The Economic Burden of Schizophrenia in the United States in 2013

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ABSTRACT

Objective: The objective of this study was to estimate the US societal economic burden of schizophrenia and update the 2002 reported costs of $62.7 billion given the disease management and health care structural changes of the last decade.

Methods: A prevalence-based approach was used to assess direct health care costs, direct non–health care costs, and indirect costs associated with schizophrenia (*ICD-9* codes 295.xx) for 2013, with cost adjustments where necessary. Direct health care costs were estimated using a retrospective matched cohort design using the Truven Health Analytics MarketScan Commercial Claims and Encounters, Medicare Supplemental, and Medicaid Multistate databases. Direct non–health care costs were estimated for law enforcement, homeless shelters, and research and training. Indirect costs were estimated for productivity loss from unemployment, reduced work productivity among the employed, premature mortality (ie, suicide), and caregiving.

Results: The economic burden of schizophrenia was estimated at $155.7 billion ($134.4 billion–$174.3 billion based on sensitivity analyses) for 2013 and included excess direct health care costs of $37.7 billion (24%), direct non–health care costs of $9.3 billion (6%), and indirect costs of $117.3 billion (76%) compared to individuals without schizophrenia. The largest components were excess costs associated with unemployment (38%), productivity loss due to caregiving (34%), and direct health care costs (24%).

Conclusions: Schizophrenia is associated with a significant economic burden where, in addition to direct health care costs, indirect and non–health care costs are strong contributors, suggesting that therapies should aim at improving not only symptom control but also cognition and functional performance, which are associated with substantial non–health care and indirect costs.

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Schizophrenia is a chronic mental disorder affecting 1.1% of the US population[1] and impacting all aspects of a patient's life.[2,3] Patients with schizophrenia experience a broad range of symptoms leading to loss of function and autonomy. Specifically, patients experience positive (eg, hallucinations and delusions) and negative (eg, social withdrawal, lack of emotion, and apathy) symptoms as well as cognitive impairment.[4–6] Patients with schizophrenia also have a shortened lifespan.[7]

This debilitating disease results in a high economic burden[8,9] that increases with disease severity.[10] These costs include direct costs related to the chronic nature of the disease, including hospital inpatient stays, emergency room visits, outpatient visits, and prescription drugs; direct non–health care costs, including law enforcement (victims and criminals) and homeless shelters; and disease-related indirect costs, including unemployment, productivity loss, premature mortality, and caregiver time—all of which contribute to substantial costs.

A study[9] estimating the 2002 societal costs of schizophrenia reported costs of approximately $62.7 billion (direct health care costs, 35%; direct non–health care costs, 15%; indirect costs, 50%). Structural changes in the past decade most likely affected estimates from the 2002 study. Since 2006, Medicare has offered coverage for outpatient prescription drugs (Part D).[11] In addition, legislations since 2002 have affected both health care coverage access (ie, Patient Protection and Affordable Care Act, 2010)[12] and coverage quality (ie, Mental Health Parity and Addiction Equity Act, 2008).[12–14] Another factor likely affecting costs is the trend to deinstitutionalize mentally ill patients, which had already started in 2002 but has continued over the last decade; state mental health hospital inpatient expenditures have continued to decrease, while community-based outpatient expenditures have increased.[15–17] Other factors include the increased proportion of Medicaid enrollees served through managed care delivery systems over time and other changes in pharmacologic therapies and disease and drug management, such as the introduction of new atypical antipsychotic drugs since 2002[18] and the availability of some generic atypical antipsychotics in 2008[19,20] and the introduction of the new HEDIS (Healthcare Effectiveness Data and Information Set) quality measures[21] and the Excellence in Mental Health Act.[22]

Previous estimates of the economic burden of schizophrenia may no longer reflect the current context, and an updated estimation is warranted to increase awareness of the burden of schizophrenia and to provide guidance to decision makers responsible for the allocation of mental health service resources. The objective of this study was to estimate the current US societal economic burden of schizophrenia.

Clinical Points

- From a societal perspective, schizophrenia is associated with an important economic burden that goes beyond direct health care costs and that has been impacted by recent changes in the disease and drug management.
- Therapies should aim at improving not only symptom control but also cognition and functional performance, which are associated with substantial non–health care and indirect costs.

METHODS

Study Design

The economic burden of schizophrenia was estimated for 2013 (the latest year for which direct health care cost data were available) from a societal perspective using a prevalence-based approach assessing direct health care costs, direct non–health care costs, and indirect costs associated with schizophrenia. The estimates were based on a schizophrenia prevalence rate of 1.1% and the 2013 US population census.[1,23] The incremental costs of schizophrenia were estimated based on the cost difference between an individual with schizophrenia and one without schizophrenia; therefore, the costs herein are the "excess" costs attributed to schizophrenia. All costs in the report are expressed in 2013 US dollars. When necessary, adjustments were made to account for population growth and inflation (based on the consumer price index [CPI] for non–health care and indirect costs, and CPI medical care for health care costs) where 2013 statistics were not directly available. This study was exempt from review by an institutional review board because the database was compliant with the Health Insurance Portability and Accountability Act and because the data do not include any identifiable patient information.

Excess Direct Health Care Costs

Direct health care costs were estimated using a retrospective matched cohort design. Patients were classified into 3 samples: commercially insured, Medicare, or Medicaid. Data sources included the Truven Health Analytics MarketScan Commercial Claims and Encounters (Q1 2010 to Q2 2013), Medicare Supplemental (Q1 2010 to Q2 2013), and Medicaid Multistate databases (Q1 2010 to Q4 2013), which are nationally representative on age, gender, geography, and type of coverage within the sample. Patients were required to have ≥ 12 months of continuous health care plan enrollment (the most recent 12 months defined the study period). Medicaid and commercially insured patients were < 65 years old; Medicare patients were ≥ 65 years at the index date (ie, the last calendar date followed by 12 months of continuous health care plan enrollment). Patients with a documented diagnosis of schizophrenia (*ICD-9* codes 295.xx) were classified in the schizophrenia cohort and were matched on a ratio of up to 1:3 to patients without schizophrenia with the same age, gender, residence region (except Medicaid), health care plan type, race (Medicaid only), and index date year. Demographic characteristics were reported descriptively for each study sample.

Total direct health care costs were estimated based on total number of patients enrolled in each health care plan and the average excess direct health care costs incurred by patients with schizophrenia versus those without schizophrenia.[24,25] Uninsured patients with schizophrenia were assumed to incur no excess direct health care costs compared with uninsured patients without schizophrenia. Societal costs were measured based on the sum of payer reimbursement and patient out-of-pocket costs.

Excess Direct Non–Health Care Costs

Direct non–health care costs (related to law enforcement, homeless shelters, and research and training) were estimated from the most recent literature and governmental publications. Law enforcement included incarceration, judicial and legal services, and police protection. Incarceration costs were estimated based on the general population and prevalence of schizophrenia in correctional facilities[26–28] multiplied by annual mentally ill inmate incarceration costs.[29–32] Incarceration costs were stratified by correctional facility type (ie, federal/state prisons and county jails) to account for inherent differences in schizophrenia prevalence and incarceration costs. Judicial and legal services costs were estimated based on number of schizophrenia patients at risk of arrest[17,33]; annual rate of arrest among schizophrenia patients[34]; excess rate of arrest in the schizophrenia population calculated from schizophrenia patient arrests, schizophrenia prevalence, and total number of arrests[35]; and total judicial and legal services calculated from the excess rate of arrests and total judicial and legal expenditures.[36] Costs for police protection for the schizophrenia population were estimated based on total annual police costs and total number of crimes,[36,37] excess number of crimes committed against the schizophrenia population (based on the percentage of crime victims with schizophrenia, prevalence of schizophrenia, and percentage of crime victims without schizophrenia),[34] and average police costs per crime. Police protection costs were calculated by multiplying the average police costs per crime by the number of crimes committed against the schizophrenia population.

Costs related to homeless shelters were estimated based on number of individuals in poverty and homeless,[28,38–41] number of homeless individuals in shelters (based on the number and percentage of homeless individuals living in shelters),[42] and excess number of schizophrenia patients in shelters (based on the percentage of schizophrenia patients in shelters, schizophrenia prevalence, and number of homeless individuals in shelters).[43] The excess costs of shelters were calculated by multiplying the excess number of schizophrenia patients in shelters by the annual cost of sheltering a homeless individual.[44]

Schizophrenia research and training costs were drawn directly from estimates by the National Institutes of Health (NIH).[45]

Direct Cost Offsets

Assuming that homeless patients with schizophrenia or patients living in mental institutions, nursing homes, prisons, or jails[17,33,38–41,46,47] would resort to the social safety net had they not been homeless or institutionalized, society would still have incurred costs for basic living expenses. Therefore, to avoid overestimating costs, the basic living expense cost offsets of these patients were deducted from the total excess direct costs of schizophrenia patients, using the US national poverty threshold as a proxy for basic living expenses.[48]

Excess Indirect Costs

Indirect costs of productivity loss from unemployment, reduced work productivity among the employed, premature mortality (ie, suicide), and caregiving were estimated through data gathered from the most recent literature and governmental publications. The excess number of unemployed schizophrenia patients was based on the number of schizophrenia patients aged 18–64 years and the unemployment rates among schizophrenia patients and the general population for that age group.[49–51] Unemployment productivity loss costs were estimated based on the excess number of unemployed in the schizophrenia population and the US average annual income.[52]

The costs of work productivity loss among employed schizophrenia patients were calculated as the difference between the total annual income that the employed schizophrenia population would have earned without schizophrenia (ie, annual income in the general US population) and the total annual income earned in the employed schizophrenia population.[49,52] Estimates were based on the proportion of working individuals, the productivity levels (stratified by age and gender) in the schizophrenia and general populations,[52–54] and the employed schizophrenia population.[1,51]

Productivity loss indirect costs from premature mortality (ie, suicide in the schizophrenia population) were estimated based on US average age of retirement (63 years) and average age of suicide in the schizophrenia population (31 years) resulting in suicides between 1982 and 2013[8,55]; annual excess number of suicides (based on annual US suicides, percentage of schizophrenia patient suicides, number of schizophrenia patients, and US population for that year)[25,56,57]; and the number of patients who would have been alive and of working age, subtracting death from other causes.[58,59] The costs were calculated by multiplying the number of patients who would have been alive and of working age in 2013 by the employment rate of the population without schizophrenia and the average US annual income.[49–52]

Indirect caregiving costs were based on the productivity loss due to family caregiver hours devoted to schizophrenia patients. These were estimated based on number of schizophrenia patients, percentage of schizophrenia patients in regular contact with family caregivers, average annual number of caregiving hours, and average annual US income.[52,60–62]

Table 1. Total Excess Costs for Patients With Schizophrenia in the United States in 2013[a]

Component	Cost (in million)	Proportion of Total Cost, %
Excess direct health care costs		
Drugs	$9,223	5.9
Outpatient	$7,395	4.7
Inpatient	$15,205	9.8
Emergency room	$2,570	1.7
Long-term care	$607	0.4
Other medical services	$2,690	1.7
Total excess direct health care costs	$37,690	24.2
Excess direct non–health care costs		
Law enforcement	$7,164	4.6
Incarceration	$3,637	2.3
Judicial and legal services	$2,504	1.6
Police protection	$1,024	0.7
Schizophrenia-related research and training	$232	0.1
Shelters for the homeless	$1,896	1.2
Total excess direct non–health care costs	$9,293	6.0
Cost offsets	($8,555)	5.5
Excess indirect costs		
Unemployment	$58,988	37.9
Productivity loss	$2,480	1.6
Premature mortality (suicide)	$3,307	2.1
Caregiving	$52,492	33.7
Total excess indirect costs	$117,267	75.3
Total excess costs	$155,694	

[a]Based on a prevalence rate of 1.1%, the total 2013 US schizophrenia population was estimated at 3,477,417.

Sensitivity Analyses

To assess the robustness of the estimates and the impact of using different literature estimates, 4 sensitivity analyses were performed. First, the percentage of uninsured schizophrenia patients was varied from 12.9% (base case) to 0.0% by redistributing patients proportionally into Medicare and Medicaid health care plans based on recent legislation that increased the access and quality of health care for patients with severe mental illnesses.[12–14] Second, the percentage of patients with schizophrenia who are victims of a crime was varied from 12.7% (base case) to 17.7%.[34] Third, the annual number of caregiving hours was varied from 1,040 (base case) to 804.[60,61] Lastly, the percentage of schizophrenia patients in regular contact with family caregivers was varied from 65.0% (base case) down to 50.0% and up to 80.0%.[60–62]

RESULTS

Based on a prevalence rate of 1.1%, the total 2013 US schizophrenia population was estimated at 3,477,417, leading to an overall estimated economic burden for the 2013 schizophrenia population of $155.7 billion (Table 1). Excess direct health care costs were $37.7 billion, direct non–health care costs were $9.3 billion, and indirect costs were $117.3 billion (Table 1). Indirect costs were the largest cost component, driven by excess unemployment and caregiving costs. On average, each patient with schizophrenia was associated with an excess annual cost of $44,773.

Excess Direct Health Care Costs

The excess direct health care costs of $37.7 billion included costs of drugs ($9.2 billion); outpatient, inpatient,

and emergency room services ($7.4 billion, $15.2 billion, and $2.6 billion, respectively); long-term care ($0.6 billion); and other medical services ($2.7 billion) (Table 1). These costs were estimated based on 107,191 patients with schizophrenia (31,698 commercially insured; 6,629 Medicare insured; and 68,864 Medicaid insured) and their matched controls without schizophrenia (Table 2). The mean absolute costs varied across the commercial, Medicaid, and Medicare health care plans; however, the mean excess costs were consistent ($12,461, $12,447, and $12,396, respectively) (Table 3).

Excess Direct Non–Health Care Costs

Direct non–health care costs accounted for approximately 6% ($9.3 billion) of the economic burden of schizophrenia (Table 1; see also Supplementary eTable 1 at PSYCHIATRIST.COM). Law enforcement costs in the schizophrenia population were nearly $7.2 billion, including $3.6 billion for incarceration, $2.5 billion for judicial and legal services, and $1.0 billion for police protection. Homeless shelter costs for the schizophrenia population were estimated at $1.9 billion, based on the number of US homeless individuals in shelters (2.1 million) and the proportion of schizophrenia patients in shelters (6.3%). Schizophrenia-related research and training costs, as reported by the NIH, were $0.2 billion.

Excess Direct Cost Offsets

Direct cost offsets of $8.6 billion were deducted from the direct costs (Table 1) using the US national poverty threshold for an individual, estimated at $11,888.

Excess Indirect Costs

Indirect costs accounted for approximately 76% ($117.3 billion) of the economic burden of schizophrenia (Figure 1, Table 4). Costs due to unemployment and caregiving were the largest contributors, accounting for 38% and 34% of the economic burden of schizophrenia, respectively. Based on an excess unemployment rate of 58% in the working age schizophrenia population, the cost of productivity loss due to unemployment was $59.0 billion. Additionally, the estimated reduced work productivity for employed patients with schizophrenia was $2.1 billion for males and $0.4 billion for females. Furthermore, schizophrenia-related premature mortality contributed $3.3 billion of indirect costs. Finally, caregiving cost was $52.5 billion, based on an average of 1,040 hours per year devoted to each schizophrenia patient by family members for caregiving.

Sensitivity Analysis

The excess costs of schizophrenia ranged from $134.4 billion to $174.3 billion based on the most and least conservative estimates, respectively. Direct health care costs increased to $43.3 billion based on the assumption that all patients with schizophrenia are

Table 2. Patient Characteristics for 2013 Direct Schizophrenia Costs in the United States

Characteristic	Commercially Insured (n = 31,698)	Medicare (n = 6,629)	Medicaid (n = 68,864)
Age at the index date, mean ± SD (median), y	40.3 ± 15.2 (42)	75.4 ± 7.5 (74)	39.3 ± 14.1 (41)
Female, n (%)	15,599 (49.2)	4,393 (66.3)	33,592 (48.8)
Health plan type, n (%)			
Comprehensive	1,596 (5.0)	3,012 (45.4)	48,218 (70.0)
Consumer driven health plan	1,212 (3.8)	13 (0.2)	0 (0.0)
Exclusive provider organization	446 (1.4)	2 (0.0)	0 (0.0)
High deductible health plan	682 (2.2)	0 (0.0)	0 (0.0)
Home maintenance organization	5,718 (18.0)	1,134 (17.1)	18,516 (26.9)
Point of service, partially or fully capitated	164 (0.5)	12 (0.2)	2,126 (3.1)
Point of service, uncapitated	2,440 (7.7)	148 (2.2)	0 (0.0)
Preferred provider organization	19,400 (61.2)	2,306 (34.8)	0 (0.0)
Unknown	40 (0.1)	2 (0.0)	4 (0.0)
Region of residence, n (%)			
North central	8,067 (25.4)	2,485 (37.5)	…
Northeast	6,074 (19.2)	1,586 (23.9)	…
South	10,230 (32.3)	1,499 (22.6)	…
West	7,246 (22.9)	1,057 (15.9)	…
Unknown	81 (0.3)	2 (0.0)	…
Race, n (%)			
Black	…	…	30,432 (44.2)
Hispanic	…	…	1,254 (1.8)
White	…	…	28,272 (41.1)
Other	…	…	8,906 (12.9)
Year of index date, n (%)			
2010	1,610 (5.1)	302 (4.6)	2,690 (3.9)
2011	4,933 (15.6)	1,003 (15.1)	5,159 (7.5)
2012	25,155 (79.4)	5,324 (80.3)	8,122 (11.8)
2013	0 (0.0)	0 (0.0)	52,893 (76.8)

Symbol: … = data not available.

Table 3. Total Excess Annual 2013 Direct Health Care Costs per Patient for Schizophrenia in the United States

Cost Category	Commercially Insured (schizophrenia, n = 31,696; nonschizophrenia, n = 92,758)	Medicaid (schizophrenia, n = 68,864; nonschizophrenia, n = 201,856)	Medicare (schizophrenia, n = 6,629; nonschizophrenia, n = 19,516)	Weighted Average[a]
Drugs	$3,500	$3,003	$1,877	$2,652
Outpatient	$2,648	$3,754	$1,127	$2,127
Inpatient	$5,160	$2,680	$6,032	$4,373
Emergency room	$871	$570	$953	$739
Long-term care	…	$1,431	…	$175
Other medical services	$281	$1,008	$2,407	$773
Total	$12,461	$12,447	$12,396	$10,838
Schizophrenia, mean ± SD	$18,090 ± $39,055	$23,455 ± $62,060	$27,552 ± $57,014	…
Nonschizophrenia, mean ± SD	$5,630 ± $13,156	$11,007 ± $24,674	$15,155 ± $22,645	…

[a]Includes uninsured patients (weighted at 12.9%). Uninsured patients were assumed to incur no excess costs. Other weights include 54.2% for commercial health care insurance, 20.7% for Medicare, and 12.2% for Medicaid, all based on US Census Bureau estimates.
Symbol: … = data not available.

Figure 1. Distribution of 2013 Excess Indirect Costs for Schizophrenia in the United States

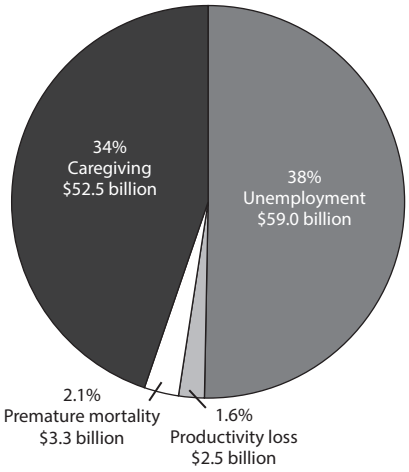

Table 4. Summary of Excess Indirect Costs

Indirect Item	Cost (in million)	Components
Unemployment	$58,988	Patient employment rate: 10.02%[45–47] US population employment rate: 67.74%[45–47] Excess no. of unemployed patients: 1,270,202[45–47] Mean US annual income: $46,440[48]
Productivity loss	$2,480	Estimated income without schizophrenia: $9,493,628,194 (calculated)[1,45,48] Estimated schizophrenia population income: $7,014,028,779 (calculated)[48–50]
Premature mortality productivity loss	$3,307	No. of patients who would have been alive if not for schizophrenia: 104,150 (calculated)[21,52–55] Employment rate of patients without schizophrenia: 68.38%[45,46] Mean US annual income: $46,440[48]
Caregiving productivity loss	$52,492	No. of annual family caregiving hours: 1,040[50,56–58] Patients in regular family contact: 65.0%[56–58] Mean hourly US income: $22.33[1]

covered by a health care plan. Additionally, direct non–health care costs increased to $10.2 billion after the percentage of patients with schizophrenia who are victims of a crime was varied from 12.7% to 17.7%. Last, productivity loss due to caregiving was varied, from estimates of 804 hours per year devoted by caregivers and 50% of the schizophrenia population in contact with family members to 1,040 hours per year and 80%, resulting in indirect costs that varied from $96.0 billion to $129.4 billion, respectively. See Supplementary eTable 2 for full results from the sensitivity analyses performed. In addition, base case values are reported in Table 4.

DISCUSSION

The US economic burden of schizophrenia for 2013 was estimated at $155.7 billion, and the largest components were unemployment (38%), productivity loss due to caregiving (34%), and direct health care costs (24%). Sensitivity analyses yielded costs ranging from $134.4 billion to $174.3 billion.

Cost estimates of the schizophrenia economic burden have not been thoroughly assessed in over a decade. The most recent study[9] found excess costs of $62.7 billion in 2002. Most estimates of that study were consistent with those of the current study. Similarly, the largest components were also unemployment, productivity loss due to caregiving, and direct health care costs.[9] However, some differences between the studies are worth noting. The main difference was the schizophrenia prevalence estimates used. The current study used a prevalence estimate of 1.1% based on National Institute of Mental Health estimates, while the 2002 study[9] used a prevalence of 0.5% based on a retrospective claims analysis and epidemiologic survey studies. Applying a prevalence estimate of 0.5% to the current study would yield excess costs of $75.3 billion, consistent with the estimates from the 2002 study, considering inflation and structural changes in health care and schizophrenia treatment from 2002 to 2013.

Another difference between the 2 studies was the unemployment rate. The 2002 study[9] used an employment-to-population ratio among both the US and the schizophrenia population aged 16 years and older. The present study used a working age range of 18–64 years, which yielded a slightly higher ratio. In addition, the excess rate of unemployment in 2013 (58%) was higher than that of 2002 (41%). This greater excess rate, driven by the decline in the schizophrenia population employment rate, may be explained by the recent economic context where budgetary reductions and a difficult economic situation may have had more effect on vulnerable individuals, such as schizophrenia patients.

The excess caregiving estimate costs also differed between the current study and the 2002 study[9]; the number of hours devoted to caregiving by family members increased substantially from 484[63] to 1,040 hours per year. This increase may be a result of the deinstitutionalization of schizophrenia patients, which began with the reintegration of mentally ill patients following the 1990 American Disabilities Act and has continued over the past decade.[17] A push for increased family intervention for schizophrenia patients can be beneficial and is recommended by many international clinical guidelines, but this intervention comes at a high emotional and economic price to caregivers.[64]

Although consistent excess costs were found in both studies for commercially insured patients following inflation adjustment, some differences between Medicaid and Medicare patients in excess direct costs need to be highlighted. When compared to the 2002 study, excess costs of drugs and outpatient care decreased. However, results presented here cannot be directly compared with the 2002 study results due to differences in approaches and data sources used and changes in mental health care practices since 2002. These changes include (1) Medicare coverage

changes (eg, offering coverage for outpatient prescription drugs),[11] (2) legislations affecting both health care coverage access and quality for patients with mental illness,[12–14] (3) the continued trend to deinstitutionalize mentally ill patients,[15] (4) the increased proportion of Medicaid enrollees served through managed care delivery systems over time, (5) the introduction of new antipsychotic drugs into the market,[18] (6) the recent availability of some generic atypical antipsychotics,[19,20] and (7) other changes in disease and drug management, such as the introduction of the new HEDIS quality measures and the Excellence in Mental Health Act.[21,22]

In the current study, although absolute costs vary across insurance types, the incremental costs between patients with and patients without schizophrenia are consistent among the commercially, Medicaid-, and Medicare-insured samples. These findings suggest that, when patients with a similar profile are compared, the direct health care costs of schizophrenia are consistent (approximately $12,400) across the different insurance types.

Direct costs are the most apparent for schizophrenia. However, it is important to highlight that direct non–health care costs, including law enforcement costs, and indirect costs such as those from unemployment and caregiving, are significant contributors to the schizophrenia economic burden. Law enforcement alone represents nearly $7.2 billion, and excess indirect costs of unemployment and caregiving amount to $59.0 billion and $52.5 billion, respectively.

Despite its relatively low prevalence (ie, 1.1%), schizophrenia is associated with a significant economic burden. In comparison, a recent study[65] reported that major depressive disorder (MDD), which has a prevalence of 6.4% in the United States, is associated with an economic burden of $210.5 billion. Although MDD is almost 6 times more prevalent than schizophrenia, its economic burden is only 35% higher than that of schizophrenia.[65]

The findings from this study should be considered in the light of limitations. Direct health care costs were estimated from the amounts reimbursed by payers and incurred by patients and may not fully reflect the societal costs incurred, which may differ for various administrative reasons. Direct health care costs of patients with undiagnosed schizophrenia were not captured, which may impact the representativeness of the studied sample. These patients may have a different profile than those diagnosed. Patients covered by military health insurance and those eligible simultaneously for Medicare and Medicaid were not captured by the data sources used and were assumed to incur the same costs as patients covered by commercial insurance or Medicare, respectively. On the basis of the sample selection criteria applied for direct health care cost assessment, some patients with recurrent enrollment gaps may not have been selected for the administrative database analysis. Therefore, the studied sample may not be fully representative of the US schizophrenia population. Additionally, the human capital approach, which values productivity costs of morbidity and mortality, was used in this study; other methods may provide different estimates. Because of the lack of information specific to the schizophrenia population, the incremental health care costs incurred by caregivers resulting from the care of schizophrenia patients, the economic burden of non-Medicaid state programs to support patients with schizophrenia and their caregivers, the costs associated with a reduced life expectancy due to an increased prevalence of some comorbidities/risk factors (eg, cardiovascular risk), and the potential excess costs of uninsured schizophrenia patients (eg, emergency room/department costs) were not assessed, which most likely resulted in an underestimation of the societal costs. The study was also limited by the extent of information and the wide range of estimates reported in the literature and by the potential heterogeneity (eg, different study periods or schizophrenia samples) across the data sources used. However, sensitivity analyses were conducted based on different literature values reported for major cost components.

This study is an important update to the existing literature on the economic burden of schizophrenia, supporting previous findings of schizophrenia as a costly disease. Results show that direct non–health care costs of law enforcement and incarceration are significant contributors and that indirect costs of unemployment and caregiving contribute even more to the societal costs of schizophrenia than direct health care costs. Health care spending for schizophrenia appears to continue to have a large focus on crisis-oriented direct costs typically seen in inpatient and emergency care. However, the results here suggest that effective treatments and interventions to increase the stability and functional performance of schizophrenia patients should also be targeted to better address non–health care and indirect costs.

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Supplementary material: Available at PSYCHIATRIST.COM.

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Supplementary Material

Article Title: The Economic Burden of Schizophrenia in the United States in 2013

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List of Supplementary Material for the article

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This Supplementary Material has been provided by the author(s) as an enhancement to the published article. It has been approved by peer review; however, it has undergone neither editing nor formatting by in-house editorial staff. The material is presented in the manner supplied by the author.

Supplementary eTable 1: Summary of 2013 Excess Direct Non-Healthcare Costs for Schizophrenia in the United States

Direct non-healthcare item and cost	Cost (in million USD)	Components
Incarceration	3,637	
State and Federal prisons:	2,704	Excess no. patients: 31,317[1–3]
		Daily cost of incarceration: $236.39[4–7]
Jails:	933	Excess no. patients: 18,128[1–3]
		Daily cost of incarcerations: $140.85[4–7]
Judicial and legal services	2,504	Annual arrest rate: 7.20%[8]
		Excess annual arrest rate: 3.38% (calculated)[9]
		No. patients at risk: 3,370,854 (calculated)[10,11]
		Excess no. patient arrests: 113,817 (calculated)
		No. arrests in US: 12,196,959[9]
		Excess rate of arrest in patients: 0.93% (calculated)[8,9]
		Judicial and legal expenditures: $268,320,766,802[12]

Police protection	1,024	% patients who are crime victims: 12.70%[8]
		Excess annual crime rate of schizophrenia population: 5.52% (calculated)[8]
		Excess no. crimes against schizophrenia patients: 191,837[8]
		Average police cost per crime: $5,336[12,13]
Research and training	232[14]	
Shelters for the homeless	1,896	Excess no. homeless patients: 301,439[3,14–17]
		Excess no. patients in shelters: 114,081 (calculated)[18,19]
		Daily cost to shelter an individual: $45.51[20]

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Supplementary eTable 2: Impact of Sensitivity Analyses on Total Excess Costs vs. Core Analysis

	Components Varied for Sensitivity Analyses					
	Uninsured Schizophrenia Patients	Schizophrenia Patients Victims of Crimes	Number of Hours Devoted to Caregiving (weekly)	Schizophrenia Patients in Contact with Family Caregivers	Total Excess Costs (in million USD)	Impact on Total Excess Costs vs. Core Analysis
Core Analysis	12.9%	12.7%	20	65.0%	155,694	–
Sensitivity 1	0.0%	–	–	–	161,263	3.6%
Sensitivity 2	–	17.7%	–	–	156,632	0.6%
Sensitivity 3	–	–	15.5	–	143,782	-7.7%
Sensitivity 4	–	–	–	50.0%	143,580	-7.8%
Sensitivity 5	–	–	–	80.0%	167,807	7.8%
Sensitivity 6	0.0%	17.7%	–	–	162,201	4.2%
Sensitivity 7	0.0%	–	15.5	–	149,352	-4.1%
Sensitivity 8	0.0%	–	–	50.0%	149,150	-4.2%
Sensitivity 9	0.0%	–	–	80.0%	173,377	11.4%
Sensitivity 10	–	17.7%	15.5	–	144,720	-7.0%
Sensitivity 11	–	17.7%	–	50.0%	144,518	-7.2%
Sensitivity 12	–	17.7%	–	80.0%	168,746	8.4%
Sensitivity 13	–	–	15.5	50.0%	134,418	-13.7%
Sensitivity 14	–	–	15.5	80.0%	153,147	-1.6%
Sensitivity 15	0.0%	17.7%	15.5	–	150,290	-3.5%
Sensitivity 16	0.0%	17.7%	–	50.0%	150,088	-3.6%
Sensitivity 17	0.0%	17.7%	–	80.0%	174,315	12.0%
Sensitivity 18	0.0%	–	15.5	50.0%	139,987	-10.1%
Sensitivity 19	0.0%	–	15.5	80.0%	158,716	1.9%
Sensitivity 20	–	17.7%	15.5	50.0%	135,356	-13.1%
Sensitivity 21	–	17.7%	15.5	80.0%	154,085	-1.0%
Sensitivity 22	0.0%	17.7%	15.5	50.0%	140,925	-9.5%
Sensitivity 23	0.0%	17.7%	15.5	80.0%	159,654	2.5%

Note: ”–“ no change from the core analysis