

Rural-urban variations in psychological distress: findings from the Behavioral Risk Factor Surveillance System, 2007

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Abstract

Objectives: To describe rural and urban differences in the prevalence and correlates of psychological distress in the United States.

Methods: We analyzed 2007 Behavioral Risk Factor Surveillance System (BRFSS) data from 62,913 respondents residing in 94 counties in 24 states, and District of Columbia that administered the Kessler-6 (K6) psychological distress questionnaire and met the BRFSS weighting criterion. Using the Rural Urban Classification Codes (RUCC), 94 counties fell into four groups (two metropolitan and two non-metropolitan) out of the nine-part RUCC scheme; these levels were collapsed into two distinct categories of *urban* and *rural*.

Results: Unadjusted estimates indicate that urban county residents have a 22 % higher likelihood of having either MPD or SPD than rural residence (odds ratio [OR]: 1.22, 95 % confidence interval [CI]: 1.09–1.36). This association was slightly attenuated after adjusting for sociodemographic characteristics 17 % higher (OR: 1.17, 95 % CI: 1.04–1.31).

Conclusion: This is the first study to our knowledge reporting rural and urban prevalence of psychological distress derived from population-based, county-level data for 94 counties in the United States.

Keywords: Mental health – Psychological distress – Rural health – Urban health – Rural-urban continuum codes – Behavioral Risk Factor Surveillance System.

Introduction

Mental health problems in general and depression in particular, are leading and growing causes of global disease burden.^{1–3} Mental disorders exact a substantial toll not only on the individuals affected but also on their families, their loved ones, the communities in which they live, and society at large.⁴ Variations in the prevalence of depressive disorders among countries have been recognized at least since a cross-national study of major depression and bipolar disorder was conducted across 10 countries during the 1980s.⁵ The prevalence of having any World Mental Health Composite International Diagnostic Instrument⁶ or Diagnostic and Statistical Manual of Mental Disorders, 4th edition⁷ (WMH-CIDI/DSM-IV) in the prior year varied widely, from 4.3 % in Shanghai to 26.4 % in the United States.⁸ Similarly, lifetime prevalence estimates of any mental disorder varied widely from >40 % in the Netherlands and the U.S. to levels of 12 % in Turkey and 20 % in Mexico.⁹

Despite these recognized differences in the prevalence and burden of mental disorders among countries, not many studies take into account distinction of rural and urban setting, and those that do, often do not use standardized criteria to operationalize rural and urban.^{10–13} Most studies of factors associated with people's mental health focus on individual characteristics such as sex, age, race/ethnicity, education, income, marital, employment, and health status; few studies examine contextual characteristics such as local level social disruption, social capital, economic conditions and health care resources,^{14,15} and only one study, to our knowledge, investigated the contribution of multiple contextual variables associated with rural and urban settings.¹¹ Although there has

been some research examining the correlates of variation in the prevalence of mental disorders within countries^{16–18} research within states (at the county-level) and between rural and urban areas has been of mostly occasional or peripheral interest,^{11,12,14} resulting in inconsistent findings on the potential differences in prevalence of depression in rural and urban settings.^{19–21}

Past findings indicate that respondents with sub-threshold depression are at elevated risk of later depression.²² Some researchers suggest the importance of distinguishing between depressive symptoms (sub-syndromal or sub-threshold) and depressive disorders when studying differences in the contribution of rural and urban settings.²³ Differences by rural/urban setting includes such factors as, pace and stresses of life involving housing, work, marriage, and child rearing,²⁴ levels and concentration of poverty,²⁵ and violence.²⁶ There is a body of research pointing to rural and urban settings having both salutogenic and pathogenic consequences.²⁴ Overall, there is little consensus on differences in the prevalence of and causal relationships between rurality/urbanicity and mental health, indicating a need for further research to explicate critical etiological factors and their relationship to subpopulation characteristics.

The United States Department of Agriculture's Economic Research Service (USDA/ERS) developed several classifications to measure rurality and assess the economic and social diversity of rural America. The Rural-Urban Continuum Codes (RUCC), the Urban-Influence Codes, and the Rural-Urban Commuting Areas are used to classify counties, census tracts, and ZIP codes by degree of rurality. The ERS typology code classifies rural counties by their economic and policy types. These classification schemes have been used to determine eligibility for Federal programs that assist rural areas.²⁷

The opportunity to assess urban and rural differences in depressive symptoms presented itself in 2007 when Behavioral Risk Surveillance System (BRFSS), the largest population-based, state representative telephone survey, included a short dimensional measure of non-specific psychological distress, the Kessler 6 (K6) scale. Linking publicly available BRFSS data with RUCC typology now makes it possible for the first time for researchers to assess the prevalence of serious psychological distress (SPD) and mild-moderate psychological distress (MPD) not only at the national and state levels but also at the county-levels (for counties that have sufficient number of respondents to meet weighting criteria).

There are two objectives in conducting this study: (1) to report the prevalence of SPD and MPD at the rural and urban classification level, and (2) to determine the association between urbanicity/rurality and psychological distress.

Methods

Behavioral Risk Factor Surveillance System

Our source of data for this study was the U.S. Behavioral Risk Factor Surveillance System (BRFSS), which monitors the prevalence of key health- and safety-related behaviors and characteristics among U.S. adults aged 18 or older via telephone surveys.^{28,29} In 2007, state health departments, in collaboration with the Centers for Disease Control and Prevention (CDC) and the Substance Abuse and Mental Health Services Administration (SAMHSA), administered a mental illness and stigma module as part of the BRFSS survey in 35 states, the District of Columbia, and Puerto Rico. The module consisted of a set of questions about symptoms of psychological distress. BRFSS methods, including the weighting procedure used to derive population estimates from BRFSS data, are described elsewhere.³⁰ All BRFSS questionnaires, data, and reports are available at www.cdc.gov/brfss.

Counties were eligible to be included if they either contained, or were already a part of the metropolitan and micropolitan statistical areas (MMSAs) that contained, at least 500 respondents and at least 19 sample members in each of the age and sex, or age, sex, and race categories, and met the weighting criteria for county-level weights. Among the 35 states, the District of Columbia, and Puerto Rico that collected Kessler-6 data, 94 counties, within 24 states and the District of Columbia, either met the criteria or fell within these MMSAs that met the criteria, and were included in these analyses.

Psychological Distress

The Kessler-6 (K6) scale was originally developed in 1992 as a short dimensional measure of non-specific psychological distress in the past 30 days for the U.S. National Health Interview Survey (NHIS).³¹ The K6 scale is used to screen for the Diagnostic and Statistical Manual, Fourth Edition (*DSM-IV*)⁷ anxiety and mood disorders in the 30 days before the interview. This scale identifies individuals who are likely to meet formal definitions for anxiety and/or depressive disorders, and individuals with sub-clinical illness who may not meet formal definitions for a specific disorder.³² K6 is strongly predictive of anxiety disorders, for example agoraphobia, post-traumatic stress disorder, panic disorder, social phobia, generalized anxiety disorder, as well as minor and major depressive disorders as measured using the World Health Organization Composite International Diagnostic Interview Version 3.0 (CIDI).³³ This scale is increasingly used in population mental health research, and has been validated in multiple settings.^{31,32} The K6 scale of nonspecific psychological distress is based on respondents' answers to six questions concerning how frequently they experienced symptoms of psychological

Table 1. Weighted descriptive statistics for the Behavioral Risk Factor Surveillance System (BRFSS) 2007 population of Kessler-6 (K6) respondents stratified by Rural and Urban categories.

Variable RUCC	Urban (95 % CI) 1 and 2	Rural (95 % CI) 5 & 8	Total (95 % CI)	p value
Study population (n)	54,158 (100 %)	8,755 (100 %)	62,913 (100 %)	
Sex				ns
Female	51.4 (50.3–52.5)	50.9 (49.4–52.4)	51.4 (50.3–52.5)	
Male	48.6 (47.5–49.7)	49.1 (47.6–50.6)	48.6 (47.5–49.7)	
Age categories (years)				p < .001
18–24	10.3 (9.4–11.2)	10.3 (9.1–11.7)	10.3 (9.5–11.2)	
25–34	20.1 (19.1–21.1)	17.5 (16.2–19.0)	20.1 (19.1–21.1)	
35–44	21.3 (20.4–22.2)	17.3 (16.3–18.4)	21.2 (20.4–22.1)	
45–54	19.3 (18.5–20.1)	20.5 (19.5–21.5)	19.3 (18.6–20.1)	
> 55	29.0 (28.1–29.8)	34.3 (33.1–35.5)	29.1 (28.3–29.9)	
Race/ethnicity				p < .001
White	59.8 (58.7–60.9)	71.1 (69.9–72.3)	60.0 (59.0–61.1)	
Black	10.9 (10.3–11.5)	1.7 (1.3–2.2)	10.7 (10.1–11.3)	
Hispanic	19.5 (18.4–20.7)	5.0 (4.3–5.8)	19.2 (18.1–20.3)	
Asian/other	9.8 (9.1–10.6)	22.2 (21.2–23.3)	10.1 (9.4–10.8)	
Educational attainment				p < .001
< High school	11.2 (10.3–12.1)	5.6 (4.9–6.5)	11.1 (10.2–12.0)	
= High school	22.6 (21.7–23.5)	30.1 (28.7–31.4)	22.8 (21.9–23.7)	
> High school	66.2 (65.1–67.3)	64.3 (62.9–65.7)	66.2 (65.1–67.2)	
Marital status				p < .001
Currently	58.9 (57.8–60.0)	62.9 (61.4–64.4)	59.0 (57.9–60.1)	
Previously	16.6 (15.9–17.3)	16.0 (15.1–16.9)	16.6 (15.9–17.3)	
Never	24.5 (23.4–25.6)	21.1 (19.7–22.6)	24.4 (23.4–25.5)	
Employment status				p < .001
Employed	63.7 (62.6–64.7)	66.2 (64.8–67.4)	63.7 (62.7–64.7)	
Unemployed	4.4 (4.0–4.9)	3.5 (2.9–4.1)	4.4 (4.0–4.8)	
Retired	14.2 (13.6–14.8)	18.0 (17.1–18.8)	14.3 (13.7–14.9)	
Unable to work	3.9 (3.6–4.3)	3.4 (3.0–3.9)	3.9 (3.6–4.3)	
Homemaker/student	13.8 (12.9–14.6)	9.0 (8.1–10.0)	13.7 (12.9–14.5)	
Income categories (,000)				p < .001
< \$ 20	16.5 (15.5–17.5)	11.4 (10.4–12.3)	16.4 (15.4–17.4)	
\$ 20 - \$ 49	29.6 (28.5–30.6)	39.2 (37.7–40.7)	29.8 (28.7–30.8)	
\$ 50 - \$ 74	15.8 (15.0–16.6)	19.3 (18.1–20.5)	15.8 (15.1–16.6)	
≥ \$ 75	38.2 (37.1–39.3)	30.2 (28.8–31.6)	38.0 (37.0–39.1)	
Psychological distress severity (K6 score)				p < .001
None (0–6)	84.8 (83.9–85.6)	87.2 (86.1–88.1)	84.8 (84.0–85.6)	
Mild (7–12)	11.7 (10.9–12.4)	10.2 (9.3–11.2)	11.6 (10.9–12.4)	
Serious (≥ 13)	3.6 (3.2–4.0)	2.6 (2.2–3.1)	3.6 (3.2–4.0)	
Mild or serious psychological distress (MPD/SPD)				p < .001
None (0–6)	84.8 (83.9–85.6)	87.2 (86.1–88.1)	84.8 (84.0–85.6)	
MPD/SPD (≥ 7)	15.2 (14.4–16.1)	12.8 (11.9–13.9)	15.2 (14.4–16.0)	

distress during the previous 30 days. The answers are scored on a scale of 0 to 4: “all of the time” was coded 4, “most of the time” 3, “some of the time” 2, “a little of the time” 1, and “none of the time” 0, with “don’t know” and “refuse” coded

as missing and excluded from analyses. These scores were summed to create a total K6 score ranging from 0–24 with increasing scores reflecting an increasing degree of psychological distress.¹³ A previous validation study suggested that

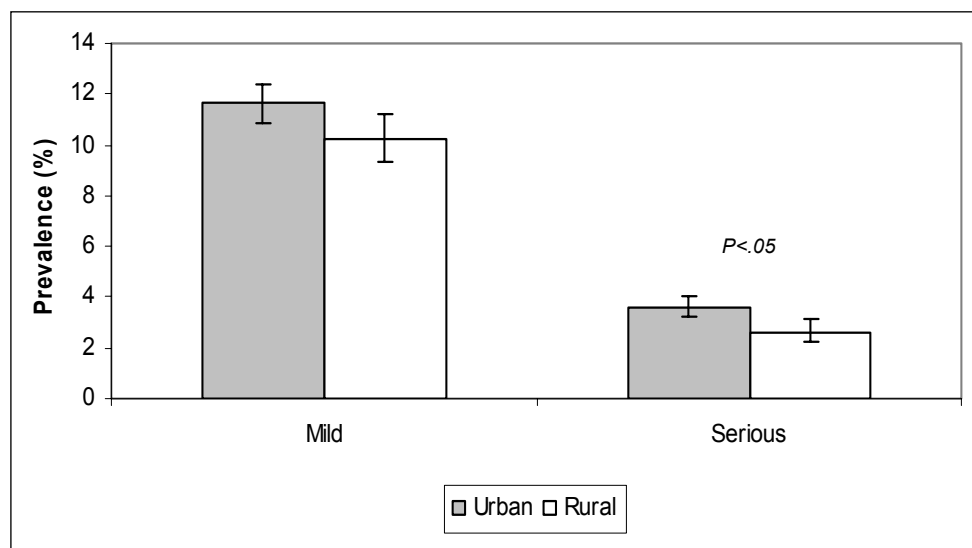


Figure 1. Prevalence (with 95 % confidence interval) of mild psychological distress (MPD) and serious psychological distress (SPD) by urbanicity/rurality.

a total K6 score of 13 or greater indicated serious psychological distress (SPD) in the previous 30 days.³⁴ A score of 8 to 12 was considered probable mild-moderate psychological distress (MPD), while a score of 0 to 7 was considered as no probable psychological distress (NPD).³⁵

Rural-Urban Continuum Codes

Rural-Urban Continuum Codes (RUCC) form a classification scheme that distinguishes metropolitan (metro) counties by the population size of their metro area, and nonmetropolitan (nonmetro) counties by degree of urbanization and adjacency to a metro area or areas. The metro and nonmetro categories have been subdivided into three metro and six nonmetro groupings, resulting in a nine-part county codification. The codes allow researchers working with county data to break such data into finer residential groups beyond a simple metro-nonmetro dichotomy, particularly for the analysis of trends in nonmetro areas that may be related to degree of rurality and metro proximity.²⁷ Descriptions of all nine RUCCs can be found at <http://www.ers.usda.gov/Briefing/Rurality/RuralUrbanCon/>.

The 94 counties, within 24 states and the District of Columbia, that met the BRFSS weighting criteria qualified to be classified into four out of the 9-part county codification, two metropolitan and two nonmetropolitan RUCCs: a metropolitan area with $\geq 1,000,000$ residents (metro $\geq 1,000$); a metropolitan area with 250,000–1,000,000 residents (metro 250–1,000); nonmetro-area counties with an urban population $\geq 20,000$ (nonmetro ≥ 20); and nonmetro area counties with an urban population $\leq 2,500$ (nonmetro ≤ 2.5). The two metropolitan-area counties were classified as urban and the nonmetro-area counties were classified as rural.

Using the 2007 BRFSS data linked to the RUCC typology, we estimated the prevalence of serious psychological distress (SPD) and mild-moderate psychological distress (MPD) for each of the 94 counties and each of the four RUCC categories. Overall, data were available for 62,913 participants with K6 scores. We report the prevalence for the two distinct categories or rural and urban. To examine the association between rurality/urbanicity and psychological distress (MPD and SPD) logistic regression analyses included several socio-demographic variables known to influence psychological distress; sex, age, race/ethnicity, education, employment status, marital status, and income.

Statistical analyses

To calculate all prevalence estimates and logistic regressions with 95 % confidence intervals (95 % CIs), we performed PROC DESCRIPT, PROC CROSSTAB, and PROC LOGIST procedures in SUDAAN 9.0.1 (RTI International, Research Triangle Park, NC) and also performed CSD DESCRIPTIVES, CSTABULATE, and CSLOGISTIC procedures in the complex sampling module of SPSS 14.0.1, (SPSS Inc., Chicago, IL). Both software packages account for the complex survey design. Information on BRFSS weighting methodology and the weights used can be found at http://www.cdc.gov/brfss/technical_infodata/surveydata/2006/2006_dual.htm.

Results

Of the 94 counties we examined, 46 were RUCC metro $\geq 1,000$ counties, 36 were metro 250–1,000 counties, 2 were nonmetro ≥ 20 counties, and 10 were nonmetro ≤ 2.5 coun-

Model	NPD	MPD (95 % CI)	SPD (95 % CI)	MPD/SPD (95 % CI)
Unadjusted				
Urban vs. Rural	Ref	1.17 (1.04–1.33)	1.40 (1.13–1.73)	1.22 (1.09–1.36)
Adjusted for sex, age, race, education, marital status, employment status, and income				
Urban vs. Rural	Ref	1.14 (1.00–1.30)	1.42 (1.12–1.79)	1.17 (1.04–1.31)

Figure 2. Urbanicity/rurality odds ratios from unadjusted and adjusted logistic models for mild psychological distress (MPD), serious psychological distress (SPD), and either MPD/SPD among Behavioral Risk Factor Surveillance System (BRFSS) 2007 population of Kessler-6 (K6) respondents.

ties. Of the 62,913 members of the study population, 27,795 resided in metro $\geq 1,000$; 26,363 in metro 250–1,000; 1,277 in nonmetro ≥ 20 ; and 7,478 in nonmetro ≤ 2.5 (data not presented). The two metro categories, consisting of 82 counties were collapsed into *urban*, and the two non-metro categories, consisting of 12 counties into *rural* for all further analyses.

Of the study population, 51 % were female, 60 % were white, 89 % had at least a high school education, 59 % were currently married, 64 % were employed, and 38 % had annual incomes of at least \$75,000 (Table 1). As compared to the urban population, the rural population was older, predominantly white, had proportionately more Asian or other race/ethnicities, were more educated, had fewer never married and more currently married individuals, had higher proportion of retired individuals, had a lower proportion of homemakers/students, were more likely to earn between \$20,000 and \$74,000, and were less likely to have individuals with either MPD or SPD (Table 1, Figure 1).

The results of the logistic regressions are presented in table 2. Overall, urban county residents were more likely to have psychological distress (MPD or SPD) than rural county residents. Urban county residents, as compared to rural county residents, had a 22 % higher likelihood (OR 1.22; 95 % CI 1.09–1.36) of having either MPD or SPD; reducing to 17 % higher (95 % CI: 1.04–1.31) after adjusting for sociodemographic characteristics. Residents of urban counties, as compared to their rural counterparts, had 17 % higher odds (95 % CI: 1.04–1.33) of having MPD and 40 % higher odds (95 % CI: 1.13–1.73) of having SPD. After adjusting for socio-demographic variables known to influence psychological distress, the urban group as compared to the rural group still had higher odds of having MPD (OR 1.14; 95 % CI: 1.00–1.30) and SPD (OR 1.42; 95 % CI: 1.12–1.79).

Discussion

Prior to the 2007 BRFSS, only national level prevalence estimates of SPD have been available. Since 1997 the U.S. National Health Interview Survey (NHIS), conducted annually by the National Center for Health Statistics (NCHS), has included the K6 questionnaire to measure SPD in the past 30 days. The National Survey on Drug Use and Health (NS-

DUH) conducted by the Substance Abuse and Mental Health Services Administration (SAMHSA) also uses the same K6 questionnaire but with a modified stem question that asks respondents to recall “during the 1 month in the past year when they were at their *worst* emotionally.” This is the first study to our knowledge that provides population-based, county-level prevalence of MPD and SPD for 94 counties in the U.S.

Given that previous research on rural urban differences in psychological distress and mental disorders has produced mixed results, the prospect of unequivocal findings based on a large state- and county-level representative, population-based dataset is of considerable interest to public mental health service planners. It is possible that previous studies have lacked sufficient statistical power to detect differences. While the results are not as explicit as we would have liked, they are an important addition to the literature. There are differences in the prevalence of both MPD and SPD between rural and urban areas; however, there were only statistically significant difference in SPD.

State and county mental health data are needed to empower local areas to make important decisions about needs assessment and resource allocation. BRFSS is the largest and the only survey of its kind and includes sufficient respondents per state to produce local area estimates. However, only some counties have sufficient respondents allowing for county-level weighted prevalence estimates without resorting to synthetic or imputed estimates. Out of the 3,141 counties or county-equivalent administrative units listed by the U.S. census bureau, county estimates could be produced for only 94 counties which met the weighting criterion (in the 24 states, and the District of Columbia that administered the K6 psychological distress questionnaire).

This study is subject to a number of limitations. First, BRFSS data are derived from self-report, which are subject to recall and response bias. Second, since the BRFSS reaches only those households with landline telephone service, it is possible, and perhaps likely, that the prevalence of MPD and SPD are underestimated particularly for those counties in which many indigent individuals (without telephone service) reside. Third, BRFSS dataset, coupled with each state’s unique sampling design, the final set of 94 counties represents a small convenience sample of all 3,141 counties or county-equiva-

lents in the U.S. For these reasons, these findings do not represent an authoritative summary of the differences in county-level, rural and urban psychological distress prevalence in the U.S.; rather, these findings indicate that for this sample of 94 counties there were interesting and significant differences in the prevalence of SPD, and differences albeit not statistically significant in the prevalence of MPD.

To overcome the limitation of the small convenience sample, there are at least three approaches to obtain reliable U.S. representative, county-level, rural and urban differences in psychological distress:

- 1) small-area estimation and indirect estimation used in the U.S. Federal programs synthetic estimations;³⁶
- 2) a low-tech, county-level telephone needs assessment based on the methods used in political polls for local and State elections;³⁷
- 3) a substantial expansion of BRFSS by making it both state- and county-representative.

In spite of these limitations, the differences warrant further consideration in the decision-making process regarding the provision of mental health services at the county level. While this data does not offer compelling evidence, it still suggests that resource allocation and planning should be done on the minimum feasible small-area level, given the observed variation in prevalence for MPD and SPD by individual-level characteristics between and within RUCC classifications of counties. Given this, this research suggests that it may be important to take individual-level and area-level indicators into account when planning for mental health care at the local level. It is possible that country-level and state-level aggregations in the data may conceal underlying variation that is more evident at the county-level.

The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the Centers of Disease Control and Prevention.

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