The Economic Costs of Schizophrenia

Implications for Public Policy

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• **The direct and indirect costs associated with schizophrenia in Australia were calculated using the incidence approach and compared with similar costings of myocardial infarction in Australia and the United States. In Australia schizophrenia affects one-twelfth as many people as does myocardial infarction, yet costs half as much. This is because the stream of costs associated with each case of schizophrenia is six times the stream of costs associated with myocardial infarction. To illustrate the utility of this costing approach, the information was used to estimate the cost-benefit ratio likely to follow the introduction of social intervention strategies. The information also showed that Australian support for research in schizophrenia is inadequate when compared with that for myocardial infarction and quite out of proportion to the cost of schizophrenia to the community.**

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There is a problem of supply and demand in health care. Although the amount of money available for health care is limited, there is no limit to the potential amount that could be spent if all existing demands were to be met. The discrepancy between the demand for services and their available supply requires that some rational means be found for allocating scarce resources among the various sectors demanding them. The most desirable method, from an economic point of view, would be an allocation based on a comparison of the costs and benefits of each policy option.

Cost comparisons of health programs require that we put some monetary value on the morbidity and mortality associated with various types of disease. The very idea of attempting such an estimate is morally repugnant to many who argue that "you can't measure life and suffering in monetary terms." This argument ignores the fact that decisions and choices in regard to health programs are already being made. They do not disappear if we refuse to acknowledge them; they are simply made implicitly on the basis of "same as last year plus or minus 5% for pressure groups."[1(p76)] Even those who eschew economic models are often guilty of implicitly using them. Whenever an appeal is made for funds on the basis of the prevalence of a particular disease, a simple economic model of the costs of illness is presupposed, one in which the economic importance of disease is a simple function of its prevalence.

Schizophrenia affects some 0.5% of the population and produces a large morbidity and a small but definite mortality. In these ways it is unlike heart disease or cancer, the diseases most commonly costed, for they affect a much larger portion of the community and often produce death rather than chronic disability. In this report we will estimate the costs of schizophrenia in the state of New South Wales, Australia. New South Wales (NSW) is the largest state in Australia, with a largely urban population of some 5 million people. We will then compare these costs with the costs of myocardial infarction in NSW measured in the same manner and with the costs of myocardial infarction in the United States again costed in the same manner. In the interests of uniformity all costs in this article are expressed in 1975 US dollars. We acknowledge that intercountry and even interstate variations in direct costs will be large and related both to the cost of living and the prevailing system for financing medical care. However, if psychiatry is to obtain a proper share of the health budget, we must produce data that are of use to health planners.

METHODS

Concepts Used in Costing Illness

Direct costs are those associated with medical care expenditures for diagnosis and treatment. They include hospital costs, outpatient costs, nursing care, drugs, services of professionals, and rehabilitation costs. The *indirect costs* of illness are usually confined to the earnings that are forgone on account of illness. This is derived from the "human capital approach" to valuing life in

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which healthy human beings are regarded as a productive labor resource.

There are two principal approaches to costing disease. In the *prevalence* approach, disease costs and productivity losses are assigned to the years in which they occur. It provides an answer to the question: What did all cases of disease x cost in year y, directly because of treatment costs and indirectly because of lost productivity? The *incidence* approach "is based on the principle that the stream of costs associated with an illness should be assigned to the year in which the stream begins."[2(p17)] All future direct and indirect costs are "present-valued," ie, measured in the dollars of the year in which the illness first occurs. The incidence approach provides an answer to the question: What will new cases of disease x occurring in year y cost directly and indirectly in the long term when valued in year y dollars?

The approach to costing that is ultimately chosen will depend on the purpose. If cost control is the aim of the exercise, then prevalence-based costing will suffice. It identifies the major contributors to current expenditure and identifies possible targets for economy. If the aim of the exercise is to make decisions about which treatment or research strategy to implement, then the incidence-based approach is the most appropriate, for it provides predictions about the likely savings from programs that reduce incidence or improve outcome. How are prevalence- and incidence-based approaches related? In general, prevalence estimates are larger than incidence estimates. The discrepancy between the two increases as the discount rate (a measure of the effect of inflation on the value of money) increases, as the duration of the disease increases, and as annual treatment costs increase over the course of the disease.

The incidence-based method of Hartunian et al[2] was carefully followed in the present study. *Direct costs* were estimated by summing all treatment-related costs for each age and sex for each year of the illness over the expected life span of the affected individuals. This required information about age, sex, and disease-specific incidence, survival probability, and treatment costs, together with an assumption about the discount rate. *Indirect costs* were measured from the forgone earnings that have been "discounted back to the year of incidence."[2(p42)] Housework was valued by means of the "market value of services performed." Forgone productivity may occur because of death or permanent or temporary disability. Each was separately estimated and the three quantities multiplied by the appropriate incidence before being summed to give total indirect costs. The model of Hartunian et al assumes two things: the affected person would have lived the expected life span for someone of his or her sex and age, if he or she had not become ill, and he or she would have earned the same amount as his or her age peers during this period. In this way future earnings forgone because of death or permanent or temporary disability were estimated by subtracting from the expected earnings of a well peer the expected future earnings of a person with the disease under study. Social security payments or invalid pensions, which are regarded as transfer payments by the model, are not included.

Incidence-based costing requires a detailed knowledge of the epidemiology and natural history of disease as well as detailed demographic data on life expectancy, employment rates, and average earnings of the normal, nondiseased population. Data not available may have to be estimated, and even the data that are available may be varyingly trustworthy. Hartunian et al[2] dealt with this problem by investigating the sensitivity of costing estimates to variations in the parameters entering into the equations. It involves varying the values of key parameters through the likely range of their values and tabulating the effects on total estimates. The outcome is an estimate of the imprecision of the costing and is analogous to a confidence interval for the estimated total cost. The results of the sensitivity analysis of the present study are published elsewhere.[3]

Sources of Data

From 1964 to 1977 the State Department of Health and the Australian Bureau of Statistics collaborated on a register of inpatients in psychiatric centers.[4] These centers included all state psychiatric institutions, all authorized private psychiatric hospitals, and all the psychiatric units of general hospitals. In NSW a proportion of psychiatric patients were also admitted to private hospitals registered as medical rather than psychiatric. We have obtained information about the number of psychiatric patients in these "unauthorized" hospitals and conclude that the register covered 89% of psychiatric admissions. The number of new cases on the register was adjusted to allow for this failure in ascertainment.[5] All authorized psychiatric centers supplied the name, address, date of birth, sex, dates of admission and discharge, and diagnosis in accord with the *International Classification of Diseases*, eighth revision. All persons were given a unique identifier that allowed name changes through marriage or alias to be identified. Periods of leave of less than 12 days were not taken as evidence of discharge. Readmission to the same or another hospital within 12 days of discharge was counted as one admission period. Computerized linkage analysis allowed admissions to different hospitals for the same acute exacerbation to be identified as a single admission.

The present investigation was confined to the years 1974-1975, 1975-1976, and 1976-1977 when 4,852, 5,045, and 4,780 admissions for schizophrenia were recorded from a population base of 4,914,277 persons resident in NSW in 1976.[4] The boundaries of the state make it unlikely that there would be a net outflow or inflow of psychiatric patients from the adjoining states, so that the cost estimates can be taken as representative of this state at that time. Tables of first admissions for schizophrenia by age and sex during the three years were obtained and the average of these data was used for the calculations.

The ratio of total to first admissions was used to estimate the expected number of admissions during the course of the illness. Between 1974 and 1977 the ratio of total to first admissions was 4.52:1. Thus, on average, a patient had one first and 3.52 follow-up admissions. To calculate the overall yearly admission rate for subsequent admissions we divided the total expected years of survival for all patients by the total number of patients to derive the average life expectancy after diagnosis. This was 37.22 years for men and 38.62 years for women. This figure was divided into 3.52 (the average number of follow-up admissions) to give the overall yearly readmission rate, 0.095 for men and 0.091 for women. In the studies of Hartunian et al in the United States[2] and in the NSW Heart Disease Study,[6] which will be used as comparisons, the age-specific likelihood of recurrence was assumed to be constant over the expected life of the individual. In the case of schizophrenia, recurrent admissions are more likely early than late in the course of the illness. As the assumption of a constant likelihood of readmission errs in the conservative direction, in the interests of uniformity it was retained in the main analysis in this study.

The extent of the underestimate that derives from the assumption of a constant recurrence rate depends on the discount factor used. A discount rate has to be included because a dollar spent now is more valuable than a dollar spent in the future. In the interests of uniformity with the other studies, the conservative discount rate of 6% was chosen.

The mean length of stay for all patients with a diagnosis of schizophrenia in all hospitals is available in the NSW hospital morbidity reports.[7] In 1978, 1979, and 1980, the period of peak admission of the three-year cohort being studied, these figures were 146.7, 147.4, and 134.5 days, respectively. A separate source of length-of-stay information was the register of inpatients[4] that provided the period spent in the hospital by patients with schizophrenia in the year from July 1976 to June 1977. The maximum possible length of stay was 365 days, so skewing of the figures by a relatively small number of more or less permanently institutionalized patients was minimized: 5,137 patients had 656,564 bed-days, a mean of 127.8 per patient. In our clinical experience, admissions to the hospital for schizophrenia are usually measured in weeks, not months. The four-month admission period in the present data must reflect the impact of two factors that produce long admissions. The first factor is the chronic schizophrenics who spend long periods in state hospitals. Second, because readmission within 12 days is counted as one admission, a series of short admissions is shown as one admission. In our calculations we took the mean of the hospital morbidity figures (142.9 days) as the upper limit of the range and the inpatient register data (127.8 days) as the lower limit and used the average of these two figures (135.4 days) in the main calculation.

Bed-day costs in 1975 dollars were calculated from a recent study[8] in which the usual costing procedures were supplemented by direct observation of time spent with schizophrenic patients. The first ten days of inpatient care were more expensive (US $74/day) than subsequent days, which were costed at US $61/day. This study was conducted in a state psychiatric hospital and took no account of capital costs. We expected psychiatric units in general hospitals and private psychiatric hospitals to have higher costs, but as the rebate from third-party insurers was some $75/day in 1976, the $74 and $61 estimates[8] were used for all hospitals.

Long-term mortality data were not available for our cohort. Instead we used data from the study by Tsuang et al,[9] which involved a conservatively diagnosed cohort of similar age at onset who had been followed up for 30 years after hospitalization. The increased mortality risk associated with schizophrenia was analyzed using a variation of the rank Von Neumann test.[10] This showed that the expected one-year survival probability did not vary according to the elapsed time in years since diagnosis, and it could be approximated by subtracting a constant of .0054 for men and .0066 for women from the survival probability in the normal Australian life table. The average life expectancy for a schizophrenic patient was obtained by summing the stream of survival probabilities applicable to patients in each age group.

A review of outcome studies was prepared in connection with another project.[11] The literature did not lend support to the use of outcome categories more refined than good, median, or poor. A costing vignette was constructed for the typical case in each of these outcome categories. A good-outcome case was defined as having only a single episode requiring 60 days in the hospital, six subsequent visits to the physician, medication for six months, six months out of the work force because of illness, and no further disability. A median-outcome case was defined as requiring close to the overall average admissions per year, six physician visits per year, continuous medication for the rest of life, and being in the work force for only four months each year after the diagnostic admission. A poor-outcome case was defined as needing about twice the overall average admissions to the hospital per year, never being able to work, and requiring monthly physician visits and continuous medication when out of the hospital.

The costs of the prodrome, which all cases were presumed to have had, were based on the data of Nyman et al,[12] and again costing vignettes for the good, median, and poor cases were constructed. For the good case, the prodrome was estimated as three months of loss of work in the year prior to the incident year and six outpatient visits at which schizophrenia was not the diagnosis but that were related to the prodrome of schizophrenia. For the median case, it was estimated as 12 outpatient visits and six months of loss of work in the year prior to the incident year. For the poor case, it was estimated as 12 months of loss of work in the year prior to diagnosis, 24 outpatient visits, and one period of hospitalization of 25 days that was schizophrenia related but that did not lead to the diagnosis of schizophrenia.

The leaders of Australian psychiatry were surveyed to determine the five psychiatrists considered to be most expert in the treatment of schizophrenia.[11] The range of outcome data reviewed and the costing vignettes were discussed with these five experts, who were asked to estimate the frequency of the three outcomes. After reviewing these data they considered that a 30-year outcome study would reveal that 25% of a cohort would have a good outcome, 40% a median outcome, and 35% a poor outcome as defined by these categories. The distribution of prodrome severities was considered to be similar.

Data on weekly earnings and work force participation rates were obtained from official government statistics.[13,14] Age- and sex-specific yearly earnings of normal persons were calculated. A wage equal to the market value of age-matched female labor was assumed for housewives, and, to follow the costing model, 90% of women were costed as employed either in the marketplace or in the home.

These data were used to perform an incidence-based costing using the formulas established by Hartunian et al.[2] The formulas used, the steps in the computation, and the results of the sensitivity analysis are given elsewhere.[3] These data are summarized in Table 1.

RESULTS

Incidence and Readmission Rates

The average number of first cases in the psychiatric register per year are shown in Table 2. In all subsequent calculations each of these figures was increased by 11% to allow for unascertained cases admitted to unauthorized hospitals.

The life expectancy in schizophrenics and normal persons is shown in Table 3. The mean life expectancy after diagnosis is 37.22 years for men and 38.62 years for women, some six years shorter than that for age- and sex-matched normal persons. Given that each patient can expect an average of 3.52 readmissions in his or her lifetime, the yearly readmission rate is 0.095 for men and 0.091 for women. Using these rates, the yearly readmission risk for patients with good outcome is zero, for those with median outcome was calculated as 0.086 (men) and 0.083 (women), and for those with poor outcome was calculated as 0.172 (men) and 0.166 (women).

Direct Costs

First admissions were costed on the basis of 60 days for the good-outcome case and 135 days for the other outcomes. All recurrent admissions have been costed on the basis of an estimated duration of admission of 135 days. Thus, the cost of an admission (any age or sex) is $74/day for the first ten days and $61/day for the remaining days, giving a total cost for the 135-day admission of $8,401. Other costs in the first year include outpatient visit costs: patients with good outcome have six, with median outcome six, and with poor outcome 12. We used the cost of $29.43 as the cost of a 15- to 30-minute visit to a consultant psychiatrist in 1975 and $7.36 as the estimate of drug costs, giving a total cost of $36.79 per visit.[15] An additional cost in the first year is the annual recurrence cost, which is estimated by multiplying the risk of recurrence by the cost of a recurrent admission. The annual follow-up cost is estimated by adding the outpatient costs to the annual recurrence cost. The cost for the second and subsequent years (Table 4) are obtained by adding for each year of expected life the estimated outpatient and inpatient costs and then discounting the total by the discount rate. The estimates for the total direct costs are also shown in Table 4.

Table 1.—Data for Estimating the Cost of Schizophrenia in New South Wales, Australia*

	Best Estimate
No. of new cases in year	1,058
Discount rate, %	6
Average length of stay per admission, days	135
Bed-day costs, $	
1st 10 days	74
Subsequent days	61
Mortality deficit	
Men	−0.0054
Women	−0.0066
Likelihood of readmission/year	
Men	0.095
Women	0.090
Distribution of prodrome and outcomes, %	
Good	25
Median	40
Poor	35
Employment (participation) rate	
Men	Actual for 1979
Women	90% of rate for men

*In 1975 US dollars.

Forgone Earnings

Because of the reduced life expectancy in schizophrenia (Table 3), even if a schizophrenic patient lost no time from work due to his or her illness, he or she would experience reduced lifetime earnings compared with a normal person. More important, earnings are forgone because of time lost from work.

In the good-outcome group, therefore, the forgone earnings consisted of six months of loss of earnings in the year of onset plus the difference between the normal lifetime earnings and the reduced potential schizophrenic lifetime earnings because of mortality. In the median-outcome group, the lifetime earnings forgone are estimated as two thirds of the hypothetical schizophrenic age- and sex-specific lifetime earnings based on the assumption that this group averages only four months of work per year for the remaining lifetime following diagnosis. The poor-outcome group are assumed not to work following onset of the condition, and their forgone earnings are estimated to equal the expected lifetime earnings for the period after diagnosis.

The average forgone earnings per case were calculated. The total forgone earnings then were the product of the number of new cases of that outcome in the year and the average forgone earnings per patient of that age and sex (Table 5).

The direct, indirect, and total costs of the prodrome, calculated with the conventions specified previously, are shown in Table 6. A summary of the total costs of schizophrenia obtained by adding the direct, indirect, and prodrome costs, together with the costs of myocardial infarction in Australia and the United States, are shown in Table 7. Data on the costs per case and the cost per head of population in NSW and the United States are also appended.

COMMENT

Schizophrenia is a costly disease. In NSW it cost $131,333 per case, or $29 for every man, woman, and child residing in the state. The ratio between indirect and direct costs was 4.64. Acute myocardial infarction in NSW was costed by the same method.[6] In 1979, 13,025 persons had their first heart attack; thus, the disorder strikes 12 times as many persons as does schizophrenia, but the per-case cost of schizophrenia is some six times greater. Thus, the total cost of schizophrenia was found to be half that of myocardial infarction. These cost comparisons are presented in 1975 US dollars in Table 7, together with data from the study of Hartunian et al.[2] The cost per case of myocardial infarction in the United States was 1.6 times that in NSW because both direct and indirect costs in the United States are higher. It is not unreasonable to expect that the costs of schizophrenia in the United States would be increased by similar factors.

There are a number of issues to be discussed. The first is the stability and validity of the admission diagnosis. To establish the stability of the diagnoses we obtained two samples of patients. Of 50 first-admission patients discharged as schizophrenic, three were admitted with other diagnoses and therefore may have been lost to the register. Of 100 random first-admission patients, only one was admitted as a schizophrenic and subsequently rediagnosed. This

Table 2.—Average Number of First Cases of Schizophrenia in Psychiatric Register per Year, 1974-1977

	No. of Patients	
Age, yr	Male	Female
10-14	2.7	3.3
15-19	70.0	46.0
20-24	135.3	72.7
25-29	108.7	82.0
30-34	63.0	65.7
35-39	48.7	52.0
40-44	30.3	36.3
45-49	31.0	37.7
50-54	26.7	41.0
Total	**516.3**	**436.7**

Table 3.—Life Expectancy in the General Population and Patients With Schizophrenia

	Life Expectancy, yr			
	General Population		Schizophrenia	
Age, yr	Male	Female	Male	Female
10-14	58.4	65.3	49.5	52.4
15-19	53.6	60.4	45.9	49.1
20-24	49.1	55.5	42.6	45.9
25-29	44.4	50.7	39.0	42.5
30-34	39.7	45.8	35.3	38.9
35-39	35.0	41.0	31.4	35.4
40-44	30.4	36.3	27.6	31.7
45-49	26.0	31.7	23.9	28.1
50-54	21.8	27.3	20.3	24.5

Table 4.—Direct Costs of Schizophrenia in New South Wales, Australia*

Age at Onset, yr	No. of New Cases		1st-yr Costs		Costs After 1st yr		Total Direct Costs†	
	Male	Female	Male	Female	Male	Female	Male	Female
10-14	3.0	3.7	24,679	30,826	44,675	54,352	**69,353**	**85,177**
15-19	77.7	51.1	646,938	424,580	1,154,188	742,432	**1,801,126**	**1,167,012**
20-24	150.2	80.7	1,250,735	670,834	2,204,912	1,160,820	**3,455,647**	**1,831,654**
25-29	120.6	91.0	1,004,371	756,963	1,736,807	1,291,475	**2,741,178**	**2,048,438**
30-34	70.0	72.9	582,234	606,121	977,806	1,012,775	**1,560,040**	**1,618,897**
35-39	54.0	57.7	449,804	479,980	726,256	780,439	**1,176,061**	**1,260,420**
40-44	33.7	40.3	280,289	335,418	429,154	526,239	**709,443**	**861,657**
45-49	34.4	41.8	286,505	347,706	410,111	521,452	**696,616**	**869,157**
50-54	29.6	45.5	246,477	378,527	323,942	535,038	**570,419**	**913,564**
All ages	. . .	. . .	**4,772,032**	**4,030,954**	**8,007,851**	**6,625,023**	**12,779,884**	**10,655,976**
Both sexes	. . .	. . .	**8,802,986**		**14,632,874**		**23,435,860**	

*In 1975 US dollars.
†Row and column discrepancies are due to rounding.

Table 5.—Indirect Costs due to Forgone Earnings*

Age at Onset, yr	No. of New Cases		Costs per Case by Outcome: Good (25% of Cases)		Median (40% of Cases)		Poor (35% of Cases)		Total Costs, NSW, 1975/1976†	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
10-14	3.0	3.7	15,930	15,422	103,670	84,499	147,474	118,985	287,316	294,203
15-19	77.7	51.1	17,796	17,968	125,288	101,325	179,973	144,300	9,134,009	4,876,647
20-24	150.2	80.7	19,391	18,409	137,002	110,292	198,041	158,258	19,372,820	8,398,501
25-29	120.6	91.0	18,936	17,477	136,071	105,310	197,489	151,579	15,474,882	9,060,681
30-34	70.0	72.9	17,410	15,630	127,531	97,365	185,718	140,529	8,417,196	6,707,773
35-39	54.0	57.7	15,288	13,478	114,098	88,972	166,692	128,852	5,823,552	4,851,746
40-44	33.7	40.3	12,948	11,625	97,348	80,020	142,698	116,392	3,100,776	3,051,007
45-49	34.4	41.8	10,380	9,691	78,620	68,638	115,669	100,317	2,564,477	2,717,167
50-54	29.6	45.5	8,482	7,624	57,930	54,839	85,584	80,588	1,635,306	2,369,202
All ages	**573**	**485**	. . .	. . .	. . .	. . .	. . .	. . .	**65,810,333**	**42,326,927**
Both sexes	**1,058**		. . .		. . .		. . .		**108,137,260**	

*In 1975 US dollars.
†NSW represents New South Wales, Australia.

Table 6.—Prodrome: Direct and Indirect Costs*

Age at Onset, yr	No. of New Cases		Total Direct Costs		Total Indirect Costs		Total Prodrome Costs, NSW, 1975/1976†	
	Male	Female	Male	Female	Male	Female	Male	Female
10-14	3.0	3.7	3,316	4,156	0	0	**3,316**	**4,156**
15-19	77.7	51.1	87,050	57,193	194,333	170,273	**281,382**	**227,466**
20-24	150.2	80.7	168,296	90,377	855,770	414,317	**1,024,066**	**504,694**
25-29	120.6	91.0	135,145	101,972	869,744	540,014	**1,004,889**	**641,986**
30-34	70.0	72.9	78,345	81,650	550,432	421,635	**628,777**	**503,284**
35-39	54.0	57.7	60,520	64,665	432,554	310,077	**493,075**	**374,742**
40-44	33.7	40.3	37,710	45,183	265,331	220,228	**303,041**	**265,411**
45-49	34.4	41.8	38,551	46,841	251,606	230,778	**290,157**	**277,619**
50-54	29.6	45.5	33,162	50,997	215,552	243,194	**248,714**	**294,191**
All ages	. . .	. . .	**642,095**	**543,035**	**3,635,323**	**2,550,515**	**4,277,418**	**3,093,550**
Both sexes	. . .		. . .		. . .		**7,370,968**	

*In 1975 US dollars.
†NSW represents New South Wales, Australia. Row and column discrepancies are due to rounding.

Table 7.—Costs of Schizophrenia in NSW, Myocardial Infarction in NSW, and Myocardial Infarction in United States*

	Schizophrenia in NSW		Myocardial Infarction in NSW		Myocardial Infarction in US, 1975†	
	Male	Female	Male	Female	Male	Female
No. of cases	573	485	8,238	4,787	226,433	74,366
Population	2.4M	2.39M	2.54M	2.54M	104.24M	109.39M
Direct costs	$13.42M	$11.20M	$21.84M	$11.46M	$1,134.41M	$369.45M
Indirect costs	$69.45M	$44.88M	$200.00M	$61.40M	$7,804.9M	$1,455.6M
Indirect/direct cost ratio	5.18	4.01	9.16	5.36	6.88	3.94
Total cost	**$82.87M**	**$56.08M**	**$221.84M**	**$72.86M**	**$8,939.31M**	**$1,825.05M**
Cost per case	$144,625	$115,629	$26,929	$15,221	$39,477	$24,542
Cost per head of population	$34.57	$23.44	$81.51	$28.64	$85.76	$16.68
Both sexes						
Total cost	**$138.95M**		**$294.71M**		**$10,764.37M**	
Cost per case	$131,333		$22,626		$35,785	
Cost per head of population	$29		$58		$50	

*In 1975 US dollars. NSW represents New South Wales, Australia; M, million.
†Data from Hartunian et al.[2]

case may have been wrongly included in the register. To decide the extent to which the diagnoses of the period would be congruent with *DSM-III* criteria, we drew a sample of 50 first-admission schizophrenics with a mean age of 25 years. Forty-nine met the full criteria for symptoms and one satisfied the criteria on a later admission. In 48 patients, role deterioration was recorded while in the other two no mention was made of role performance. Forty-nine were aged less than 45 years at onset of the symptoms (or prodrome), and in the remaining case, symptoms began at 51 years of age with no mention of a prodrome. Emphasis on the prodrome was unusual in the mid-1970s and the notes seldom made explicit mention of this feature, hence data on duration of illness plus prodrome were difficult to obtain. The minimum length of illness, as described in the records, was greater than six months in 37 cases, between one and six months in 11 cases, under one month in one case, and uncertain in the remaining case. If these samples are representative of the whole material, then the diagnostic stability and validity of cases in the register were high. In the further interest of the *DSM-III* congruence, we included in the costing analysis only patients from the register who had a first admission before age 55 years in the expectation that, because of the high likelihood that all the older patients would have shown prodromal symptoms, virtually all would have had onset of symptoms prior to age 45 years and thus would be consistent with *DSM-III*.

The second issue is whether the data used for estimating direct and indirect costs were valid. The direct costs were obtained from independent sources and the indirect costs estimated from a categorization of outcome that was consistent with the literature and believed to represent experience in Australia. The sensitivity analysis[3] shows the effect of varying these parameters in a systematic fashion and underscores the importance of the discount rate, wage levels, and female employment levels in estimating costs.

The third problem concerns the applicability of these estimates to other cultures. In 1976, Australia had a fee-for-service health system with 70% of the population privately insured, while the aged and indigent were supported by a federally supported insurance system. Public and private hospital costs were covered by such health insurance, while state psychiatric hospital care was paid from a mix of state and federal funds. Australia is a less affluent country than the United States, and costs per case are considerably less than in the United States. Attention to the absolute costs in this report may therefore be misleading. Attention should be paid to the comparison with myocardial infarction and to the comparison between myocardial infarction costs in the United States and Australia, for the Australian heart disease study was a replication of the US estimate of the cost of heart disease by Hartunian et al.[2] Using this comparison ratio (1.6:1) we estimate the 1975 costs of schizophrenia in the United States to have been approximately $208,000 per case or $9.6 billion in all, given that the incidence was the same as in Australia.

This is not the sum total of costs. No account is taken of the pain and suffering experienced by the patient and his or her family. Other costs conceivably could be estimated, such as those due to disruption to the livelihood of other family members and to action by social agencies. Social security payments or pensions, although a very real factor in the long-term outcome of schizophrenia, are not included in the costing, for there is an economic convention that they are to be regarded as transfer payments from one part of society to another and do not represent a true loss of productivity. In the present study health insurance administration costs were also omitted.

There have been previous attempts to cost mental illness, and such estimates have pointed to schizophrenia as a major contributor to overall costs. Fein[16] made one of the earliest estimates of the costs of mental illness to the US economy. He produced an estimate based on the treated prevalence of mental illness. Direct costs were measured by "actual dollar expenditures on mental illness"[16(p10)] and were obtained by adding together the expenditures of various branches of government on mental hospitals and an estimate of the amount of money spent on private psychiatry. The result was an aggregate figure that could not be broken down to see which diagnoses were contributing most to total direct costs. An analysis by age group showed that the "cost problem for hospitals lies in the 25-34 age group,"[16(p105)] which is the peak period for the incidence of schizophrenia. In estimating indirect costs, Fein was able to provide an analysis by diagnosis. The result was unequivocal: schizophenia was easily the most expensive illness. It accounted for 368,522 years of lost productivity among men, well ahead of the next most costly category, alcoholism, which accounted for 78,081 years of lost productivity.

More recently, an attempt has been made to provide a prevalence-based costing of schizophrenia. Gunderson and Mosher[17] provided an estimate of the direct and indirect costs of schizophrenia in the United States in 1975. Direct costs were estimated by summing the following quantities: (1) the average costs per day in state, general, and private hospitals multiplied by the number of schizophrenics receiving inpatient care in each type of hospital for a year; (2) the number of outpatient terminations multiplied by the average cost of each; and (3) the number of halfway-house residents multiplied by the average annual cost per resident. These calculations produced an estimated annual direct cost of between (US) $2 and $4 billion. Indirect costs were estimated by multiplying "the degree of work disability by the average number of people possessing it by the average expectable yearly income."[17(p902)] These calculations yielded estimates of between $8.5 and $11.4 billion. When direct and indirect costs were added together with miscellaneous expenses, the total cost came to between $11.6 and $19.5 billion. The lowest of these estimates of the cost of schizophrenia in the United States amounted to 2% of the gross national product for 1975.[18] We estimated the US 1975 cost as $9.6 billion, and, although more conservative as would be expected with an incidence-based approach, our estimate affirms the accuracy of the earlier study.

Implications for Cost-Benefit Studies

This type of costing allows one to explore some implications for public policy. Given that schizophrenia costs the community so much, it could be claimed that too little is being invested in promoting new treatments or in developing new lines of research. Given these costing data, cost-benefit calculations become very simple. For example, a number of workers[18-22] have recently claimed that the outcome can be substantially improved and relapse inhibited by the use of specific social intervention strategies. To illustrate the utility of this incidence-based costing, we reviewed these studies and found results on 622 patients who had received some type of social intervention in addition to drugs and who were followed up for an average of 15 months after family intervention began. They were compared with control patients given drug therapy. Intervention was reported to reduce readmission by an average of 45%. (The reduction varied from −15% to 100%; the median was 44%.) These studies did not provide data on return to

work, but for the purposes of the present example we have estimated that there was a small (5%) increased chance of the treated patients reentering the work force. Given these data we calculated the costs and benefits that would result from the introduction of family intervention programs for all new patients with schizophrenia in NSW. The costs of the treatment were estimated from those described by Cardin et al[23] at $388 (1982) per year, per patient. We made the assumption, which is likely to overestimate the costs, that such therapy would have to continue at this intensity for the life expectancy of the patient. When this cost was converted to 1975 dollars, discounted at 6% per annum for the life expectancy period (38 years), and multiplied by the number of patients (1,058), the total was $4.55 million. On detailed examination, we found that direct costs could be equated, for the purposes of this example, with admission cost. The benefits that derived from a 45% reduction in the second- and subsequent-year direct costs shown in Table 4 were $6.58 million, and from a 5% reduction in forgone earnings shown in Table 5, $5.41 million. The potential savings therefore totaled $11.99 million. Thus, a clear cost advantage from the adoption of these social intervention therapies is likely.

One problem with the introduction of such therapies is that they are "nonproprietary" and hence no money is customarily expended to advertise or promote them. The pharmaceutical industry is not philanthropic, yet given the advent of a new drug of similar effectiveness, it would spend heavily to promote the new product.[24] The potential savings to third-party insurers and to state and federal treasuries from the adoption of these new social intervention strategies are considerable, and yet in Australia there has been no move to promote the new treatments. In part, this is an organizational problem within medicine—we have had no mechanism to promote effective nonproprietary remedies such as psychotherapy, behavior therapy, lithium carbonate, and now social interventions in schizophrenia,[25] while we have had very effective means of promoting proprietary remedies whether they be drugs or appliances. Cost-benefit analyses based on incidence-based costings of disease may provide one tool to redress this balance.

Implications for Research

If schizophrenia costs the community half what myocardial infarction does, then clearly we should be spending something approaching half the myocardial infarction research budget on schizophrenia. We surveyed funding agencies in Australia for research grants with schizophrenia or myocardial infarction in the key words or titles. In 1982 Australia spent $840,000 on applied research into myocardial infarction and $4.3 million on heart disease in general, while only $60,000 was spent on schizophrenia research. Thus, at best, the funding for schizophrenia was only one-fourteenth that spent on myocardial infarction. In part this disparity exists because schizophrenia is not at present a scientifically fashionable field. Somehow we must develop strategies to change this and encourage both basic and applied research into schizophrenia. It is not just a matter of more money but of enticing new people into the field. Articles like Garfield's recent review[26] are valuable for they can sensitize scientists in other fields to current issues in schizophrenia research. Over and above this type of initiative, we need some inducement to encourage both basic and applied scientists to consider the relevance of their current research to schizophrenia. We cannot guess from which direction new developments will emerge, so task-force approaches are not likely to prove effective. One cannot help but be attracted by Horrobin's suggestion of substantial prizes as inducements for research.[27] After all, there are two notable examples where this strategy has solved difficult technical problems: the need for an accurate chronometer in 1735 and the first man-powered flight in 1980. Clearly some original solution is required, for our current system of funding research is not producing the rapid growth in knowledge that might have been expected to follow Kraepelin and Bleuler's delineation of the disorder 70 years ago.

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