Rural-Urban Differences in Depression Prevalence: Implications for Family Medicine

Janice C. Probst, PhD; Sarah B. Laditka, PhD; Charity G. Moore, PhD; Nusrat Harun, MS; M. Paige Powell, PhD; Elizabeth G. Baxley, MD

Background and Objectives: *Rural populations experience more adverse living circumstances than urban populations, but the evidence regarding the prevalence of mental health disorders in rural areas is contradictory. We examined the prevalence of depression in rural versus urban areas.* Methods: *We performed a cross-sectional study using the 1999 National Health Interview Survey (NHIS). In face-to-face interviews, the NHIS administered the Composite International Diagnostic Interview Short Form (CIDI-SF) depression scale to a nationally representative sample of 30,801 adults, ages 18 and over.* Results: *An estimated 2.6 million rural adults suffer from depression. The unadjusted prevalence of depression was significantly higher among rural than urban populations (6.1% versus 5.2%). After adjusting for rural/urban population characteristics, however, the odds of depression did not differ by residence. Depression risk was higher among persons likely to be encountered in a primary care setting: those with fair or poor self-reported health, hypertension, with limitations in daily activities, or whose health status changed during the previous year.* Conclusions: *The prevalence of depression is slightly but significantly higher in residents of rural areas compared to urban areas, possibly due to differing population characteristics.*

Depression affects the lives of a substantial number of persons in the United States and their families. The National Comorbidity Survey (NCS), a diagnostic screening study conducted between 1990 and 1992, estimated the 30-day prevalence of a major depressive episode at 4.9% for US adults between the ages of 15 and 54.[1] That prevalence has remained fairly constant. The National Comorbidity Survey Replication (NCS-R), conducted in 2001–2002, found the 12-month prevalence of depression among US adults ages 18 and above to lie between 5.2% and 7.6%.[2,3] In a 2002–2003 survey, the WHO World Mental Health Survey estimated that 9.6% of US adults suffer from mood disorders, including depression.[4]

Rural residents are more likely than their urban peers to experience circumstances, conditions, and behaviors that challenge health and may increase the prevalence of depression. These include a greater likelihood of reporting fair or poor health, physical inactivity, heavy alcohol consumption, and fewer regular dental visits.[5,6] Rural residents are more likely to live in poverty than urban residents; poverty is associated with more morbidity.[7-9]

Rural medical care is largely provided by generalists; two of every five physicians practicing in small towns are family physicians (41%).[10] Rural residents commonly have less access to primary health care, specialists, health-related technologies, and other health and social services than persons in urban areas.[11-14] The proportion of counties that are whole-county shortage areas for mental health professionals increases from 37% among large rural counties adjacent to metropolitan areas to 76% among isolated small rural counties.[15] Thus, it may be difficult to obtain specialist care for depressed persons living in rural areas, and mental health specialists to whom generalist physicians can refer persons with depression are limited.

The purpose of our research was to examine the prevalence of depression in rural adults and to compare it to that among urban populations. A better understanding of the proportion of the population that experiences depression is needed to assess the likely demand for physicians to screen, treat, and refer for depression.

From the South Carolina Rural Health Research Center (Drs Probst and Laditka and Ms Harun) and the Department of Family and Preventive Medicine (Dr Baxley), University of South Carolina; the Sheps Center for Health Services Research, University of North Carolina (Dr Moore); and the Department of Health Services Administration, University of Alabama at Birmingham and the Deep South Center on Effectiveness at the Birmingham VA Medical Center (Dr Powell).

Previous work on geographic differences has yielded mixed findings. Both the NCS and the NCS-R found no differences in prevalence of depression between rural and urban areas,[1,2,16] while Canadian work found depression to be less prevalent in rural areas.[17] However, because rural residents make up only about 20% of the population, and depression is only found in a small subset of individuals, previous studies may have lacked sufficient statistical power to detect differences. The present research addresses this limitation by using the 1999 National Health Interview Survey (NHIS), a considerably larger data set, to examine rural-urban differences. We also examine individual characteristics associated with a positive screen for depression.

Methods
Survey Methods
We conducted a cross-sectional examination of the prevalence of depression using data from the 1999 NHIS. The NHIS is a face-to-face survey conducted annually by the National Center for Health Statistics of the Centers for Disease Control and Prevention. It yields data representative of the noninstitutionalized, civilian adult US population.

The 1999 NHIS administered the Composite International Diagnostic Interview Short Form (CIDI-SF) depression scale to 30,801 respondents ages 18 and older. 1999 is the most recent year in which such screening was conducted and for which results are available in public use data. The survey was administered in Spanish in households where that was the primary language. The CIDI has been used to estimate the prevalence of mental health diagnoses in the United States,[1,18] Canada,[17,19] and internationally.[4] Canadian research found the CIDI-SF to have a sensitivity of 98.4% and a specificity of 72.4% when compared to clinical judgment;[20] researchers have suggested that the CIDI-SF tends to overestimate the prevalence of depression.[21] The negative predictive value of the CIDI-SF, given a true population prevalence of 5% through 9%, exceeds 99%. The positive predictive value would be 16% for a true prevalence of 5% and 26% for a true prevalence of 9%.

Definition
Depression was defined as positive screening value for the CIDI-SF, acknowledging the limitations described above.[22] Rural residence was defined as residence in an area outside a metropolitan statistical area (MSA), with counties within a MSA being urban. Further differentiation within rural, for example, comparing isolated small counties to larger rural counties, was not possible with the NHIS public use data set.

Because the prevalence of depression is known to vary across personal characteristics,[23,24] we examined data on demographic characteristics of the rural population. Race/ethnicity used the NHIS categories of Hispanic, non-Hispanic white (hereafter, white), non-Hispanic Black (hereafter, African American), and "other." Other demographic characteristics examined were gender and age. Individual health characteristics included current health status, change in health status in the past year, limitations in activities (any/none), obesity (body mass index calculated from self-reported height and weight), and the presence of a diagnosis of diabetes, hypertension, or asthma. English fluency, education (less than high school versus graduation), marital status (married versus other), employment status, and income were categorized as resources available to the individual. Because the research focus was depression prevalence, rather than treatment, we did not include health insurance among personal resources examined for an association with depression.

Data Analysis
All analyses were carried out in SAS-callable SUDAAN Release 8.0.0, to take into consideration the complex sample design of the NHIS, which involves stratification, clustering, and multistage sampling (SAS Institute, Inc, Cary, NC; RTI International, Research Triangle Park, NC). Chi-square tests were used to assess bivariate differences in prevalence. Logistic regression was used to determine the effects of residence on the probability of a positive screen for depression, holding other characteristics of the respondent constant. Our multivariable analysis used two models. In the first model, we controlled only for demographic characteristics (residence, race, gender, and age). In the second model, we added health and resource variables.

To determine whether the effects of race were different for rural rather than urban residents, we tested for interaction effects; none were found at $\alpha=.05$.

Results
Population Characteristics
Adults sampled by the 1999 NHIS, reflecting the US population, principally lived in urban counties (78.7%). The rural population contained a larger white majority (85.0%) than did the urban population (71.8%). African Americans formed the largest rural minority group (7.7%), followed by Hispanics (4.7%) and persons of "other" race (2.7%). The rural population contained a higher proportion of adults over age 50.

Rural residents were more likely to report that they had poor health status, worsening health status, activity limitations, and chronic disease than were urban residents (Table 1). However, a greater proportion of the rural population had a BMI of 30 or higher. Rural populations had fewer personal resources, with a higher proportion of residents who had not completed high school, lived in or near poverty, and were unemployed. Other characteristics of the adult US population are presented in Table 1.

Table 1

Characteristics of Rural and Urban Adults, 1999 National Health Interview Survey

	Total *n=30,801, N=199,617,483* *% (SE)*	*Rural* *n=6,227, N=42,518,114* *% (SE)*	*Urban* *n=24,574, N=157,099,369* *% (SE)*	P *Value for Rural-Urban Comparison*
Demographics				
Race/ethnicity				
Hispanic	10.27 (0.27)	4.66 (0.66)	11.79 (0.29)	
White	74.64 (0.40)	85.00 (1.01)	71.83 (0.43)	
African American	11.25 (0.29)	7.67 (0.85)	12.22 (0.29)	
Others	3.84 (0.18)	2.66 (0.38)	4.15 (0.20)	<.0001
Gender				
Male	47.87 (0.34)	48.28 (0.68)	47.76 (0.39)	
Female	52.13 (0.34)	51.72 (0.68)	52.24 (0.39)	.5127
Age categories				
18–34	32.04 (0.38)	30.28 (0.93)	32.52 (0.41)	
35–49	31.96 (0.33)	30.44 (0.67)	32.37 (0.38)	
50–64	19.73 (0.26)	21.14 (0.56)	19.35 (0.30)	
≥ 65	16.27 (0.27)	18.14 (0.63)	15.76 (0.31)	.0001
Health Status				
Current health status				
Excellent to very good	64.66 (0.38)	56.53 (0.96)	66.86 (0.40)	
Good	24.19 (0.30)	28.42 (0.73)	23.05 (0.33)	
Fair to poor	11.15 (0.22)	15.05 (0.57)	10.09 (0.23)	<.0001
Health status compared to past 12 months				
Better	17.29 (0.29)	16.87 (0.57)	17.41 (0.33)	
Worse	7.52 (0.18)	9.28 (0.40)	7.04 (0.20)	
Same	75.19 (0.32)	73.85 (0.69)	75.56 (0.36)	<.0001
Obesity status (kg/m2)				
BMI<25	43.63 (0.35)	41.33 (0.84)	44.25 (0.38)	
BMI 25-29	35.26 (0.32)	35.01 (0.61)	35.33 (0.37)	
BMI >=30	21.11 (0.29)	23.66 (0.68)	20.42 (0.32)	.0001
Diabetes				.0009
Yes	5.43 (0.15)	6.46 (0.35)	5.16 (0.17)	
No	94.57 (0.15)	93.54 (0.35)	94.84 (0.17)	
Hypertension				<.0001
Yes	22.58 (0.29)	25.76 (0.67)	21.73 (0.32)	
No	77.42 (0.29)	74.24 (0.67)	78.2790.32)	
Asthma				.0228
Yes	8.49 (0.19)	9.32 (0.40)	8.27 (0.21)	
No	91.51 (0.19)	90.68 (0.40)	91.73 (0.21)	
Limitations to activities				<.0001
Yes	28.08 (0.35)	34.00 (1.02)	26.47 (0.35)	
No	71.92 (0.35)	66.00 (1.02)	73.53 (0.35)	
Resources				
Education				
≥ High school	82.13 (0.30)	77.64 (0.69)	83.35 (0.34)	
< High school	17.87 (0.30)	22.36 (0.69)	16.65 (0.34)	<.0001
Income				
$20,000 or more/year	75.06 (0.37)	68.28 (0.96)	76.89 (0.39)	
Less than $20,000	19.92 (0.34)	26.88 (0.95)	18.03 (0.35)	<.0001
Missing	5.03 (0.18)	4.84 (0.43)	5.08 (0.19)	
Marital status				
Married	58.60 (0.41)	62.43 (0.96)	57.56 (0.45)	
Not married	41.40 (0.41)	37.57 (0.96)	42.44 (0.45)	<.0001
Employment				
Employed	65.60 (0.38)	61.04 (0.89)	66.83 (0.43)	
Not employed	34.40 (0.38)	38.96 (0.89)	33.17 (0.43)	<.0001
Language of interview				
Fluent in English	95.72 (0.18)	98.35 (0.48)	95.00 (0.19)	
Not fluent in English	4.28 (0.18)	1.65 (0.48)	5.00 (0.19)	<.0001

n—unweighted observations, N—population estimate
SE—standard error

Unadjusted Prevalence of Depression

A total of 2.6 million rural adults screened positive for depression, with an unadjusted prevalence significantly higher among rural than among urban populations (6.1% versus 5.2%, *P*=.0171) (Table 2). Rural and urban residents scoring positive for depression were equally likely to report that their symptoms interfered "a lot" with their life or activities (46.7% rural, 44.3% urban, *P*=.4101). Among rural adults, the prevalence of depression did not vary significantly with race/ethnicity (*P*=.4332, data not shown).

Across all US residents, however, not limited to rural residents, the prevalence of depression did vary with race/ethnicity, with whites having the highest prevalence and Hispanics the lowest (Table 2). Other factors significantly associated with a positive screen for depression included female gender and age below 65. Health factors associated with depression were generally those that might be anticipated: prevalence was higher among persons in fair to poor health, who experienced limitations in daily activities, or who reported having a diagnosis of diabetes, hypertension, or asthma. Persons who reported a change in health during the past 12 months, whether an improvement or a decline, were also more likely to screen positive. Persons having a BMI lower than 25 (normal or underweight) or greater than 29 (obese) were more likely to have symptoms of depression than persons in the 25–29 (overweight) category. Resource characteristics associated with depression included having an annual family income of less than $20,000, being unemployed, being unmarried, or being English fluent (versus not fluent). In general, the factors associated with depression were the same in rural and urban areas (data not shown).

Multivariable Analysis

In the multivariable model limited to residence, gender, race, and age, rural residents had higher odds for depression than did urban residents (odds ratio [OR]=1.19, confidence interval [CI]=1.03 –1.38) (Table 3). However, when health and resource characteristics were held equal, rural residence was no longer significantly

Table 2

Unadjusted Prevalence of a Positive Depression
Screen Among Adults, 1999 NHIS

Unweighted observations: 30,801		Unadjusted Prevalence, Positive Screen for Depression		
		Percent	*SE*	P *Value*
Demographics				
Residence	Rural	6.11	0.36	.0171
	Urban	5.16	0.17	
Race	Hispanic	4.20	0.34	.0081
	Non-Hispanic white	5.55	0.19	
	African American	5.26	0.41	
	Non-Hispanic others	5.18	0. 73	
Gender	Male	3.64	0.18	<.0001
	Female	6.95	0.22	
Age	18–34	5.62	0.29	<.0001
	35–49	6.23	0.26	
	50–64	5.67	0.37	
	65+	2.79	0.25	
Health status				
Perceived health	Excellent, very good	3.33	0.14	<.0001
	Good	6.91	0.35	
	Poor, fair	13.83	0.63	
Health status change	Same	3.54	0.84	<.0001
	Worse	17.20	0.16	
	Better	8.16	0.48	
Obesity	BMI <25	5.21	0.23	.0004
	BMI 25–29	4.70	0.24	
	BMI >30	7.02	0.35	
Diabetes	Yes	7.80	0.74	<.0001
	No	5.18	0.15	
Hypertension	Yes	7.23	0.37	<.0001
	No	4.82	0.17	
Asthma	Yes	9.83	0.60	<.0001
	No	4.95	0.15	
Limitations to activities	Limited	10.41	0.36	<.0001
	Not limited	3.40	0.14	
Resources				
Education	Not high school graduate	5.30	0.17	.2335
	High school graduate	5.38	0.15	
Income	Less than $20,000	8.11	0.33	<.0001
	$20,000 or more	4.76	0.18	
	Missing	4.49	0.54	
Employment	Unemployed	6.70	0.27	<.0001
	Employed	4.66	0.19	
Marital status	Not married	7.38	0.26	<.0001
	Married	3.95	0.19	
Language	Not fluent in English	3.42	0.40	<.0001
	Fluent in English	5.41	0.16	

NHIS—National Health Interview Survey
SE—standard error
BMI—body mass index

Table 3

Adjusted Odds for a Positive Depression Screen Among Adults, 1999 NHIS

		Demographic Characteristics Only		Demographics Plus Health and Resource Variables	
Unweighted Observations		30,801		28,193	
		Odds Ratio	95% Confidence Interval	Odds Ratio	95% Confidence Interval
Demographics					
Residence	Rural	1.19	1.03–1.38	0.97	0.82–1.13
	Urban			—	
Race	Hispanic	0.72	0.60–0.88	0.71	0.57–0.89
	Non-Hispanic white	—		—	
	African American	0.90	0.75–1.07	0.60	0.49–0.74
	Non-Hispanic others	0.89	0.66–1.20	0.88	0.63–1.24
Gender	Male	0.49	0.44–0.55	0.54	0.48–0.61
	Female	—		—	
Age	18–34	2.27	1.83–2.83	6.78	5.16–8.91
	35–49	2.50	2.07–3.02	6.43	5.02–8.24
	50–64	2.21	1.74–2.81	3.87	2.95–5.08
	65+	—		—	
Health status					
Perceived health	Excellent, very good			—	
	Good			1.81	1.54–2.12
	Poor, fair			2.74	2.25–3.34
Health status change	Same			—	
	Worse			2.85	2.38–3.43
	Better			2.01	1.71–2.37
Obesity	BMI <25			—	
	BMI 25–29			0.98	0.85–1.14
	BMI >30			1.00	0.84–1.19
Diabetes	Yes			0.90	0.70–1.15
	No			—	
Hypertension	Yes			1.33	1.12–1.59
	No			—	
Asthma	Yes			1.17	1.00–1.38
	No			—	
Limitations to activities	Limited			2.31	1.95–2.72
	Not limited			—	
Resources					
Education	Not high school graduate			0.90	0.75–1.07
	High school graduate			—	
Income	Less than $20,000			1.12	0.96–1.31
	$20,000 or more			—	
	Missing			0.78	0.55–1.12
Employment	Unemployed			1.22	1.03–1.44
	Employed			—	
Marital status	Not married			1.92	1.67–2.21
	Married			—	
Language	Not fluent in English			0.80	0.58–1.09
	Fluent in English			—	

— Indicates reference value.

NHIS—National Health Interview Survey
BMI—body mass index

associated with depression (OR=0.97, CI= 0.82–1.13).

Hispanic ethnicity was associated with reduced risks for depression in both models (Table 3), with little change when health and resources were held constant. African Americans did not differ from whites in the first model, which included only demographics (OR= 0.90, CI=0.75–1.07). When differences in health status and resources were held constant, however, African Americans were found to be at reduced risk for depression (OR=0.60, CI=0.49–0.74). Women had increased odds for depression in both models. Age effects were significant in both models but were accentuated when health and resource considerations were held equal. Younger adults had markedly higher odds for depression than those over age 65.

Poorer self-perceived health was associated with higher odds for a positive screen for depression, as was activity limitation. Any health status change, whether positive or negative, was associated with higher odds for depression when compared to health that had stayed the same across the past year. Reported diabetes or asthma were not significant in multivariable analysis; hypertension, however, remained associated with depression (Table 3).

Education, income, and language were not associated with the odds of depression (Table 3). Persons who were unemployed had higher odds for depression than those who reported employment. Individuals who were not married had higher odds for depression than did married persons (Table 3).

Discussion

Depression Is More Prevalent in Rural Areas, Lower Among Minorities

We found the prevalence of depression, as measured by the CIDI-SF, to be slightly but significantly higher among residents in rural than in urban areas. This finding is consistent with research showing higher rates of suicide in the rural US.[25] The large dataset used for this study may account for the difference between our findings and those of earlier studies that showed no rural-urban differences.[2] Increased prevalence among rural persons did not appear to result from rural residence itself, however, since residence was not independently associated with depression once health and resource factors were held constant. Rather, people in rural areas were more likely to have characteristics that are strongly associated with depression, including poor health status, chronic disease, and poverty.

The present paper adds to the evidence regarding depression within minority populations, which have variously found Hispanics and African Americans to be at lower[2,26] or higher[23] risk for depression. Hispanics were found to be at lower risk for depression in both unadjusted and multivariable analysis. The large sample used by the present study, coupled with the fact that the

1999 NHIS was administered in Spanish if the respondent preferred, may account for differences between our results among Hispanics and previous findings of no difference between Hispanics and whites.[2] We found that African Americans did not differ from depression at higher rates than whites when only demographic considerations were considered but were at reduced risk for depression when health and resources, generally less advantageous among minorities, were added to the analysis. This is consistent with recent research.[26]

Depression and Primary Care

Several health and diagnostic factors were associated with a positive screen for depression. The odds for a positive screen for depression were higher among persons with less than "excellent" self-reported health, persons with limitations in daily activities, and persons whose health status had changed during the past year. Even with these subjective health characteristics held constant, persons reporting hypertension were more likely to test positive for depression than were persons without hypertension. Correlations between depression and hypertension, as well as other forms of cardiovascular disease, have been noted previously.[27] A similar pattern was not found for diabetes or asthma, the other chronic conditions explored. All conditions were more prevalent among rural populations (Table 1).

The adjusted odds of depression were notably higher in younger adults than in older adults. Other research has found a higher prevalence of emotional disorders in younger adults than in older adults.[28] The screening instrument may be less sensitive for older adults. The need to improve mental health screening for older adults among primary care physicians has been noted previously.[29] The higher odds of depression among younger adults may be attributable to both true prevalence differences and screening artifacts; however, this area warrants further research.

Given that rural individuals' first contact and subsequent treatment[30] may involve local physicians, it is essential that these clinicans be equipped to refer or treat appropriately. The present study could not address adequacy of treatment for depression, and previous research has yielded contradictory findings regarding care received by rural residents. Consistent with shortages of specialist personnel, people living in rural areas are less likely to receive specialized mental services than those in urban areas.[31] Increases in the distance traveled for care among rural residents are associated with a decreased likelihood of guideline-concordant treatment, which requires patient commitment as well as practitioner action.[32] County-level analysis has linked prescribing of outdated depression medication to suicide rates.[33] Perplexingly, a detailed analysis of treatment received by persons identified as depressed through screening found no rural-urban differences in

quality of treatment but still documented higher hospitalization risks among rural persons with depression.[34] Rural residents with mental needs have been found to have both higher hospitalization rates and higher physician visit rates than those living in urban areas.[35] The latter two studies suggest a pattern of high need with few resources available to provide interventions for depression short of hospitalization.

While earlier analysis suggested no difference in overall quality between rural and urban residents receiving care for depression, recent work has suggested that generalist physicians are less likely than mental health specialists to provide care that meets current recommendations. About half (52%) of persons with major depression visiting mental health specialists received "minimally adequate" care, defined as appropriate pharmacotherapy (antidepressants for at least 2 months plus more than four visits) or psychotherapy (at least eight visits with a professional, averaging at least 30 minutes each).[36] In the general medical sector, the proportion receiving adequate care dropped to 14.2%. However, it remains possible that patients who plan to be more engaged in care disproportionately seek out specialist practitioners.

Limitations

Our study is limited by reliance on self-reported symptoms elicited with a screening instrument, rather than clinical diagnosis. Not all persons screening positive for depression will require treatment.[37] As noted in the methods section, the CIDI-SF may overestimate the prevalence of depression in a general population. Further, "rural" in the NHIS is not subdivided to reflect differences between communities close to urban providers and isolated, small rural places. The exceptionally large size and representative nature of the data set, however, were felt to balance these disadvantages.

Conclusions

The association between poor health and a positive screen for depression suggests that family physicians are likely to encounter patients needing depression care. Rural physicians need to develop ways to meet this challenge. For example, rural physicians could attempt to delegate initial psychosocial screening to nonphysician staff, thus identifying patients with depression while conserving physician time. In addition, rural physicians could work with community agencies to identify alternative resources to help their patients in areas with few mental health specialists, ranging from work with the faith community through telemedicine links for group counseling. Finally, community-oriented family physicians need be involved in changing the communities in which they serve by developing linkages within and outside the community that can bring adequate, evidence-based care for depression to rural residents.

Corresponding Author: Address corresondence to Dr Probst, South Carolina Rural Health Research Center, University of South Carolina, 220 Stoneridge Drive, Suite 204, Columbia, SC 29210. 803-251-6317. Fax: 803-251-6399. jprobst@gwm.sc.edu.

REFERENCES

1. Blazer DG, Kessler RC, McGonagle KA, Swartz MS. The prevalence and distribution of major depression in a national community sample: the National Comorbidity Survey. Am J Psychiatry 1994;151:979-86.
2. Kessler RC, Berglund P, Demler O, et al. The epidemiology of major depressive disorder: results from the National Comorbidity Survey Replication (NCS-R). JAMA 2003;289(23):3095-105.
3. Kessler RC, Chie WT, Demler O, Walters EE. Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. Arch Gen Psychiatry 2005;62:617:27.
4. WHO World Mental Health Survey Consortium. Prevalence, severity, and unmet need for treatment of mental disorders in the World Health Organization World Mental Health Surveys. JAMA 2004;291:2581-90.
5. National Center for Health Statistics. Urban and rural health chartbook. Hyattsville, Md: National Center for Health Statistics, 2001.
6. National Center for Health Statistics. Health, United States, 2005, with chartbook on trends in the health of Americans. Hyattsville, Md: National Center for Health Statistics, 2005.
7. Auchincloss AH, Hadden W. The health effects of rural-urban residence and concentrated poverty. J Rural Health 2002;18:319-36.
8. Auchincloss AH, Van Nostrand JF, Ronsaville D. Access to health care for older persons in the United States: personal, structural, and neighborhood characteristics. J Aging Health 2001;13:329-54.
9. Wen M, Browning CR, Cagney KA. Poverty, affluence, and income inequality: neighborhood economic structure and its implications for health. Soc Sci Med 2003;57:843-60.
10. Rosenblatt RA. A view from the periphery—health care in rural America. N Engl J Med 2004;351(11):1049-51.
11. Coburn AF. Rural long-term care: what do we need to know to improve policy and programs? J Rural Health 2002;18:256-69.
12. Eberhardt MS, Pamuk ER. The importance of place of residence: examining health in rural and non-rural areas. Am J Public Health 2004;94:1682-6.
13. Hawes C, Phillips CD, Holan S, Sherman M, Hutchison LL. Assisted living in rural America: results from a national survey. J Rural Health 2005;21:131-9.
14. Probst JC, Moore CG, Glover SH, Samuels ME. Person and place: the compounding effects of race/ethnicity and rurality on health. Am J Public Health 2004;95:1695-1703.
15. Mervin E, Hinton I, Dembling B, Stern S. Shortages of rural mental health professionals. Arch Psychiatr Nurs 2003;17:42-51.
16. Kessler RC, McGonagle KA, et al. Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Arch Gen Psychiatry 1994;51:8-19.
17. Wang JL. Rural-urban differences in the prevalence of major depression and associated impairment. Soc Psychiatry Psychiatr Epidemiol 2004;39(1):19-25.
18. Mojtabai R, Olfson M. Major depression in community-dwelling middle-aged and older adults: prevalence and 2- and 4-year follow-up symptoms. Psychol Med 2004;34(4):623-34.
19. Patten SB, Stuart HL, Russell ML, Maxwell CJ, Arboleda-Florez J. Epidemiology of major depression in a predominantly rural health region. Soc Psychiatry Psychiatr Epidemiol 2003;38(7):360-5.
20. Patten SB. Performance of the Composite International Diagnostic Interview Short Form for major depression in community and clinical samples. Chronic Dis Can 1997;18(3):109-12.
21. Patten SB, Wang JL, Beck CA, Maxwell CJ. Measurement issues related to the evaluation and monitoring of major depression prevalence in Canada. Chronic Dis Can 2005;26(4):100-6.
22. Walters EE, Kessler RC, Nelson CB, Mroczek D. Scoring the World Health Organization's Composite International Diagnostic Interview Short Form, December 2002. www3.who.int/cidi/cidisf.htm. Accessed April 30, 2005.

23. Bromberger JT, Harlow S, Avis N, Kravitz HM, Cordal A. Racial/ethnic differences in the prevalence of depressive symptoms among middle-aged women: The Study of Women's Health Across the Nation (SWAN). Am J Public Health 2004;94(8):1378-85.

24. Dunlop DD, Song J, Lyons JS, Manheim LM, Chang RW. Racial/ethnic differences in rates of depression among pre-retirement adults. Am J Public Health 2003;93:1945-52.

25. Singh GK, Siahpush M. Increasing rural-urban gradients in US suicide mortality, 1970–1997. Am J Public Health 2002;92:1161-7.

26. Riolo SA, Nguyen TA, Greden JF, King CA. Prevalence of depression by race/ethnicity: findings from the National Health and Nutrition Examination Survey III. Am J Public Health 2005;95:998-1000.

27. Scalco AZ, Scalco MZ, Azul JB, Lotufo Neto F. Hypertension and depression. Clinics 2005;60(3):241-50.

28. Koenig HG, George LK, Schneider RS. Mental health care for older adults in the year 2020: a dangerous and avoided topic. Gerontologist 1994;34:674-9.

29. Lebowitz, BD, Pearson JL, Schneider LS, et al. Diagnosis and treatment of depression in later life: consensus statement update. JAMA 1997;278:1186-90.

30. Regier DA, Narrow WE, Rae DS, Manderscheid RW, Locke BZ, Goodwin FK. The de facto US mental and addictive disorders service system. Epidemiologic catchment area prospective 1-year prevalence rates of disorders and services. Arch Gen Psychiatry 1993;50(2):85-94.

31. Alegria M, Canino G, Rios R, et al. Inequalities in use of specialty mental health services among Latinos, African Americans, and non-Latino whites. Psychiatr Serv 2002;53(12):1547-55.

32. Fortney J, Rost K, Zhang M, Warren J. The impact of geographic accessibility on the intensity and quality of depression treatment. Med Care 1999;37(9):884-93.

33. Gibbons RD, Hur K, Bhaumik DK, Mann JJ. The relationship between antidepressant medication use and rate of suicide. Arch Gen Psychiatry 2005;62(2):165-72.

34. Rost K, Fortney J, Zhang M, Smith J, Smith GR Jr. Treatment of depression in rural Arkansas: policy implications for improving care. J Rural Health 1999;15(3):308-15.

35. Petterson SM. Metropolitan and nonmetropolitan difference in amount and types of mental health treatment. Arch Psychiatr Nurs 2003;17:12-9.

36. Wang PS, Lane M, Olfson M, Pincus HA, Wells KB, Kessler RC. Twelve-month use of mental health services in the United States: results from the National Comorbidity Survey Replication. Arch Gen Psychiatry 2005;62(6):629-40.

37. Regier DA, Kaelber CT, Rae DS, et al. Limitations of diagnostic criteria and assessment instruments for mental disorders. Arch Gen Psychiatry 1998;55:109-15.