£396.0 million	1.6	£1.7 billion
	Knapp 1997	1992/93	£2.6 billion	£810.0 million ⁷	2.8	£1.8 billion
	Guest and Cookson 1999 ⁸	1997	£172.5 million	£88.2 million	-	£84.3 million
U.S.	Gunderson and Mosher 1975	1975	\$11.6–19.5 billion	\$2–4 billion	-	\$8.5–11.4 billion
	Rice and Miller 1996	1985	\$22.8 billion	\$11.1 billion	3.0	\$11.6 billion ⁹
	Rice and Miller 1996	1990	\$32.5 billion	\$17.3 billion	2.5	\$15.2 billion ⁹

¹ Represents health care costs only for most countries.² Prevalence data is for 1976; cost estimates are in 1975 U.S. dollars.³ Cost estimates are in 1975 U.S. dollars.⁴ Includes administrative costs and costs of incarceration.⁵ Incidence-based data.⁶ Prevalence-based data.⁷ Includes NHS and social services expenditures.⁸ Estimates are for a cohort of newly diagnosed patients only.⁹ Includes other related costs—crime and social services.

billion represented 2.5 percent of total national health care expenditure in 1990. As in the estimates for 1985, morbidity and mortality cost estimations were based on the human capital approach. Total indirect costs were estimated to be \$12.0 billion, of which \$10.7 billion was attributed to morbidity and \$1.3 billion to mortality from schizophrenia. Other related costs (direct and indirect) were estimated to be \$3.2 billion in 1990. Despite some expressed reservations, this remains the most comprehensive and widely cited costing of schizophrenia.

Wyatt et al. (1995) projected empirically obtained costs of schizophrenia from previous studies to 1991, estimating the total economic burden of schizophrenia in the United States as \$65 billion.

Europe. In the United Kingdom, Davies and Drummond (1994) estimated the annual average direct cost of treating a person with schizophrenia to be £2,138 and the annual treated prevalence of schizophrenia to be approximately 185,400 persons. Combining the two, they arrived at the total annual direct treatment cost of £396 million, which represented 1.6 percent of the national health care budget in 1990–91. Turning to the nonservice items, morbidity costs were calculated under the assumption that 70 to 80 percent of people with schizophrenia would be unemployed. Using an average wage of £14,912 the productivity losses were estimated to be £1.7 billion. These are conservative estimates in that neither the direct nor indirect cost estimates covered all major cost components. For example, expenditures on social care and criminal justice were excluded and lower-bound estimates were taken for the frequency of health service use. Productivity losses due to premature deaths and family caregivers' costs were also excluded.

A later study suggested rather higher costs (Knapp 1997). The estimated direct health care costs of schizophrenia were £714 million in England in 1992–93 (taken from the National Health Service program budget). Including social service usage raised the direct costs to £810 million. Schizophrenia accounted for 2.8 percent of all national health and social services expenditure in that year. Together with estimates for some indirect costs (excluding costs of caregiver time) the total burden of illness in 1992–93 was £2.6 billion.

More recently, Guest and Cookson (1999) computed a lower figure for total costs from an incidence-based study of an annual cohort of patients over the first 5 years following diagnosis of schizophrenia. Mean discounted annual cost was £172.5 million for this cohort of 7,500 newly diagnosed patients (approximately 1.5 percent of the total schizophrenia population in the United Kingdom). Half this total was attributed to lost productivity because of morbidity and mortality of patients and unemployment of family caregivers because of caring

responsibilities. The indirect costs figure is an underestimate as mortality and morbidity costs were examined over only 5 years rather than the lifetime.

Rouillon et al. (1997) estimated the direct costs of schizophrenia in France to be Fr12.4 billion in 1992. Estimates were based on prevalence data derived from a survey of patients treated by public, private, and community psychiatrists. Indirect costs for lost employment were measured by social assistance allowances and accounted for Fr5.2 billion, which could be an underestimate unless the allowances reflect average wages.

Using incidence-based data for 1993–94, De Hert et al. (1998b) computed the mean annual health care cost of treating a schizophrenia patient in Belgium as U.S. \$12,050. With prevalence taken as 2.5 per 1,000, equivalent to 25,274 people in the country, the total annual cost amounted to \$304 million, 1.9 percent of all government health care expenditure. Indirect costs were not estimated, although it was noted that three out of four patients were unemployed.

Kissling et al. (1999) provided gross estimates of costs for 1995 for Germany using prevalence data from one locality. Total yearly cost of treatment was estimated to be about DM33,000 for someone treated predominantly as an outpatient, DM126,000 for someone requiring hospital care, and about DM135,000 for someone in job rehabilitation. Assuming a prevalence of 200,000 to 424,000 patients, total yearly costs for the economy were estimated to be between DM8.5 and 18 billion. Indirect costs because of morbidity accounted for 87 percent of this total—the highest such proportion across the international literature. Osterheider et al. (1998) estimated the total annual cost of schizophrenia to be between DM12.3 and 26 billion for Germany in 1993. Direct costs amounted from DM4.1 to 8.7 billion. An earlier calculation by Pietzcker (1987) suggested that the total cost for West Germany was DM8 billion.

Information on the economic impact of schizophrenia in The Netherlands comes from two studies that produced comparable estimates using different methods. Evers and Ament (1995) aggregated expenditures due to schizophrenia under various heads to arrive at a total direct cost of 778 million guilders (2% of all health care costs) in 1989. Meering et al. (1998) identified all health care costs in 1994 by diagnostic group across the full disease spectrum and assigned 1.4 percent to schizophrenia (approximately 800 million guilders). Both Dutch studies were based on prevalence data. Meering et al. (1998) did not look at indirect costs, while Evers and Ament used the human capital approach to reach a figure of 65.6 million guilders. This latter figure is probably an underestimate as it was based only on national data on absence from work through disability, and most

studies agree that few schizophrenia patients form part of the active workforce.

Two studies provide somewhat different estimates of direct costs in Norway. Rund and Ruud (1999) calculated costs of services from a 1994 register of the patient population using services over a 4-week period in six catchment areas. Their estimate of NOK1.2 billion is lower than the NOK1.8 billion reported by Rund (1995), which was based on official statistics. While Rund and Ruud (1999) did not estimate indirect costs, Rund (1995) calculated them to amount to NOK1.7 billion, giving a total economic impact of NOK3.5 billion per year. Cost-of-illness figures are also available for two other Scandinavian countries. The socioeconomic cost of schizophrenia in Sweden was approximately SEK12 billion in 1990 (Jönsson and Walinder 1994). In Denmark, direct treatment costs were estimated at \$562 million in 1992, although this did not include day care and drugs (Lund 1994).

Based on Hungarian national data, Rupp et al. (1999) estimated direct costs to be Ft8.81 billion and indirect costs Ft16.82 billion, showing that almost two-thirds of the total cost of schizophrenia is related to disease-specific morbidity and premature mortality in Hungary.

Canada. The indirect cost estimates in all of the above studies were based on the human capital approach. A different perspective on indirect cost estimates is offered by Goeree et al. (1999) for Canada, using the friction cost method. Assuming a 3-month friction period, lost productivity associated with morbidity and premature mortality from schizophrenia in Canada was estimated to be CAN\$1.23 billion in 1996. For comparative purposes Goeree et al. (1999) also employed the human capital approach and found a 69-fold difference (CAN\$105 million) between the two methods. Together with the direct costs (health care and non-health care) of CAN\$1.12 billion, the total cost of schizophrenia was estimated to be CAN\$2.35 billion, which represented approximately 0.3 percent of Canadian gross domestic product in 1996.

Australia. One of the earliest cost-of-illness estimates for schizophrenia was an incidence-based study in New South Wales, Australia, in 1976 (Hall et al. 1985). The annual incidence of 22/100,000 resulted in total costs of AUS\$139 million. Including direct and indirect costs during the prodrome phase, the total burden of new cases to the New South Wales economy was estimated to be AUS\$146.4 million.

At the beginning of the 1990s, there were some suggestions that the incidence of schizophrenia fell in some countries between 1975 and 1990, and that the early onset and very severe cases were no longer appearing (Der et al. 1990). Influenced by this argument, Andrews (1991) reestimated the costs of schizophrenia in New South Wales in 1990, using data based on conditions in 1976 but assum-

ing a 40 percent reduction in incidence between 1976 and 1990. The figures for 1990 were AUS\$12.8 million in direct costs and AUS\$56.7 million in indirect costs (without costs for the prodrome phase).

Puerto Rico. Rubio-Stipec et al. (1994) estimated the total and direct costs of schizophrenia in Puerto Rico, first adopting an incidence-based approach and then a prevalence-based method. The huge differences in the estimates (\$266.1 million vs. \$60 million, \$36.1 million vs. \$19.58 million) provide a clear illustration of how the chosen methodology influences the calculation.

Direct, Indirect, and Total Costs Per Patient Per Year.

In table 2 all available direct, indirect, and total cost estimates are presented for the average patient year. These annual estimates vary greatly between countries, and indeed sometimes between studies within a country, as a consequence of using different reference years, different calculation methodologies, and changing health care settings. Most estimates stem from studies described above, and we do not repeat the detail. Pertinent study characteristics are listed in the notes to table 2.

Costs of Inpatient Services. Inpatient admission is the single largest contributor to the direct costs of treating schizophrenia. Patients presenting for the first time often show acute psychotic symptoms that require hospitalization, while treatment for people with repeated relapses is also still predominantly hospital-based across much of the world. The seemingly high cost of inpatient treatment has partly driven efforts to shift the balance of care from hospital to community. Assumptions about effectiveness, professional opinion, patient preferences, human rights arguments, and greater societal tolerance have also been influential.

The proportion of costs attributed to inpatient care varies from country to country, depending on the organization of mental health services. In some countries, hospitalization accounts for more than 90 percent of all direct health care costs, while in some other countries or localities (see Haro et al. 1998)—especially where hospital closures have been actively pursued—the share of inpatient costs has reduced considerably in recent years. It is possible to compute hospitalization costs as a percentage of total direct health care costs for some countries, as discussed briefly below (see table 3). As noted earlier, comparisons are not straightforward. Estimation methods are less than perfect in most studies, and the organization of care patterns can make it difficult to separate inpatient and outpatient costs.

In the United States, almost two-fifths (37%) of the total direct cost in 1990 was accounted for by expenditures for care in speciality institutions and another 31 per-

Table 2. Direct, indirect, and total costs per patient per year

Country	Source	Year of costing	Cost Per Patient Per Yr		
			Direct costs ¹	Indirect costs	Total costs ²
Australia	Andrews 1985	1975	\$11,074	-	-
	Hall et al. 1985	1975	-	-	\$131,333
	Langley-Hawthorne 1997 ³	1995	\$12,191	\$21,369	\$33,560
Belgium	De Hert et al. 1998 ^b	1994	\$12,050	-	-
Canada	Goeree et al. 1999	1996	\$4,602	\$6,710	\$11,312
Denmark	Lund 1994 ⁴	1992	\$14,312	-	-
Germany	Häfner et al. 1986 ⁵	1986	DM15,574	-	-
	Salize and Rössler 1996 ⁵	1994	DM27,566	-	-
Italy	Moscarelli et al. 1991	1991	\$5,678	-	-
	Tarricone et al. 2000	1995	ITL14.82 million	ITL34.54 million	ITL49.36 million
Mexico	Rascon et al. 1998	1994	-	-	\$1,230
Netherlands	Wiersma et al. 1995	1979	\$17,000	-	-
	Evers and Ament 1995	1989	\$12,470	-	-
Nigeria	Suleiman et al. 1997	1995	5042.6 Naira	860.2 Naira	5902.8 Naira
Norway	Rund and Ruud 1999	1994	\$39,000	-	-
Spain	Haro et al. 1998 ⁶	1994	\$2,243	\$2,863 (Burlada) \$2,423 (Barcelona) \$68 (Cantabria)	-
Sweden	Wistedt 1992	1990	\$17,285	-	-
Switzerland	Fischer and Barrelet 1987	1981	\$12,300	-	-
U.K.	Davies and Drummond 1994	1990	\$3,560	\$15,300	\$18,860
	Kavanagh et al. 1995	1991/93	-	-	\$17,421
	Guest and Cookson 1999 ⁷	1997	£11,599	£11,401	£23,000
U.S.	Muller and Caton 1983	1975	-	-	\$13,700
	Rice and Miller 1996	1990	\$6,918	\$6,097	\$13,015
	Hu et al. 1996	1990	-	-	\$31,890
	Martin and Miller 1998 ⁸	1991–1993	\$2,543	-	-

¹ Health care costs only.

² Total of direct health care and non-health care costs and indirect costs.

³ Incidence-based study, costs averaged per annum over expected life span.

⁴ Without costs for day care and drugs.

⁵ Cost of comprehensive community-based mental health care.

⁶ For the third year of treatment.

⁷ For newly diagnosed patients.

⁸ Three-year Medicaid cohort study.

Table 3. Costs of inpatient services

Country	Source	Year of costing	Hospitalization cost as percent of direct health care costs
Australia	Langley-Hawthorne 1997 ¹	1995	28
Belgium	De Hert et al. 1998 ^b	1994	89.6
Canada	Goeree et al. 1999	1996	54
France	Rouillon et al. 1997	1992	55
Germany	Häfner et al. 1986	1979/80	80
	Salize and Rössler 1996	1994/95	38
Hungary	Rupp et al. 1999	NA	62
Italy	Moscarelli et al. 1991	1991	41
	Tarricone et al. 2000	1995	16.5
Netherlands	Evers and Ament 1995	1989	80
Norway	Rund and Ruud 1999	1994	94
Spain	Haro et al. 1998	1994	76 (Cantabria) 31 (Barcelona) 49 (Burlada)
Sweden	Jönsson and Walinder 1994 ²	1990	93
U.K.	Davies and Drummond 1994	1990/91	74
	Kavanagh et al. 1995	1992	51
	Guest and Cookson 1999	1997	69
U.S.	Rice and Miller 1996	1990	68

Note.—NA = not applicable.

¹ Incidence-based study.

² The figure relates to inpatient care for therapy refractory patients only.

cent for nursing home expenditures (Rice and Miller 1996). These proportional contributions will doubtless have declined over time: a national cohort study found decreasing inpatient service costs between 1993 and 1995, falling from \$12,429 to \$9,506 per patient year (Leslie and Rosenheck 1999).

The direct cost of treating schizophrenia in other countries is similarly dominated by hospitalization and (increasingly over time) by community-based residential services. For example, Davies and Drummond (1994) found that hospital- and community-based residential care accounted for nearly three-quarters of all direct costs in 1990 in the United Kingdom, and that 97 percent of the lifetime direct treatment costs of schizophrenia were attributable to 41 percent of patients who had hospital inpatient treatment episodes of 2.5 years or longer. Evidence of such asymmetry was also observed by Kavanagh et al. (1995): the 14 percent of schizophrenia patients who were in either short- or long-stay hospitals in 1992 accounted for 51 percent of total public expenditure

on schizophrenia care. Guest and Cookson (1999) placed the burden of hospitalization costs at 69 percent of all health care costs for their cohort of newly diagnosed patients.

According to De Hert (1998a), hospitalization costs in Belgium accounted for 90 percent of all health care expenditure for schizophrenia in 1994, although this could be an overestimate as, under the Belgian hospital regulations, day care is considered a form of hospitalization. In 1994, schizophrenia patients were estimated to have spent 2.4 million days in the hospital, claiming 38 percent of government expenditure on all psychiatric hospital beds and 8 percent of all government expenditure on inpatient services.

Changes have been reported over time. A German study conducted in Mannheim found that 80 percent of the direct health care costs in 1979–80 went for inpatient treatment (Häfner et al. 1986), compared with 37 percent in 1994–95 due in large part to the development of comprehensive community care (Salize and Rössler 1996).

While the average service cost of community care for the cohort in the latter study was \$18,377 per patient year, long-term care in a long-term ward or in a hospital ward of a state mental hospital costs \$43,000 and \$61,261 per patient year, respectively. Italy also provides evidence of a changing inpatient contribution to total costs, with an earlier estimate of 41 percent (Moscarelli et al. 1991) compared with only 17 percent more recently (Tarricone et al. 2000).

Long-term inpatient provision continues to dominate expenditure patterns in some countries, however. In Norway, three-quarters of all direct health care costs were attributed to inpatient care in long-term hospital wards or psychiatric nursing homes, with acute and intermediate length inpatient care costs representing another fifth (Rund and Ruud 1999).

Another characteristic of some studies is that some patient groups are disproportionately costly. For example, in Sweden, Jönsson and Walinder (1999) estimated that inpatient costs for therapy-refractory schizophrenia patients accounted for 93 percent of their total health care costs in 1990, equivalent to 46 percent of the total cost of inpatient care for all schizophrenia patients. (See also Hertzman 1983.)

Cost of Drugs. The contribution of drug costs to the total cost of treatment is generally modest, although it varies from country to country (table 4). In high-income countries, the proportion spent on medication usually lies between 1.1 percent and 9 percent of all direct health care costs. Differences reflect the structure of services, national pricing policies, the extent and methods of disaggregation of costs, and the market share of the more expensive atypical antipsychotics. Not surprisingly, the drug-cost proportion tends to be higher in countries where the service range is more limited and where the cost of inpatient treatment is lower. This is vividly illustrated by a Nigerian study that found antipsychotic drugs accounted for 53 percent of total cost (Suleiman et al. 1997). As a proportion of the direct costs only, the proportion is a staggering 61.8 percent, reflecting the high acquisition costs of imported drugs and the typical practice of treating only in outpatient settings.

Most available schizophrenia cost-of-illness estimates are for periods when medication comprised typical (conventional) antipsychotics and adjunctive medications. The wider use of atypicals will push up the drug-cost contribution to total cost, partly because of their higher prices and partly because they are likely to reduce inpatient

Table 4. Costs of drugs

Country	Source	Yr of costing	Cost of drugs as percent of costs
Belgium	De Hert et al. 1998 ^b	1994	5.4
Canada	Goeree et al. 1999	1996	4.7
France	Rouillon et al. 1997	1992	5.6
Germany	Salize and Rössler 1996 Kissling et al. 1999 ¹	1994/95 1995	5.8 4.5
Hungary	Rupp et al. 1999	NA	9.0
Italy	Tarricone et al. 2000	1995	7.0
Netherlands	Evers and Ament 1995	1989	1.1
Nigeria	Suleiman et al. 1997	1995	61.8
Spain	Haro et al. 1998 ²	1994	11.3 (Burlada) 11.8 (Barcelona) 13.0 (Cantabria)
Sweden	Lindstrom 1996	1996	4.0
U.K.	Davies and Drummond 1994 Knapp 1997 Guest and Cookson 1999	1990/91 1992/93 1997	5.0 4.0 2.0
U.S.	Rice and Miller 1996	1990	2.3

Note.—NA = not applicable.

¹ Includes doctors' fees.

² Includes both inpatient and outpatient medication costs.

stays, thus potentially reducing the total cost. Indeed, in the grander scheme of things, these more expensive treatments may actually prove to be cheaper for society, and more cost effective if the efficacy of these drugs results in fewer relapses, fewer inpatient admissions, and earlier discharge of patients from hospitals (Sartorius et al. 2002).

Costs of Lost Productivity. A large part of the global economic impact of mental illness stems from the difficulties encountered by people with schizophrenia in finding and keeping paid employment. About a third of all sickness absence from work has been attributed to common mental disorders (Jenkins 1985; Almond and Healey 2003), and there are also large impacts on productivity at the workplace (Kessler et al. 2001). In the case of schizophrenia, the most important feature of indirect costs is the loss of productivity because of patient morbidity and mortality (i.e., loss of ability to work). In Poland, Skarbak and Koval (1999) estimated that 98,233 disability-adjusted life years (DALYs) for males and slightly fewer for females were lost due to premature deaths and disability caused by schizophrenia in 1992. All but 5 percent of this resulted from disability.

The Office for Population Censuses and Surveys (OPCS) psychiatric morbidity surveys in the United Kingdom found that only 20 percent of people with psychoses were in paid employment (Foster et al. 1996), and

other studies in other countries point to the high rate of unemployment. In Nigeria, in contrast, "only" 44 percent of the patients were unemployed and the mean cost of lost productivity was 445.2 Naira, which is 52 percent of the total indirect costs. With a low average age of onset and the largely chronic development of schizophrenia, the loss of productivity for the national economy can be very high, although as Goeree et al. (1999) point out, the estimated impact is highly dependent on the mode of calculation. Table 5 presents estimates for the value of lost productivity due to schizophrenia-related morbidity and mortality. For example, in the United States, Rice and Miller (1996) estimated lost productivity due to morbidity to be \$8.1 billion in 1985 and \$10.7 billion in 1990. Wyatt et al. (1995) estimated the costs of lost labor of schizophrenia patients to be approximately double the direct health care costs.

Mortality Costs. Pooling evidence from across countries, Harris and Barraclough (1998) calculated that mortality among people with schizophrenia is 1.6 times greater than would be expected in a general population of similar age and gender, and the risk of suicide is 9 times greater. These deaths have costs. For example, Rice and Miller (1996) estimated that a total of 3,154 deaths due to schizophrenia occurred in 1985 in the United States, 10 percent of which were suicides. The cost of these deaths was a loss of an average of 32 person years per death,

Table 5. Costs of lost productivity

Country	Source	Yr of costing	Value of Lost Productivity		
			Morbidity costs	Mortality costs	Total
Canada	Goeree et al. 1999	1996	\$1.23 billion	\$1.53 million	\$1.23 billion
Germany	Kissling et al. 1999	1995	DM7.4–15.7 billion	-	-
Hungary	Rupp et al. 1999	NA	Ft12.4 billion	Ft1.4 billion	Ft13.8 billion
Netherlands	Evers and Ament 1995	1989	65.6 million Guilders	-	-
Nigeria	Suleiman et al. 1997 ¹	1995	445.2 Naira	-	-
Sweden	Jönsson and Walinder 1994 ²	1990	SEK7,310 million	-	-
U.K.	Davies and Drummond 1994	1990	£1.7 billion	-	-
	Guest and Cookson 1999 ³	1997	£78.8 million	£3.6 million	£82.4 million
U.S.	Rice and Miller 1996	1985	\$8.1 billion	\$1.0 billion	\$9.1 billion
	Rice and Miller 1996	1990	\$10.7 billion	\$1.3 billion	\$12.0 billion

¹ Per patient data.

² Estimates for treatment refractory patients only.

³ Estimates for a cohort of newly diagnosed patients.

resulting in a loss of \$1.0 billion to the American economy in 1985, and \$1.3 billion in 1990. About 36 percent of the deaths were among persons aged 25 to 44 years, and they accounted for 56 percent of the total mortality costs. Table 5 summarizes the international evidence on costs.

Family Impact Costs. With its chronic course and early onset, schizophrenia can have substantial psychological and economic impacts, not only on people with the illness, but also on their families. A five-country European study reported that family caregivers for adults with schizophrenia spent on average from 6 to 9 hours per day providing support (Magliano et al. 1998). The most common impacts reported were constraints on social activities, negative effects on family life, and feelings of loss. Patients living in a family environment might impose additional costs through household expenditure, travel costs, or lost earnings for those who care for them. These indirect costs may constitute only a small proportion of the total cost of schizophrenia, but their impact on some families can be large, although difficult to measure accurately (Creed et al. 1997). A few studies have attempted to estimate this financial burden (table 6).

One of the earliest attempts was a small sample American study by Franks (1990) in which 80 percent of the respondents had a family member with schizophrenia. Mean hours spent by family members in caregiving activities was 67 hours per month. There were also consequential employment and financial difficulties for families. The estimated average annual dollar expense per family was estimated to be \$3,311. Rice and Miller (1996) estimated

that family cost was 17 percent of total indirect costs of schizophrenia. The value of time committed by family members to the care of mentally ill relatives was estimated to be \$2 billion in 1985 and \$2.5 billion or an annual \$11,519 per family in 1990. Terkelsen and Menikoff (1995) reported family impact costs amounting to between \$2.47 and \$8.65 billion. Wyatt et al. (1995) supported that the loss of income incurred by relatives can be as high as productivity losses caused by suicide.

More than half of people with schizophrenia in the United Kingdom live at home, often with a family member. A survey of 100 patients in the United Kingdom found that 10 percent of families looking after someone with schizophrenia reported financial difficulties because of the patient's illness: 3 percent had stopped work to look after the patient, and 7 percent had taken time off work. Another study found that 16 percent of caregivers had stopped work to look after a relative with schizophrenia (Johnstone et al. 1991). More recently, Guest and Cookson (1999) estimated that the proportion of caregivers giving up work to care for patients ranged from 1.2 percent for first episode cases to 2.5 percent for highly dependent patients. Their estimate for the family impact cost was £1.9 million in 1997.

Roberts (1999) looked at the labor supply consequences of having a family member with a mental illness, based on a large U.S. sample (the 1987 National Medical Expenditure Survey). Both males and females experience reductions in their hours of work when the mentally ill family member also had additional illness. Comorbid substance misuse adds to the family impact by raising expenditures of both time and money (Clark and Drake 1994).

Table 6. Family impact costs

Country	Source	Yr of costing	Family Costs	
			Annual costs in national currency units	As a percent of indirect costs
Hungary	Rupp et al. 1999	NA	Ft2.1 billion	12.5
Italy	Tarricone et al. 2000 ¹	1995	ITL14.24 million	41.2
Nigeria	Suleiman et al. 1997 ¹	1995	415 Naira	48.0
Spain	Haro et al. 1998	1994	-	75 (Burlada) 69 (Barcelona) 85 (Cantabria)
U.K.	Guest and Cookson 1999 ²	1997	£1.9 million	2.3
U.S.	Rice and Miller 1996	1985	\$2.0 billion	17.0
	Rice and Miller 1996	1990	\$2.5 billion	17.0

Note.—NA = not applicable.

¹ Per patient data.

² Estimates for a cohort of newly diagnosed patients.

Informal family care and formal services have been found to be substitutes; in the long term, a 1 percent decrease in formal care costs for people with schizophrenia is associated with a 4 to 6 percent increase in informal care hours (Clark et al. 2001). In Spain, the cost of informal care per patient was estimated to be \$2,161 in Burlada, \$1,686 in among the regions is mainly due to a more conservative interview technique in Cantabria.

In Italy, family costs have been found to represent 41.2 percent of all indirect costs (Tarricone et al. 2000) and in Hungary, 12.5 percent (Rupp et al. 1999). In Nigeria, two studies found that financial impoverishment constituted the greatest source of burden to families, followed by the effect on family routine and family interaction (Martyns-Yellowe 1992; Ige 1993). Another study estimated the cost resulting from caregivers' loss of earnings to be 415 Naira, which amounted to 48 percent of all indirect costs (Suleiman et al. 1997).

Criminal Justice System Costs. The rate of criminal activity among persons with severe mental illness, including schizophrenia, is slightly higher than in the general population (Evers and Ament 1995; Arboledo-Florez et al. 1996; Monahan and Arnold 1996), and there are disproportionately high numbers of people with schizophrenia in prisons (Birmingham et al. 1996; Brooke et al. 1996). Taylor and Gunn (1999) offer an informed review of the links between serious mental illness and violent crime. Arguably, therefore, the costs of policing, investigations, legal defense, prosecution, and incarceration as well as victim costs (e.g., damages, lost property, time away from work because of physical and emotional injury) could all be included in the estimate of societal costs of schizophrenia. In fact, this has rarely been done; indeed, attempts to allocate costs of law enforcement and justice to schizophrenia have even been described as arbitrary (Goeree et al. 1999).

The estimated costs of contacts with criminal justice agencies in the United States by people with schizophrenia amounted to \$464 million in 1990 (Rice and Miller 1996), which represented 1.4 percent of total costs and 2.7

percent of direct costs (table 7). A rough estimate for the United Kingdom by Guest and Cookson (1999) is that schizophrenia patients in prison and on remand cost £1.3 million annually. In Canada, the cost of incarceration was estimated to be \$70 million in 1996, or nearly 3 percent of the total costs and 6 percent of direct costs (Goeree et al. 1999). In contrast to these results, in one Nigerian study it was found that none of the schizophrenia patients or their families generated or incurred costs from crime, accidents, or damages (Suleiman et al. 1997).

Conclusions

Cost-of-illness studies can provide useful information on the burden of a disorder to society. However, they do not indicate the cost savings from eradication or reduction of the disorder because of the continuing impact of comorbidities. Indeed, most cost-of-illness calculations can be criticized for attributing *all* costs to a single disorder, when most patients will have other health problems requiring attention. On the other hand, people with severe and enduring mental health problems may find themselves disadvantaged in terms of access to and quantity of general medical care (Druss et al. 2002), so that this "exaggerated" attribution may actually be the result of other unidentified or untreated health problems.

Another important limitation is that, because cost-of-illness studies do not assess the benefits of any interventions in terms of health outcomes, they cannot tell us anything about the cost effectiveness or otherwise of treatment expenditures. That is, they do not tell us how a health system can allocate its available resources to achieve greater effectiveness in terms of improvements to the health and quality of life of patients. By ignoring the opportunity cost of resources, cost-of-illness studies may therefore not assist in the prioritizing of resources. In fact, there is the danger that they may divert attention from areas where important health gains can be achieved at low cost to those areas where achievable health gains are of uncertain nature. A further issue is that national cost-of-

Table 7. Criminal justice system costs

Country	Source	Yr of costing	Criminal justice system costs
Canada	Goeree et al. 1999	1996	\$70 million
Hungary	Rupp et al. 1999	NA	Ft0.6 billion
U.K.	Guest and Cookson 1999	1997	£1.3 million
U.S.	Rice and Miller 1996	1990	\$464 million

Note.—NA = not applicable.

illness studies may hide quite marked variations from one region to another.

Notwithstanding these limitations, this international review of the costs of schizophrenia has shown clearly the magnitude and wide-ranging nature of the economic impacts of this devastating and distressing disorder. With very few exceptions, all of the evidence comes from developed countries. A number of conclusions can be drawn:

- The full cost of schizophrenia is high and wide ranging. However, this full cost is rarely fully appreciated by health care decision makers or other stakeholders.
- Schizophrenia is a chronic illness, and so its costs tend to persist.
- The impact of schizophrenia on health care budgets is substantial, typically between 1.5 percent and 3 percent of total national health care expenditures.
- Sizeable proportions of total inpatient budgets are accounted for by people with schizophrenia. Generally between one-third and two-thirds of the total health care cost of schizophrenia is for hospitalization, even in countries that have already substantially reduced their inpatient provision.
- Less readily observed, but often no less important, are costs to other care organizations and public sector bodies, particularly social service (welfare) agencies, housing departments, and the criminal justice system.
- A proportion of the aggregate costs of schizophrenia is borne by charities, nongovernmental organizations (NGOs), and private for-profit bodies, either as the providers of services or as the funders.
- There are often substantial “hidden” or “indirect” costs of schizophrenia to people with schizophrenia themselves, to their families and other caregivers, and to the wider society. Employment difficulties are very common among people with schizophrenia, mortality rates are high, and substantial family burden has been reported. Each can have large costs.
- Finally, and perhaps most pertinently, are those “costs” experienced by people with schizophrenia linked to the distress, pain, and impoverished quality of life that so often accompany the illness. These are not measurable in monetary terms, but they may provide another reason why more must be done to improve treatments for people with schizophrenia.

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