Impact of Bipolar Disorder on the Family

Utilization and Cost of Health Care Resources

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ABSTRACT

Objective: Our retrospective analysis compared costs and patterns of health care utilization by families that included a member with bipolar disorder ("bipolar families") and by families without serious psychiatric disease ("control families").

Methods: We used the MarketScan Commercial Claims and Encounters Database covering January 1998 through December 2002. International Classification of Diseases (ICD-9-CM) codes were used to identify individuals with bipolar disorder and link them to their family members. Bipolar families were matched in a ratio of 1:3 to families without a serious mental illness. We calculated and statistically compared the mean annual use of resources and health care costs for each group, including the individual with bipolar disorder. We used a multivariate model to test the effect of demographic and health care variables on the impact of total health care expenditures.

Results: Families with a member with bipolar disorder (n = 43,448), compared with matched families (n = 122,769), made significantly more outpatient physician visits (24 vs. eight; $P < 0.001$), more inpatient hospital stays (1 vs. 0.3; $P < 0.001$), and more prescription medications (24 vs. 7.8; $P < 0.001$). Total annual health care costs were more than three-fold higher for bipolar families ($4,664), compared with matched families ($1,376) ($P < 0.001$). The multivariate model controlled for family size and comorbidities, indicating significantly higher total health care costs for families with one or more persons with bipolar disorder than for matched families without serious mental illness.

Conclusion: These results indicate that bipolar disorder has a significant financial impact on families in addition to the individual with the diagnosis.

INTRODUCTION

Bipolar disorder is a serious, chronic psychiatric disease characterized by a dysregulation of mood.[1] Like other serious mental illnesses, it significantly impairs an individual's functioning, well-being, and productivity, adding to medical costs.[2] Economic analyses estimate total annual costs at $24 to $45 billion.[3–6] The effect on the family has been incorporated into some of these economic analyses through an estimation of indirect costs, including the cost of caregivers' time and lost work productivity resulting from caregiving. These studies have reported that indirect costs represent a substantial portion (35%–83%) of total costs.[4–6]

However, the effect of mental illness on the family may exceed the cost of a caregiver's time away from work. Several studies have reported associations between providing care for a family member with a mental illness and the mental and physical strain on caregivers themselves.[7–10]

Dyck et al. reported that mental illness affects the physical health of caregivers by showing an association between the occurrence of infectious illness episodes in caregivers and the severity of schizophrenia symptoms exhibited by the patient.[11] In studies of serious mental illness (bipolar disorder, schizophrenia, major depression) the physical health, health care costs, and work productivity of the entire family are affected by the mental and physical strain on family members involved in caregiving.[12,13]

Gallagher and Mechanic observed that sharing a household with a mentally ill person is associated with self-reported poorer physical health and a greater risk of hospitalization or visiting a physician.[12] Using administrative data from a large regional health plan, Gianfrancesco et al. found that the costs of mental health care were 213% higher and other health care expenses were 7.4% higher for family members of individuals with bipolar disorder than those from a control group.[13] A pilot study also suggested that paid caregivers of patients with dementia experience symptoms of depression and anxiety related to the degree of their involvement with the patient.[14]

Although the body of research regarding the effects of caregiving on physical health and health care costs is expanding, few studies have evaluated the effect of bipolar disorder on the use and costs of health care by families. Through a retrospective study, we sought to further quantify the impact of bipolar disorder on the use and costs of health care for families that included a member with a diagnosis of bipolar disorder, compared with families that did not include a member with a serious mental illness.

METHODS

The amount of health care resources used and health care costs for families containing an individual with bipolar disorder ("bipolar families") were compared with health care costs of

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family members without a diagnosis of a serious mental illness ("control families"). We derived the data used for this study from the MarketScan Commercial Claims and Encounters Database, which reflects the combined use of health care services of more than two million privately insured individuals in the U.S. who were covered under fee-for-service, fully capitated, and partially capitated health plans. The database is constructed through employer-supplied records and does not contain information that allows for personal identification of individuals.

We identified individuals with bipolar disorder through diagnostic codes for bipolar or manic disorder (296.4x–296.8x) from the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM). Individuals with medical claims for these diagnoses from January 1998 through December 2002 were included in the analysis. Family members of the individuals with bipolar disorder were identified through eligibility codes that distinguished employees from dependents. We determined family position from eligibility files that included demographic information and the relationship to the policy beneficiary.

The "bipolar families" were matched to control families without diagnosis codes for bipolar disorder or other serious mental illnesses (ICD-9-CM codes 290–319) in a 1:3 ratio based entirely on family characteristics: the number of family members, the type of insurance plan, and geographic region. We chose this matching ratio because taking more than one control per case would have increased the statistical confidence of the results. However, this effect declines considerably at a ratio of over five controls per case. In this situation, with families being matched, going beyond three controls per case would have been difficult and time-consuming. This ratio was also used in a similar study comparing family costs of migraine.[15]

We created a file containing inpatient, outpatient, and pharmaceutical claims for all individuals in both groups. Services and costs were considered to be related to bipolar disorder if an outpatient or emergency visit or a hospital stay was associated with a primary diagnosis code of 296.4x–296.8x; only prescriptions for lithium, valproate, lamotrigine (Lamictal, GlaxoSmithKline), and antipsychotic agents were considered bipolar disorder–related.

We calculated health care use as the average number of inpatient and outpatient visits as well as the number of prescriptions per family over the five years of data. We determined the cost of health care services from the total payment received by the provider, including copayments and deductibles.

The total costs included all "carve-out" claims such as behavioral health. We calculated the cost of care as an average over the five-year study period. The primary analyses comparing health care utilization and costs between families included the family member with bipolar disorder. We calculated per-member costs by dividing the total cost for the specific group by the total number of members in that group.

Because we had concerns about extrapolating costs for services provided under capitated insurance plans, we included only families in health plans that reported the amount paid per service in calculating the costs of health care; by contrast, we included all families in calculating the utilization of health care resources.

Although it is possible to assign a cost to a service provided under a capitated health plan, it was felt that the calculation could be biased. Therefore, we calculated resource utilization for everyone as an alternate way to assess the difference in health care usage between study groups.

We used Major Diagnosis Categories (MDCs), a classification system developed by the Centers for Medicare and Medicaid Services, to group diagnosis codes into 26 major categories as proxies of medical and mental health comorbidities. We used *t*-tests to compare utilization of resources between groups. Wilcoxon rank sum tests were used to compare health care costs because of the non-normal distribution of cost data. A P value of 0.05 was considered statistically significant, and the Bonferroni method was used to adjust P values for multiple comparisons.

We used regression analysis to test the impact of other demographic and health care variables on total health expenditures. We transformed the expenditures into logs before estimating using an ordinary least-squares model, as is typically done to normalize highly skewed distributions.

Independent variables considered for the regression model were family size, the total number of MDCs, the presence of an individual with bipolar disorder in the family, area of residence, and type of insurance plan.

RESULTS

The MarketScan Database contained 1,868,968 families. From these, we identified 43,448 families, including at least one member with bipolar disorder, that were matched to 122,769 families without a serious mental illness (Table 1). Preferred provider organization (PPO) and point-of-service (POS) plans were the most prevalent types of health insurance; 50% of families (21,767 bipolar families and 61,139 control families) had this type of coverage.

Most families resided in the southern and northern central regions of the U.S. The trends in insurance type and geographic region were similar for those individuals in the master MarketScan Database, with 39% and 28% residing in the southern and north central regions respectively; 63% were covered by PPO and POS health plans.

In this sample, individuals with bipolar disorder were primarily between the ages of 18 and 65 years (37,204 family members, 82%) and female (27,322 family members, 60%). The mean number of MDCs for this population was 7.2. The most common bipolar diagnosis code for these individuals (10,881 members, 24%) was episodic affective disorder (ICD-9 code 296.8), followed closely by bipolar affective disorder–mixed (ICD-9 code 296.6) and bipolar affective disorder–unspecified (ICD-9 code 296.7), each with slightly more than 19% of diagnoses (8,779 and 8,787 family members, respectively).

More comorbid conditions were observed among the bipolar families, according to the mean number of MDCs (Table 1). The distribution of diagnoses in each of the 26 MDCs (Table 2) was similar between the groups except for a lower percentage of pregnancy and newborn diagnoses, and a greater percentage of diagnoses of alcohol or drug use in the bipolar families. The category of "Injuries, Poison, and Toxic Effect of Drugs" also tended to be more common in the bipolar

continued on page 23

continued from page 16

Table I **Summary of Demographics as a Function of Family Type**

	Families Containing a Member with BPD				
	One Individual with BPD	*Two Individuals with BPD*	*Three or More Individuals with BPD*	Total Families Containing a Member with BPD	Matched Families
No. of families	41,704	1,623	121	43,448	122,769
Household size (%)					
Single households	28			27	23
Family with 2 members	24	19		24	25
Family with 3+ members	48	81	100	49	52
Mean age (SD) of primary insured (years)				48 (12.3)	47 (15.4)
BPD therapy (%)					
Lithium	10.4	16.6	26.5	10.7	0.0
Valproate	23.6	42.7	52.9	24.4	0.3
Conventional	6.3	9.8	14.1	6.4	0.2
Atypical	22.3	37.3	57.0	23.0	0.1
Other	59.9	76.5	79.3	60.6	N/A
Insurance type (%)*					
Indemnity	27.1	26.0	28.4	27.1	27.3
HMO or capitated plan	22.4	24.5	20.2	22.4	22.5
PPO/POS	50.1	49.5	50.5	50.1	49.8
Average length of insurance coverage (days)				939	761
Region (%)					
Northeast	16.6	18.6	24.8	16.7	16.6
North central	28.8	29.5	30.6	28.9	28.8
South	38.3	36.7	37.2	38.2	38.7
West	12.8	11.2	5.0	12.6	13.1
Unknown	3.6	4.1	2.5	3.6	2.8
Mean No. of MDCs	10.1	12.3	13.6	10.2	6.8

* Missing values contribute the unclassified insurance plan types.

BPD = bipolar disorder; HMO = health maintenance organization; MDC = Major Diagnostic Category; N/A = not applicable; PPO = preferred provider organization; POS = point-of-service; SD = standard deviation.

families. The category of "Mental Diseases and Disorders" was notably higher for these families, because the control families had been selected on the basis of a lack of claims with diagnoses for serious mental illnesses.

Bipolar families (including the member with bipolar disorder) also used significantly more medical services than the matched families. The bipolar families made more outpatient physician visits, had more inpatient hospital stays, and bought more prescription medications (Table 3). Almost 90% of their total health care usage went toward treating conditions other than bipolar disorder.

Health care costs followed similar trends. Total annual mean health care costs were 239% higher for bipolar families than for matched controls, primarily because of the difference in mean annual inpatient expenses and prescription costs (see Table 3). Only 13% of total health care expenditures went toward the treatment of bipolar disorder.

Total health care costs per family depended on which family member had bipolar disorder. For families with only one member with bipolar disorder, costs were higher if a child rather than a parent had the diagnosis ($5,791 vs. $4,476, respectively) (Table 4). The health care costs for families with two members with bipolar disorder (child and parent) were higher than for families with only one member with the diagnosis. In terms of between-group differences, the costs for families having both a parent and child with bipolar disorder were nearly six-fold higher than the costs for control families with children.

Among the individuals with bipolar disorder, children had the lowest per-member costs ($2,432); adults (spouse or employee) had the highest per-member costs (see Table 4).

Among the bipolar families, health care costs for a child or a sibling of an individual with bipolar disorder were more than 60% lower than those for an adult family member (i.e., a spouse, parent, or mother of an individual with bipolar disorder). Mothers of children with bipolar disorder had the largest differen-

Table 2 **Percentage of Families with a Medical Claim for a Diagnosis within a Major Diagnostic Category**

Major Diagnostic Category	Families with a Bipolar Member	Matched Families
00 Ungroupable	3.20	3.36
1 Nervous System	4.63	3.36
2 Eye	3.65	4.62
3 Ear, Nose, Mouth, and Throat	9.95	12.55
4 Respiratory System	5.99	6.14
5 Circulatory System	5.31	5.96
6 Digestive System	6.24	6.32
7 Hepatobiliary System	0.87	0.69
8 Musculoskeletal System and Connective Tissue	8.93	9.77
9 Skin, Subcutaneous Tissue, and Breast	9.08	10.72
10 Endocrine, Nutritional, and Metabolic System	4.91	4.93
11 Kidney and Urinary Tract	3.38	3.27
12 Male Reproductive System	1.14	1.41
13 Female Reproductive System	3.63	3.81
14 Pregnancy, Childbirth, and Puerperium	0.44	1.09
15 Newborns and Other Neonates (Perinatal Period)	0.28	0.88
16 Blood and Blood Forming Organs and Immunological Disorders	1.48	1.38
17 Myeloproliferative Diseases and Disorders (Poorly Differentiated Neoplasms)	0.47	0.56
18 Infectious and Parasitic Diseases	2.10	2.38
19 Mental Diseases and Disorders	9.72	0.00
20 Alcohol/Drug Use or Induced Mental Disorders	0.75	0.00
21 Injuries, Poison, and Toxic Effect of Drugs	2.71	1.98
22 Burns	0.17	0.12
23 Factors Influencing Health Status	10.93	14.68
24 Multiple Significant Trauma	0.02	0.01
25 Human Immunodeficiency Virus Infection	0.02	0.01
TOTAL	100.00	100.00

tial in per-member health care costs, at a rate that was 203% higher than their matched counterparts.

Table 5 summarizes the results of the regression analysis of the relationship, after we controlled for other family demographic and health status variables, between the natural log of total health care costs for families and having a family member with bipolar disorder. After we controlled for comorbidities and family size, the regression model estimates showed that total health care costs for bipolar families were nearly 1.5 times greater ($e^{0.383}$ =1.47) than for families without any serious mental illness.

DISCUSSION

Our analysis provides new information about bipolar disorder and its effects on families. It reports a conservative estimate of the incremental health care cost associated with bipolar disorder in a specific American population. The results suggest that diagnosed and potentially treated bipolar disorder is associated with a substantial increase in the utilization of health care resources and costs for families. Even after we controlled for some potentially confounding factors in a multivariate model, the impact persisted, although it was somewhat diminished. It is notable that the factors included in the regression model explained 66% of the variability in total health care costs for families.

In our study, total annual health care costs were 239% higher for bipolar families than for matched controls; these costs were similar to those noted by Gianfrancesco et al.[13] In that study, annual mental health care expenses for bipolar families were 213% higher, and other health care expenses were 7.4% higher than in families without bipolar disorder, major depression, or schizophrenia.[13] Our study group was drawn from several regions of the U.S. and encompassed multiple insurers and plan designs, thereby providing a way to apply the results to other groups with commercial health insurance.

Bipolar families used significantly more health care resources and incurred significantly greater costs, although nearly 90% of these resources and costs were used to treat conditions other than bipolar disorder. There were more diagnoses of comorbid conditions in these families, as indicated by the higher mean number of MDCs.

A similar trend was seen in a study by Stang et al. In that study, only 5% of total health care costs for families with a migraineur were used for the treatment of migraine.[15] Studies have shown that caregivers of children with chronic medical conditions or physical disabilities have higher levels of anxiety and depression as well as more complaints of physical problems.[16–20] Elevated levels of depressive symptoms and physical health problems for caregivers of patients with dementia have also been reported.[21,22]

Table 3 **Annualized Unadjusted Average Health Care Utilization and Costs**

	Bipolar Families		Matched Families				Bipolar Families		Matched Families		
No. of Families	43,448		122,769			**No. of Families**	43,448		122,769		
	Mean	***SD***	***Mean***	***SD***	**P**		***Mean***	***SD***	***Mean***	***SD***	**P**
Outpatient visits per family year	24.26	28.85	8.06	10.9	<0.001	***Outpatient cost***	$2,417	$2,305	$786	$2,813	<0.001
BPD-related	2.45	4.08	0.00		<0.001	BPD-related	$227	$551	$0		<0.001
Non–BPD-related	21.81	23.14	8.06	10.9	<0.001	Non–BPD-related	$2,189	$2,021	$786	$2,813	<0.001
Inpatient visits per family year	1.14	2.86	0.33	0.91	<0.001	***Inpatient cost***	$762	$1,860	$187	$805	<0.001
BPD-related	0.15	0.39	0.00		<0.001	BPD-related	$151	$656	$0		<0.001
Non–BPD-related	0.99	2.01	0.33	0.91	<0.001	Non–BPD-related	$611	$1,487	$187	$805	<0.001
No. of prescriptions per family year	24.29	33.91	7.83	15.43	<0.001	***Prescription cost***	$1,485	$2,238	$403	$1,115	<0.001
BPD-related	1.92	2.26	0.00		<0.001	BPD-related	$214	$571	$0		<0.001
Non–BPD-related	22.38	28.65	7.83	15.43	<0.001	Non–BPD-related	$1,271	$2,127	$403	$1,115	<0.001
						Total health care cost	$4,664	$5,238	$1,376	$3,055	<0.001
						BPD-related	$592	$941	$0		<0.001
						Non–BPD-related	$4,072	$2,930	$1,376	$3,055	<0.001

* Families containing a member with bipolar disorder (BPD) include the resource use and costs for the individual with the diagnosis of BPD.
SD = standard deviation.

Although it is possible that the stress of caregiving contributes to more frequent treatment for mental and physical comorbidities, other explanations are possible. An alternate hypothesis posits that parents in families with a bipolar member have more regular contact with the health care system because of consultations for their children. If these parents interact with the system more often, they have more opportunities to discuss and receive attention for their own health concerns, compared with parents in the control group.

Other possible hypotheses for the increased usage and costs of health care services include the ability of the family to cope with the illness[23–25] as well as the shared genetic liability for mood disorders and comorbid physical conditions associated with bipolar disorder.[26]

Even though the bipolar families had more comorbid diagnoses, there was a similar distribution of diagnoses among the study groups, with a few exceptions. Pregancy and newborn diagnoses were less common in bipolar families; such families have been noted for individuals with bipolar disorder in previous research.[27] The increased use of alcohol and drugs among families with a bipolar member may be directly attributable to bipolar disorder; the correlations between bipolar disorder and these diagnoses have been well documented.[28] The trend in the Injuries, Poison, and Toxic Effect of Drugs MDC (see Table 2) may be reflective of self-injurious behavior such as suicidal attempts.[29]

Adding to the hypothesis that the effect of bipolar disorder extends beyond the individual with the diagnosis are the findings that children with the diagnosis had the lowest per-member costs. However, the costs of families with a bipolar child were 30% higher than for families with an adult bipolar member. This increase in cost appears to be driven by the use of health care resources by parents. The health care costs of parents, particularly mothers, with bipolar children are substantially affected, more so than those of the spouses of individuals with bipolar disorder, possibly because of the psychological stress associated with caring for a child with a disability. Most informal caregivers of children are mothers,[20] thereby augmenting this effect.

The impact of bipolar disorder also appears to intensify with the number of family members affected; the costs for families with a child and parent carrying the diagnosis cost are almost 500% higher than those for their matched controls. The high costs incurred by these families make them ideally suited for case management, which can reduce the level of mania symptoms.[30]

LIMITATIONS OF THE STUDY

As with all research, some limitations may need to be considered. Although our analysis used a unique and rich data set, analyses based on insurance claims data are limited by several factors, including:

- the possibility of an inaccurate diagnosis.
- coding inaccuracies, which might be relevant in bipolar disorder.

Table 4 Health Care Costs by Family Member

		Families Containing a Member with BPD						Control Group Families			
		Total Health Care Cost		BPD-Related		Non–BPD-Related				Total Health Care Cost	
Cost per Family	*No.*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Cost per Family*	*No.*	*Mean*	*SD*
All families containing a member with BPD*†	43,448	$4,664	$5,238	$592	$941	$4,072	$2,930	**All Families***	122,769	$1,375	$3,497
Just a parent with BPD†	30,873	$4,476	$5,593	$564	$1,099	$3,912	$5,229	Families (no children)	55,370	$1,340	$2,787
Just a child with BPD†	9,020	$5,791	$6,586	$671	$1,411	$5,120	$6,153	Families (with children)	67,399	$1,420	$3,985
Parent + child with BPD†	927	$8,513	$8,126	$1,551	$2,406	$6,962	$6,904				
Cost per Member								*Cost per Member*			
All individuals with BPD*	45,326	$2,909	$4,083	$553	$1,146	$2,356	$3,650				
Employee with BPD	19,768	$3,132	$4,138	$535	$1,083	$2,597	$3,737	Employee	123,832	$707	$1,700
Spouse with BPD‡	12,487	$3,400	$4,694	$573	$1,067	$2,827	$4,305	Employee or Spouse (no children)	84,049	$934	$2,018
Child with BPD‡	10,273	$2,432	$3,397	$643	$1,405	$1,789	$2,735	Employee or Spouse (with children)	125,455	$517	$2,660
Spouse of individual with BPD‡	21,383	$1,412	$2,796	$27	$264	$1,385	$2,736	Spouse	85,716	$651	$3,206
Parent of individual with BPD‡	18,176	$1,599	$3,201	$46	$289	$1,553	$3,144	Mother (with children)	64,285	$602	$1,271
Mother of individual with BPD‡	9,488	$1,824	$3,010	$52	$363	$1,772	$2,920	Child	141,139	$178	$828
Sibling of individual with BPD‡	12,468	$561	$1,323	$28	$308	$533	$1,213				
Child of individual with BPD‡	26,807	$500	$1,542	$36	$378	$464	$1,415				

* Missing values contribute to the unclassified family types.
† Costs for families with a bipolar member include those for the individual with the diagnosis of bipolar disorder (BPD).
‡ If a family had multiple members with a diagnosis of bipolar disorder, one of these members was randomly chosen for the relationship analysis.

- missing data.
- differences among employers' health insurance plans for which the study could not account.
- the fact that study samples were restricted to bipolar families, as diagnosed according to ICD-9-CM codes.

Potential selection biases also exist; it is possible that bipolar disorder might be underreported in claims data as a result of social stigma, practice differences between primary care physicians and specialists, and other factors.

We should also consider a factor that might have limited the generalizability of the results.

Table 5 Linear Regression Analysis for Natural Log of Total Health Care Costs

Variable	Parameter Estimate	Standard Error	t Value	P Value
Intercept	4.377	0.006	677.47	<0.001
Family size	–0.095	0.002	–54.78	<0.001
No. of major diagnosis categories	0.319	0.001	471.72	<0.001
Family containing a member with bipolar disorder	0.383	0.006	62.38	<0.001

$r^2 = 0.66$.
* Total health care costs include the costs of the individual with the diagnosis of bipolar disorder.

The study sample might have represented a high-functioning population of individuals with bipolar disorder. In our sample, 44% of individuals (19,768) with bipolar disorder were employees. This fact may suggest that the study population differs from bipolar individuals who would be covered by Medicaid or the mix of patients who would be seen in a general psychiatrist's practice.

Excluding families with other serious mental health diagnoses from the control group might have led to overestimating incremental costs. The reasoning behind this exclusion was the difficulty of diagnosing bipolar disorder; such a difficulty could have led to a large number of "undetected" cases in the control group. It has been reported that approximately one-third of patients diagnosed with unipolar depression also fit the diagnostic criteria for bipolar spectrum disorder. In addition, 34% of patients sometimes wait 10 years or more before they are given their first diagnosis of bipolar disorder.[31] However, the control group did include subscribers to health plans and family members with other chronic diseases such as asthma, migraine, and gastroesophogeal reflux disease, which would have attenuated this problem.

An additional limitation might be the lack of cost data for some services provided under capitated health plans. Our approach was to exclude these services, which could have resulted in an underestimation of total costs. In this study, the annual total direct medical cost for individuals with bipolar disorder ($2,909) was somewhat lower than that reported by Simon and Unutzer ($3,416).[32] Their study benefited from a cost-accounting system that estimated the actual cost of producing services at health maintenance organization (HMO) facilities, and included the costs for capitated care.[32]

Despite these limitations, our study and the associated body of research raise important questions for health care providers, insurers, and P&T committees. Bipolar families appear to have unmet needs based on their higher utilization of health care resources, including prescriptions. More research is needed to determine whether effective drug and behavioral health treatment of bipolar patients can alleviate the burden on family members, thereby decreasing their health care utilization, or whether the effect persists. Future research should also focus on methods to address these unmet needs, such as family counseling and family-based disease management.

CONCLUSION

Our findings support the evidence that bipolar disorder has a significant financial impact on family members in addition to the individual with the diagnosis. Families containing a member with bipolar disorder incur far greater direct medical costs than families without a serious mental illness. Caring for or living with these individuals is associated with secondary medical consequences. Further research is needed to elucidate the factors that affect the health of and the health care costs for caregivers and family members of individuals with bipolar disorder as well as the impact of therapy for these families.

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continued on page 34

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