Suicide Rates in Relation to Health Care Access in the United States: An Ecological Study

Leonardo Tondo, M.D.; Matthew J. Albert, B.A.; and Ross J. Baldessarini, M.D.

Objective: We tested the hypothesis that suicide rates in the United States are associated with indicators of access to health care services.

Method: With an ecological study design, we compared age-adjusted suicide rates for men and women with demographic, socioeconomic, and other indices of access to health care, by state (N = 51, including the District of Columbia). The most recently available information from the National Statistics Reports at the U.S. Census Bureau, the U.S. Centers for Disease Control and Prevention National Center for Health Statistics, and the American Board of Medical Specialties was used. Data on suicide are from 2001; other measures were matched for the closest available year, except that state-based data on psychiatrists and physicians are from 2004.

Results: Positive bivariate associations with state suicide rates (all $p \le .005$) are ranked as follows: male sex, Native American ethnicity, and higher proportion of uninsured residents. Negative bivariate associations (all $p \le .002$) are ranked as follows: higher population density, higher annual per capita income, higher population density of psychiatrists, higher population density of physicians, higher federal aid for mental health, and higher proportion of African Americans. All factors were associated with state suicide rates in expected directions. In multivariate models of associations between suicide rates and indices of access to health care, the state rate of federal aid for mental health was the strongest indicator, followed by the rate of uninsured persons and population density of psychiatrists and physicians and by population density.

Discussion: Such aggregate analyses cannot specify risk indices for individual persons. Nevertheless, the methods employed detected several factors with well-established associations with suicide. They also yielded strong correlations of state-based suicide rates with proposed indicators of access to health care. The findings support the view that clinical intervention is a crucial element in the prevention of suicide.

(J Clin Psychiatry 2006;67:517–523)

Received June 16, 2005; accepted Oct. 19, 2005. *From the Department of Psychiatry and Neuroscience Program, Harvard Medical School, Boston, and International Consortium for Bipolar Disorders, McLean Division of Massachusetts General Hospital, Belmont, Mass. (Drs. Tondo and Baldessarini); Department of Psychology, University of Cagliari and Lucio Bini Mood Disorders Center, Cagliari, Italy (Dr. Tondo); and Lucio Bini Mood Disorders Center, Rome, Italy (Mr. Albert).*

Supported, in part, by grants from the National Alliance for Research on Schizophrenia and Depression (NARSAD) and the Stanley Medical Research Institute (Dr. Tondo), the Bruce J. Anderson Foundation (Dr. Baldessarini), and the McLean Private Donors Neuropsychopharmacology Research Fund (Dr. Baldessarini).

This study was submitted in partial fulfillment of requirements for the M.S. degree in epidemiology at the Harvard School of Public Health, under the supervision of Professor Stephen Buka, Sc.D. (Dr. Tondo).

Dr. Tondo and Mr. Albert have served as consultants to IFI SpA. Dr. Baldessarini has served as a consultant to or received grant/research support from Eli Lilly, JDS Pharmaceuticals, IFI SpA, Janssen, and Novartis and has received honoraria from Eli Lilly, Pfizer, Janssen, and SmithKline Beecham. None of the authors has an equity interest in any pharmaceutical corporation.

Our esteemed colleague, the late John Hennen, Ph.D., provided valuable statistical consultation and comments on this report.

Corresponding author and reprints: Leonardo Tondo, M.D., North Belknap 318A, McLean Hospital, 115 Mill St., Belmont, MA 02478 (e-mail: ltondo@mclean.harvard.edu).

Suicide is a major public health and clinical challenge.[1,2] Progress in identifying risk factors for suicide has been substantial,[2,3] but knowledge on which to base sound clinical and public policies concerning prevention of suicide and making interventions that specifically reduce suicidal risk remains remarkably limited.[2–4]

About 1 million persons worldwide, and approximately 30,000 in the United States, die of suicide each year, at an annual U.S. national rate of approximately 11 per 100,000 population, compared to an international average of 15 per 100,000.[2,5] In the United States, suicide is the third leading cause of death at ages 15 to 24 years, and eighth at all ages.[2] Reported suicide rates vary greatly by country and region. In 21 European countries, the recent annual suicide rate averaged 14 per 100,000, but ranged from 3.6 in Greece to 28 in Hungary.[6] Similarly, annual suicide rates within the United States (adjusted for age) ranged from 6.5 per 100,000 in the District of Columbia (DC) to 20 per 100,000 in New Mexico.[5] These striking national and regional variations lack satisfactory explanations. Meteorological, geographic, cultural, and social factors, including access to firearms, have been considered.[2,3,7] In addition, there may be substantial variance in the accuracy of reporting suicides. Underreporting or misclassification of suicides may be as high as 50% in some countries.[8,9]

Following the seminal 19th-century socioepidemiologic studies of Quetelet,[10] Morselli,[11] and Durkheim,[12] suicide has been widely considered a social problem. However, it is now clear that approximately 90% of suicides are associated with a psychiatric illness.[2,3,13,14] The association of suicide with major mood disorders is particularly strong. The standardized mortality ratios (SMRs) in severe forms of major mood disorders due to suicide are 20 or more times higher than suicide rates in the general population; SMRs are somewhat lower, but also substantial, in schizophrenia and with substance abuse.[2,3,14–16] It is plausible that treatments effective in such disorders should reduce associated mortality risks, including suicidal risk specifically. Only surprisingly recently, however, has research on the potential of specific psychiatric treatments to modify suicidal risk begun to appear.

Despite the particularly strong association of suicide with mood disorders,[16–18] evidence for anticipated benefits of antidepressant treatment on suicide remains inconclusive[19–31] and includes new evidence of possibly increased risk of suicidal behavior in children treated with serotonin reuptake inhibitors (SRIs).[29] A recent ecological study of the association between suicide rates and antidepressant use at the county level in the United States[30] found no association of suicide rates (adjusted for age, sex, and race) and overall antidepressant prescription rates in a random sample of 20,000 pharmacies. Modern antidepressants (SRIs and others) were associated with lower suicide rates than older tricyclic antidepressants (TCAs),[30] perhaps suggesting more severe depressive illness or even inferior clinical care among TCA-treated persons. Direct effects of greater use of modern antidepressant treatment on suicidal risk are challenged by inconsistent ecological relationships of international rates of modern antidepressant use to suicide rates.[22,26,27,31] Specifically, in the United States over the last 40 years, use of antidepressants has tripled, with only minor changes in national suicide rates overall.[2,3,5,25,26,32] On the other hand, it might be argued that the U.S. suicide rate might have been even higher if modern antidepressant treatments were not as widely available.

In contrast to the lack of consistent support for a suicide risk-reducing effect of antidepressant treatment, there is substantial and consistent evidence of reduced mortality due to suicide, as well as reduced rates of attempted suicide, during long-term treatment of patients with bipolar disorder and other forms of manic-depressive illnesses with lithium.[16,18,33–35] Such effects of other putative mood-stabilizing agents appear to be less than those of lithium, or remain untested.[36–39] For schizophrenia patients, clozapine recently became the first drug to receive U.S. Food and Drug Administration approval for reducing suicidal risk, based primarily on evidence of reduced risk of suicide attempts or other nonlethal outcomes.[40,41] In addition, some educational and social interventions may have a positive impact on suicidal behavior.[42,43] It is also plausible to anticipate reductions of suicidal risk in association with close clinical care of mood-disorder and other psychiatric patients, even though research support for this expectation is very limited.[2,3,29]

The preceding considerations suggest that factors related to regional variance in suicide rates may include access to medical or mental health services. Access to health care services or medical insurance has been related to outcomes based on general health measures.[44–48] Pirkis and Burgess[47] considered relationships of suicide and measures of access to medical care in a systematic review of 15 international studies which indicated that, within 1 month of death, 64% of persons later dying by suicide had not contacted a health care provider; only 16% had contacted a psychiatrist, and 32% had contacted a general practitioner. In Denmark, there was a strikingly low incidence of any psychiatric care within 1 month of death: only 4% of 826 suicides.[49,50] In the only study that specifically addressed the issue of suicide and access to health care, Miller and Druss[51] found that fewer than one third of persons committing suicide had received mental health services within 12 months before death, and nearly one quarter were unable to obtain, or refused, appropriate care, despite evidence of a psychiatric or substance use disorder in three quarters of the cases. In addition, psychotropic drugs have been detected postmortem in only 8% to 17% of persons dying by suicide, usually in subtherapeutic blood concentrations.[2] Finally, interruption of ongoing care also may contribute to suicidal risk, given repeated findings that suicide rates are particularly high soon after psychiatric hospitalization[52–54] and after discontinuing some mood-stabilizing treatments.[18]

National organizations with a primary interest in mood disorders[44,55] and major national studies[45,56–60] have concluded that lack of access to health care, and lack of health insurance in particular, is a principal factor in limiting adequate treatment for serious and chronic conditions, including major depression and other prevalent mental illnesses. Remarkably, in a study of causes of death in the United States,[61] suicide—the eighth leading cause—was excluded from the analysis of potential contributing factors. These findings suggest that a medical view of suicide, despite its plausibility and relevance to national efforts at suicide prevention, still is not universally accepted.[2–4] Despite the abundance of evidence of the adverse impact of limited access to health care, only the study by Miller and Druss[51] has specifically addressed the importance of health care access for suicide prevention.

On the basis of this background, we hypothesized that regional variance in suicide rates may be related to objective indices likely to reflect access to mental health services. Such relationships have not previously been reported for the entire country, even though procedures for identifying and reporting suicide in the United States are likely to be relatively reliable and consistent. We now report on analyses of data from governmental and other reliable sources pertaining to state-specific, age-adjusted suicide rates and various factors that may be related to access to health care services in the 50 states and DC.

METHOD

This ecological, multiple-group, comparison study following a design described by Morgenstern[62] involved the states and DC as the 51 units of analysis. We tested associations between economic indices of access to health care with state-specific suicide rate as the outcome variable, using age-adjusted rates because of age-dependent differences in risk of suicide. We used the most recently available information from the National Statistics Reports at the U.S. Census Bureau,[63] the U.S. Centers for Disease Control and Prevention (CDC) National Center for Health Statistics,[5] and the American Board of Medical Specialties.[64] Data on suicide are from 2001; other measures were matched for the closest available year, except that state-based data on psychiatrists and physicians are from 2004. Selection of demographic, economic, and health care indices was guided by extensive reports on this topic.[2,3,7,30,44,45,55–60,65]

We compared age-adjusted suicide rates for men and women[5] with state-specific factors of interest in the following steps: (1) demographic factors, including proportions of (a) males, (b) whites, (c) African Americans, and (d) Native Americans[63]; (2) economic factors, including (a) state-specific income per capita[66] and (b) total annual dollars in federal aid to each state for mental health expressed as thousands of U.S. dollars per capita[67]; and (3) indices of access to health care factors, including (a) the proportion of state residents without health insurance,[68] (b) state-specific population proportions of psychiatrists and (c) of nonpsychiatric physicians,[64] and (d) population density as an index of geographical access to health care.[69] We considered male sex; white, African American, and Native American ethnicities; and population density per square mile of dry land in each state as "control" factors to test the ability of the methods employed to detect well-established risk factors for suicide.[2,3] More details about the included variables are provided in Table 1.

Statistical Methods

We compared state-specific, age-adjusted suicide rates with the 10 independent factors just described, adding putative explanatory factors in sequential steps, in the order indicated for categories 1 through 3. Initial bivariate correlations were tested with nonparametric Spearman rank correlation methods (r_s) to avoid assumptions of linearity of relationships of factor values. We then employed multiple logistic regression methods, retaining significant demographic factors, then adding economic factors, and then adding indices of access to health care, as described in the preceding section. In applying these models, we checked model fit and adherence to regression modeling assumptions using graphical methods. We also checked for interactions among the explanatory factors retained at each step in the model-fitting procedure. Robust standard error estimation methods were used when feasible. Statistical significance required 2-tailed, Bonferroni-corrected $p < .01$. Analyses employed commercial microcomputer programs (Stata, Stata Corporation, College Station, Tex.).

RESULTS

Annual age-adjusted state suicide rates per 100,000 population for 2001 showed wide interstate variations (Table 1). The suicide rate was highest in New Mexico (20.2), as well as in several intermountain and southwestern states including Montana (19.1) and Nevada (18.8), and was lowest in Massachusetts (6.5), New York (6.5), and DC (6.5). The overall national suicide rate in 2001 was 12.1 per 100,000.

Among the 10 explanatory factors considered (Table 1), we found significant initial bivariate correlations with suicide rates for all factors but white ethnicity (Table 2). Hispanic ethnicity also was unrelated to state suicide rates (not shown). Correlations were positive in descending order for male sex, Native American ethnicity, and proportion of uninsured state residents. We found negative correlations, in descending order, for population density, annual per capita income, number of psychiatrists per 100,000 population, number of physicians per 100,000 population, federal aid to state for mental health, and proportion of African Americans in the state population. All 9 factors were correlated with suicide rates in the expected directions. Since the population density of nonphysician health providers is highly correlated with that of physicians, we did not include the state distribution of registered nurses in our models, although, like physicians and psychiatrists, their presence per 100,000 population[70] was inversely correlated with state suicide rates ($z = –3.30$, $p < .002$).

We then combined factors in stepwise multivariate regression modeling for predicting suicide rates (Table 3). Among demographic variables, only the proportion of males in the population remained significantly associated with suicide rate, whereas ethnicity variables and population density were nonsignificant even if included one at a time. When we then introduced the economic indicators of personal income and federal aid, only lower federal aid for state mental health services was significantly associated with suicide rate. The rate of uninsured persons proved to be a very strong indicator of access to health

Table 1. Suicide Rates vs. Demographic, Economic, and Access to Health Care Indices, by State[a]

State	Suicide Rate[b]	% Male[c]	% White[c]	% African American[c]	% Native American[c]	Income Per Capita[d]	Federal Mental Health Aid[e]	Population Per Square Mile[f]	% Uninsured[g]	No. of Physicians Per 100,000[h]	No. of Psychiatrists Per 100,000[i]
NM	20.2	49.2	66.8	1.9	9.92	22,203	11,201	15.1	20.7	201	10.7
MT	19.1	49.8	90.6	0.3	6.20	22,569	8113	6.21	13.6	201	7.63
NV	18.8	50.9	75.2	6.8	1.43	30,529	14,179	19.2	16.1	150	5.13
CO	16.5	50.4	82.8	3.8	1.13	32,949	27,293	42.6	15.6	230	13.7
WY	16.4	50.3	92.1	0.8	2.30	27,230	3881	5.09	15.9	172	5.06
ID	16.3	50.1	91.0	0.4	1.42	24,180	8667	16.0	16.0	152	5.15
AK	15.9	51.7	69.3	3.5	15.5	30,064	5278	1.11	15.7	201	10.4
UT	15.4	50.1	89.2	0.8	1.42	23,907	19,114	27.6	14.8	185	7.14
WV	15.0	48.7	95.0	3.2	0.22	21,915	11,826	74.8	13.2	192	7.60
OK	14.9	49.2	76.2	7.6	7.93	23,517	22,509	50.4	18.3	145	5.20
AZ	14.8	50.0	75.5	3.1	5.26	25,578	35,053	46.7	17.9	185	8.27
OR	14.4	49.6	86.6	1.6	1.36	28,350	20,406	36.2	12.8	230	10.7
AR	14.2	48.9	80.0	15.7	0.66	22,257	16,293	51.7	16.1	161	6.91
SD	13.9	49.7	88.7	0.6	8.28	26,115	5515	9.98	9.30	177	7.13
FL	13.5	48.9	78.0	14.6	0.39	28,145	114,081	304	17.5	204	7.72
DE	13.3	48.6	74.6	19.2	0.32	31,255	7829	407	9.2	220	9.55
NH	13.1	49.2	96.0	0.7	0.23	33,332	8348	140	9.40	236	15.2
MO	12.7	48.7	84.9	11.2	0.46	27,445	33,048	81.7	10.2	204	8.53
ND	12.7	49.9	92.4	0.6	4.89	25,068	5792	9.19	9.60	224	11.3
TN	12.2	48.7	80.2	16.4	0.29	26,239	37,147	139	11.3	209	7.18
NC	12.1	49.1	72.1	21.6	1.29	27,194	45,559	168	14.4	215	10.3
ME	12.0	48.7	96.9	0.5	0.54	25,623	8661	41.7	10.3	240	17.2
KY	11.9	48.9	90.1	7.3	0.22	24,294	26,178	102	12.3	184	8.19
WA	11.8	49.8	81.8	3.2	1.65	31,528	43,360	90.0	13.1	236	11.5
IN	11.7	49.1	87.5	8.4	0.28	27,011	42,163	170	11.8	177	6.56
MS	11.7	48.4	61.4	36.3	0.42	20,993	18,130	60.9	16.4	142	4.69
WI	11.7	49.4	88.9	5.7	0.92	28,232	32,438	99.5	7.70	221	10.0
GA	11.4	49.3	65.1	28.7	0.30	27,940	57,992	145	16.6	188	8.62
AL	11.3	48.3	71.1	26.0	0.51	23,471	29,970	88.0	13.1	175	6.03
SC	11.3	48.6	67.2	29.5	0.36	24,321	25,737	134	12.3	189	9.28
VT	11.3	49.0	96.8	0.5	0.32	26,901	5705	66.3	9.60	287	22.8
LA	11.2	48.5	63.9	32.5	0.58	23,334	32,069	102	19.3	197	8.87
VA	11.0	49.1	72.3	19.6	0.33	31,162	52,885	181	10.9	225	11.1
HI	10.9	50.1	24.3	1.8	0.32	28,221	9409	191	9.60	248	17.0
KS	10.9	49.5	86.1	5.7	0.96	27,816	15,629	32.9	11.4	189	10.7
NE	10.9	49.4	89.6	4.0	0.92	27,829	10,356	22.3	9.50	201	8.64
TX	10.9	49.7	71.0	11.5	0.67	27,871	160,530	81.5	23.5	174	7.39
OH	10.6	48.6	85.0	11.5	0.23	28,400	83,131	278	11.2	211	8.92
MI	10.5	49.1	80.2	14.2	0.60	29,612	72,431	176	10.4	196	9.51
IA	10.1	49.1	93.9	2.1	0.34	26,723	16,942	52.3	7.50	176	6.98
PA	10.1	48.4	85.4	10.0	0.17	29,539	77,197	274	9.20	260	15.5
MN	9.6	49.5	89.4	3.5	1.13	32,101	28,324	62.4	8.00	244	10.3
IL	9.1	49.2	73.5	15.1	0.31	32,259	84,038	224	13.6	221	10.4
CA	8.5	49.9	59.5	6.7	1.17	32,275	297,408	221	19.5	215	13.0
MD	8.4	48.3	64.0	27.9	0.31	33,872	40,556	550	12.3	340	23.7
CT	8.2	48.5	81.6	9.1	0.32	40,640	22,015	707	10.2	313	25.5
RI	8.0	48.1	85.0	4.5	0.56	29,685	8355	1013	7.70	295	21.0
NJ	6.8	48.6	72.6	13.6	0.30	36,983	59,939	1143	13.1	250	13.0
MA	6.5	48.3	84.5	5.4	0.28	37,992	43,447	814	8.20	360	31.3
NY	6.5	48.3	67.9	15.9	0.34	34,547	140,868	403	15.5	298	24.0
DC	6.5	47.2	30.8	60.0	0.35	37,383	7042	9313	12.7	605	58.6

[a]States are ranked in descending order by suicide rate.
[b]Suicide Rate: age-adjusted suicide rates (number of suicides per 100,000 population) for the year 2001. Data from the Centers for Disease Control and Prevention.[5]
[c]% Male, % White, % African American, % Native American: proportion of U.S. residents by male sex and white, African American, and Native American (including Alaskan natives) ethnicities. Data from the U.S. Census Bureau.[63]
[d]Income Per Capita: personal per capita income in current dollars by state for fiscal year 2000. Data from the U.S. Census Bureau.[66]
[e]Federal Mental Health Aid: federal government grants (in thousands of dollars per capita) to states for fiscal year 2001. Data from the U.S. Census Bureau.[67]
[f]Density: population per square mile of dry land in 2001. Data from the U.S. Census Bureau.[69]
[g]% Uninsured: proportion of persons without health insurance in 2001. Data from the U.S. Census Bureau.[68]
[h]Physicians: number of physicians per 100,000 population in 2004. Data from the American Board of Medical Specialties.[64]
[i]Psychiatrists: number of psychiatrists per 100,000 population in 2004. Data from the American Board of Medical Specialties.[64]

Table 2. Preliminary Bivariate Associations of Factors With State Suicide Rates[a,b]

Factor	r_s	p
Population density	–0.735	< .001
Male sex	+0.576	< .001
Annual income (dollars per capita)	–0.550	< .001
Psychiatrists per 100,000 population	–0.544	< .001
Native American ethnicity (%)	+0.478	< .001
Physicians per 100,000 population	–0.528	< .001
Federal mental health aid	–0.439	.001
African American ethnicity (%)	–0.432	.002
Uninsured residents (%)	+0.391	.005

[a]Based on factors shown in Table 1, omitting white ethnicity as nonsignificant.
[b]Regressions (r_s) are based on nonparametric Spearman rank methods and are in descending order by strength of association.

Table 3. Regression Modeling: Predictors of State-Level, Age-Adjusted Suicide Rates[a]

Factor	β-Coefficient	95% CI	t	p
Federal mental health aid	-3.3×10^{-5}	-4.4×10^{-5} to -2.2×10^{-5}	6.16	< .0001
Uninsured residents (%)	+0.357	0.205 to 0.510	4.73	< .0001
Male sex	+140	68.3 to 213	3.92	< .0001
Psychiatrists per 100,000 population[b]	–0.102	–0.166 to –0.038	3.21	.002

[a]Based on data shown in Table 1.
[b]The results are very similar for physicians per 100,000 population.

care, and the number of psychiatrists (or physicians) per 100,000 population also was highly significantly associated with suicide rates (t = 3.21 for psychiatrists and 6.16 for physicians, p < .0001; Table 3). Eliminating DC, the region with an unusually high reported physician population density (Table 1), made no appreciable difference to the outcome (r = –0.591, p < .001; compare with Table 2). The variables included in the multivariate analyses reported (Table 3) were strongly and independently associated with suicide rates in expected directions.

DISCUSSION

In this ecological analysis, we found strong correlations between state suicide rates in the United States and proposed indices of access to health care. Their strengths of stepwise, multivariate association are ranked as follows: federal aid for mental health services > rate of uninsured persons > psychiatrists (or physicians) per 100,000 population > male sex (Table 3). The validity of the ecological methods employed[62] is supported by preliminary findings of relatively high suicide rates among Native Americans and males, as well as low rates among African Americans and in regions of high population density, as expected, based on many other studies.[2,30,31,65] Results for male sex and population density confirm the very recent findings of a similar ecological study at a county level in the United States[30]

As in all ecological studies, the aggregate nature of the findings presented cannot evaluate the relationship of observed covariates or actual health care utilization rates to suicide at the level of individual persons. The same limitation, however, should apply to all studies on the association between consumption of medications and suicide risk since these studies do not indicate whether nonsuicidal patients actually used prescribed medications. An additional circumstance that may influence the present findings is that the accuracy or reliability of reporting rates for suicide may vary among states, perhaps in nonrandom association with some of the identified risk factors for suicide, such as annual per capita income, federal aid for mental illness, availability of physicians, and population density. It is also conceivable that there may be regional variance in general underreporting or misdiagnosis of suicide related to social stigma as well as potential loss of life insurance payments to survivors of individuals who commit suicide.

If the present findings are valid, they appear to be consistent with our hypothesis that access to health care, and perhaps specifically to psychiatric care, is a contributing factor to suicide risk. An argument against this proposal is that recent national annual suicide rates vary widely among European countries with particularly highly socialized medical care systems, ranging from 7.5 per 100,000 population in the United Kingdom to 13.5 in Sweden and 19.1 in Switzerland.[6] Nevertheless, levels of seeking health care services, and particularly levels of obtaining specialized or even competent mental health services, may vary by country or region, again owing to the still widely stigmatized status of psychiatric illnesses and of suicide in particular, as well as to economic and manpower factors. Moreover, even universal medical care systems may not satisfy the requirement for a highly specialized care required for patients at high risk for suicide, nor guarantee access to care when needed. Indeed, levels of psychiatric treatment and the proportions of cases treated have been remarkably low in recent studies of European countries with highly developed national health care systems, as reviewed in the Introduction.[48–52]

If access to and use of appropriate mental health services are important factors in suicide risk, it follows that redoubled efforts at optimizing the recognition and treatment, or referral, of persons with major mood disorders are required, particularly given abundant evidence that only a minority of patients with major depression or bipolar disorder are diagnosed, and only a small proportion of those accurately diagnosed are appropriately treated.[2,71] Such efforts are likely to be especially effective among general practitioners and other primary care health professionals, who initially see a high and growing proportion of such patients.[2] Moreover, inadequate access to appropriate psychiatric services appears to be particularly acute among juveniles, an increasing proportion of whom have become at-risk for suicide across the past century[2,72] and who are also likely to lack medical insurance.[73]

Results of aggregate analyses such as in the present study and that recently reported by Gibbons et al.[31] require confirmation by controlled studies, ideally with identification of risk factors at the individual level, especially to test potential relationships of suicidal behaviors to actual use of specific psychiatric treatments. Access to specific individual information about such factors as insurance status and actual use of health services is feasible by use of modern computerized health information databases kept for large health-maintenance and insurance programs.[39,74,75] Although large samples of subjects will be required, the rates of suicide and attempts among persons with major mood disorders are surprisingly high, at about 0.35 per 100 person-years for suicide and perhaps 5 times more for life-threatening attempts, for an overall rate of suicides and attempts of about 2% per year.[2,3,16,76] Finally, we urge that such health information systems, as well as national health statistics systems, routinely include information relevant to risk factors for suicide, including access to health care and mental health services, as a contribution to clinically required, public health–relevant, and increasingly federally mandated efforts at suicide prevention.[1–3]

Drug names: clozapine (Clozaril, FazaClo, and others), lithium (Lithobid, Eskalith, and others).

REFERENCES

1. US Public Health Service. Surgeon General's Call to Action to Prevent Suicide 1999. Available at: http://www.mentalhealth.samhsa.gov/suicideprevention/calltoaction.asp. Accessibility verified Feb 14, 2006
2. Goldsmith SK, Pellmar TC, Kleinman AM, et al, eds. Reducing Suicide: A National Imperative. Washington, DC: National Academies Press; 2002
3. Practice Guideline for the Assessment and Treatment of Patients With Suicidal Behaviors, pt B. Am J Psychiatry 2003;160(suppl 11):1–44
4. Baldessarini RJ, Jamison KR. Effects of medical interventions on suicidal behavior: summary and conclusions. J Clin Psychiatry 1999;60 (suppl 2):117–122
5. US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Health Statistics. Number of deaths, death rates, and age-adjusted death rates for major causes of death for the United States, 2001. Table 30. National Vital Statistics Reports;52:91
6. World Health Organization (WHO). Suicide Prevention: Country Reports and Charts. Available at: www.who.int/mental_health/prevention/suicide/suicideprevent/en/index.html. Accessed March 12, 2006
7. Jacobs DG, ed. The Harvard Medical School Guide to Suicide Assessment and Intervention. San Francisco, Calif: Jossey-Bass; 1998
8. Diekstra RF. The epidemiology of suicide and parasuicide. Acta Psychiatr Scand Suppl 1993;371:9–20
9. Chisti P, Stone DH, Corcoran P, et al. Suicide mortality in the European Union. Eur J Public Health 2003;13:108–114
10. Quetelet ALJ. Treatise on Man and the Development of His Faculties (reproduction of the English translation of 1841). Knox R, trans. Gainesville, Fla: Scholars' Facsimiles & Reprints; 1969:80–82
11. Morselli E. Suicide: Essay on Comparative Moral Statistics. New York, NY: Appleton & Co; 1882
12. Durkheim E. Suicide. Spaulding JA, Simpson G, trans. New York, NY: Free Press; 1951
13. Guze SB, Robins E. Suicide and primary affective disorders. Br J Psychiatry 1970;117:437–438
14. Roy A. Suicide. In: Kaplan HI, Sadock VA, eds. Comprehensive Textbook of Psychiatry, vol 2. 7th ed. Baltimore, MD: Williams & Wilkins; 2000:2031–2041
15. Harris EC, Barraclough B. Suicide as an outcome for mental disorders: a meta-analysis. Br J Psychiatry 1997;170:205–208
16. Tondo L, Isacsson G, Baldessarini RJ. Suicide in bipolar disorder: risk and prevention. CNS Drugs 2003;17:491–511
17. Isometsa ET, Henriksson MM, Aro HM, et al. Suicide in major depression. Am J Psychiatry 1994;151:530–536
18. Tondo L, Baldessarini RJ, Hennen J, et al. Lithium treatment and risk of suicidal behavior in bipolar disorder patients. J Clin Psychiatry 1998;59: 405–414
19. Freemantle N, House A, Song F, et al. Prescribing selective serotonin reuptake inhibitors as strategy for prevention of suicide. BMJ 1994;309: 249–253
20. Isacsson G, Holmgren P, Druid H, et al. The utilization of antidepressants, a key issue in the prevention of suicide: analysis of 5281 suicides in Sweden, 1992–94. Acta Psychiatr Scand 1997;96:94–100
21. Isacsson G. Suicide prevention: a medical breakthrough? Acta Psychiatr Scand 2000;102:113–117
22. Verkes RJ, Van der Mast RC, Hengeveld MW, et al. Reduction by paroxetine of suicidal behavior in patients with repeated suicide attempts but not major depression. Am J Psychiatry 1998;155:543–547
23. Barbui C, Campomori A, D'Avanzo B, et al. Antidepressant drug use in Italy since the introduction of SSRIs: national trends, regional differences and impact on suicide rates. Soc Psychiatry Psychiatr Epidemiol 1999; 34:152–156
24. Müller-Oerlinghausen B, Berghöfer A. Antidepressants and suicidal risk. J Clin Psychiatry 1999;60(suppl 2):94–99
25. Khan A, Warner HA, Brown WA. Symptom reduction and suicide risk in patients treated with placebo in antidepressant clinical trials: an analysis of the FDA database. Arch Gen Psychiatry 2000;57:311–317
26. Grunebaum MF, Ellis SP, Li S, et al. Antidepressants and suicide risk in the United States, 1985–1999. J Clin Psychiatry 2004;65:1456–1462
27. Helgason T, Tómasson H, Zoëga T. Antidepressants and public health in Iceland. Br J Psychiatry 2004;184:157–162
28. Jick H, Kaye JA, Jick SS. Antidepressants and the risk of suicidal behavior. JAMA 2004;292:338–343
29. Hammad TA, Laughren T, Racoosin J. Suicidality in pediatric patients treated with antidepressant drugs. Arch Gen Psychiatry 2006;63:332–339
30. Gibbons RD, Hur K, Bhaumik DK, et al. The relationship between antidepressant medication use and rate of suicide. Arch Gen Psychiatry 2005;62:165–172
31. Baldessarini RJ. Suicide as a treatable condition. Ital J Psychopathol 2006;13(suppl 2):S201
32. Centers for Disease Control and Prevention (CDC). Annual Report on Nation's Health. National Center for Health Statistics. Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/nchs/pressroom/04news/hus04.htm. Accessed Mar 24, 2005
33. Müller-Oerlinghausen B, Berghöfer A, Bauer M. Bipolar disorder. Lancet 2002;359:241–247
34. Cipriani A, Pretty H, Hawton K, et al. Lithium in the prevention of suicidal behavior and all-cause mortality in patients with mood disorders: a systematic review of randomized trials. Am J Psychiatry 2005;162: 1805–1819
35. Baldessarini RJ, Tondo L, Davis P, et al. Decreased suicidal risk during long-term lithium treatment: a meta-analysis. Bipolar Disord 2006. In press
36. Thies-Flechtner K, Müller-Oerlinghausen B, Seibert W, et al. Effect of prophylactic treatment on suicide risk in patients with major affective disorders: data from a randomized prospective trial. Pharmacopsychiatry 1996;29:103–107
37. Greil W, Ludwig-Mayerhofer W, Erazo N, et al. Lithium versus carbamazepine in the maintenance treatment of bipolar disorders: a randomized study. J Affect Disord 1997;43:151–161
38. Greil W, Ludwig-Mayerhofer W, Erazo N, et al. Lithium vs carbamazepine in the maintenance treatment of schizoaffective disorder: a randomised study. Eur Arch Psychiatry Clin Neurosci 1997;247:42–50

39. Goodwin FK, Fireman B, Simon GE, et al. Suicide risk in bipolar disorder treatment with lithium and divalproex. JAMA 2003;290:1467–1473
40. Meltzer HY, Alphs L, Green AI, et al. Clozapine treatment for suicidality in schizophrenia. Arch Gen Psychiatry 2003;60:82–91
41. Hennen J, Baldessarini RJ. Suicidal risk during treatment with clozapine: a meta-analysis. Schizophr Res 2005;73:139–145
42. Rutz W. Preventing suicide and premature death by education and treatment. J Affect Disord 2001;62:123–129
43. Aseltine RH, DeMartino R. An outcome evaluation of the SOS suicide prevention program. Am J Public Health 2004;94:446–451
44. Hirschfeld RM, Keller MB, Panico S, et al. National Depressive and Manic-Depressive Association consensus statement on undertreatment of depression. JAMA 1997;277:333–340
45. Baker DW, Shapiro MF, Schur CL. Health insurance and access to care for symptomatic conditions. Arch Intern Med 2000;160:1269–1274
46. Baker DW, Sudano JJ, Albert JM, et al. Lack of health insurance and decline in overall health in late middle age. N Engl J Med 2001;345: 1106–1112
47. Pirkis J, Burgess P. Suicide and recency of health care contacts: systematic review. Br J Psychiatry 1998;173:462–474
48. Hall RC, Platt DE, Hall RC. Suicide risk assessment: a review of risk factors for suicide in 100 patients who made severe suicide attempts: evaluation of suicide risk in a time of managed care. Psychosomatics 1999;40:18–27
49. Andersen UA, Andersen M, Rosholm JU, et al. Contacts to the health care system prior to suicide: comprehensive analysis using registers for general and psychiatric hospital admissions, contacts to general practitioners and practicing specialists, and drug prescriptions. Acta Psychiatr Scand 2000;102:126–134
50. Andersen UA, Andersen M, Rosholm JU, et al. Psychopharmacological treatment and psychiatric morbidity in 390 cases of suicide with special focus on affective disorders. Acta Psychiatr Scand 2001;104:458–465
51. Miller CL, Druss B. Datapoints: suicide and access to care [column]. Psychiatr Serv 2001;52:1566
52. Nuttall EA, Evenson RC, Cho DW. Patients of a public state mental health system who commit suicide. J Nerv Ment Dis 1980;168:424–427
53. Black DW, Warrack G, Winokur G. Iowa record-linkage study: suicides and accidental deaths among psychiatric patients. Arch Gen Psychiatry 1985;42:71–75
54. Appleby L, Amos T, Doyle U, et al. General practitioners and young suicides: a preventive role for primary care. Br J Psychiatry 1996;168: 330–333
55. Charney DS, Reynolds CF III, Lewis L, et al. Depression and Bipolar Support Alliance consensus statement on the unmet needs in diagnosis and treatment of mood disorders in late life. Arch Gen Psychiatry 2003;60:664–672
56. Hafner-Eaton C. Physician utilization disparities between the uninsured and insured: comparisons of the chronically ill, acutely ill, and well nonelderly populations. JAMA 1993;269:787–792
57. Ayanian JZ, Weissman JS, Schneider EC, et al. Unmet health needs of uninsured adults in the United States. JAMA 2000;284:2061–2069
58. McAlpine DD, Mechanic D. Utilization of specialty mental health care among persons with severe mental illness: the roles of demographics, need, insurance, and risk. Health Serv Res 2000;35:277–292
59. Weissman JS, Stern R, Fielding SL, et al. Delayed access to health care: risk factors, reasons, and consequences. Ann Intern Med 1991;114: 325–331
60. Himmelstein DU, Woolhandler S. Care denied: US residents who are unable to obtain needed medical services. Am J Public Health 1995;85: 341–344
61. McGinnis JM, Foege WH. Actual causes of death in the United States. JAMA 1993;270:2207–2212
62. Morgenstern H. Ecologic studies in epidemiology: concepts, principles, and methods. Annu Rev Public Health 1995;16:61–81
63. US Census Bureau. Resident Population by Race and State: 2000. No 22. Statistical Abstract of the United States: 2002. Washington, DC: US Census Bureau; 2002:27
64. American Board of Medical Specialties. Annual Report and Reference Handbook. Evanston, Ill: American Board of Medical Specialties; 2004: 86–89
65. Fortney J, Rost K, Zhang M, et al. Impact of geographic accessibility on the intensity and quality of depression treatment. Med Care 1999;37: 884–893
66. US Census Bureau. Personal Income Per Capita in Current and Constant Dollars by State: 1980 to 2000. no 652. Statistical Abstract of the United States: 2001. Washington, DC: US Census Bureau; 2001:426
67. US Census Bureau. Federal Government Grants and Other Payments to State and Local Governments, by Agency and for Selected Programs, by State: Fiscal Year 2001. Table 1. Washington, DC: US Census Bureau; 2001:10
68. U.S. Census Bureau. Persons With and Without Health Insurance Coverage by State: 2001. Statistical Abstract of the United States: 2003. no 152. Washington, DC: US Census Bureau; 2003:114
69. US Census Bureau. State Population–Rank, Percent Change, and Population Density: 1980 to 2001. Statistical Abstract of the United States: 2002. no 19. Washington, DC: US Census Bureau; 2002:23
70. US Census Bureau. Active Nonfederal Physicians, 2000, and Nurses, 1999 by State. Statistical Abstract of the United States: 2002. no 147. Washington, DC: US Census Bureau; 2002:106
71. Wang PS, Demler O, Kessler RC. Adequacy of treatment for serious mental illness in the United States. Am J Public Health 2002;92:92–98
72. Olfson M, Shaffer D, Marcus SC, et al. Relationship between antidepressant medication treatment and suicide in adolescents. Arch Gen Psychiatry 2003;60:978–982
73. Ziv A, Boulet JR, Slap GB. Utilization of physician offices by adolescents in the US. Pediatrics 1999;104:35–42
74. Iribarren C, Sidney S, Jacobs DR Jr, et al. Hospitalization for suicide attempt and completed suicide: epidemiological features in a managed care population. Soc Psychiatry Psychiatr Epidemiol 2000;35:288–296
75. Coates AO, Schaefer CA, Alexander JL. Detection of postpartum depression and anxiety in a large health plan. J Behav Health Serv Res 2004;31: 117–133
76. Baldessarini RJ, Pompili M, Tondo L. Suicide in bipolar disorder: risks and management. CNS Spectrums. In press