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Negative Mood and Urban Versus Rural Residence: Using Proximity to Metropolitan Statistical Areas as an Alternative Measure of Residence

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Abstract

The purpose of this report is to describe the distribution of reported negative mood by place of residence focusing on proximity to metropolitan statistical areas (MSA's) as an alternative to the traditional urban versus rural residence variable using the 1991 National Health Interview Survey's Health Promotion and Disease Prevention (NHIS-HPDP) supplement. The self-report of negative mood comes from the negative affect items of the Bradburn Affect Balance Scale categorized as high and low presence. The proximity to MSA's is a county-based measure developed as a combination of the MSA/non-MSA residence variable from the NHIS-HPDP and the United States Department of Agriculture (USDA) adjacency code from the Area Resource File (ARF). The proximity to MSA's measure has four categories:

1. MSA central city
2. MSA not central city
3. non-MSA adjacent (contiguous) to MSA
4. non-MSA not adjacent to MSA

The odds ratios for negative mood were 1.24 (95 percent confidence limits [CL] = 1.11,1.38) for MSA central city and 1.26 (95 percent CL = 1.05,1.52) for non-MSA not adjacent to MSA as compared with MSA not central city. The odds ratio for non-MSA adjacent to MSA was not significantly different from MSA not central city. Data are presented by age, sex, race, and education. Thus, the proximity measure demonstrated greater discrimination in rates of negative mood than did urban versus rural or other measures of place of residence.

Keywords: Negative mood • Bradburn Affect Balance Scale • Place of residence • Urban/rural • Metropolitan statistical areas • USDA adjacency code • Beale code

Introduction

The purpose of this report is to describe the distribution of reported negative mood by place of residence focusing on proximity to metropolitan statistical areas (MSA's) as an alternative to the traditional urban vs. rural residence variable. Data are from the 1991 National Health Interview Survey's Health Promotion and Disease Prevention (NHIS-HPDP) supplement (1). While there has been some investigation of urban versus rural differences associated with specific psychiatric diagnostic categories in specific geographic areas, there has been limited investigation of degree of negative mood between urban and rural areas at the national level. Amato et al. (2) uses data from the National Survey of Families and Households to compare the psychological well-being of the rural and urban poor. The psychological well-being of poor African Americans is higher in rural vs. urban areas while, among whites, it is higher in urban vs. rural areas. Comstock et al. (3) obtained histories of depression-related symptoms from adult residents of Kansas City, Missouri, and Washington County, Maryland. Depressed persons were more common in Kansas City than in Washington County. Within Washington County no urban-rural differences were observed. In the Epidemiologic Catchment Area Study (ECA) specific psychiatric diagnoses, such as major depressive disorder, were studied in five sites: New Haven, Baltimore, St. Louis, Durham, and Los Angeles (4). However,

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in the ECA, data on urban versus rural differences with respect to psychiatric diagnosis were only available in two of these sites, St. Louis and Durham (5). Results of these studies for major depressive disorder, as an example, were inconsistent. In St. Louis, rates of major depressive disorder were lower in urban areas as compared with rural areas. In Durham, the rates of major depressive disorder were higher in urban areas. The ECA investigators concluded that urban and rural designations are confounded by which site is under study. For Durham, a rural designation more often represents remote areas that are substantially farther away from the urban center and consequently less affected by suburban spread. For St. Louis, the same rural designation more often represents suburban areas that are more proximal to the urban center. Furthermore, in a study of adults in French Canada, Kovess et al. (6) confirmed that rural residents had lower rates of depression than metropolitan residents. However, rates in a small county center were lower than in the rural area, not higher, as would be predicted by its urban characteristics. They suggest that the traditional urban-rural dichotomy may be inappropriate for sociopsychiatric research. Thus the comparison of rates of psychiatric diagnosis in urban vs. rural areas are further complicated by the lack of a clear definition of what urban and rural areas are.

Urban and rural areas are often defined using the designations of either the Office of Management and Budget (OMB) or the U.S. Bureau of the Census. Urban areas are thought of as captured in either OMB's ''metropolitan statistical area'' (MSA) designation (7) or in Census's urban or urbanized area definitions (8). Both approaches identify about three quarters of the population as urban or ''metropolitan'' and one quarter of the U.S. population as rural or ''nonmetropolitan'' but these populations are not identical. While small population, sparse settlements, and isolation are all features traditionally associated with rural areas, these features are not completely consistent with MSA or Census-based definitions. Thus, there has not been a clear consensus on who should be counted as residents of rural areas.

According to the Census Bureau, urban and rural are type of area concepts rather than specific areas outlined on maps (9). The urban population includes persons living in urbanized areas and those living in places with 2,500 residents or more outside of urbanized areas. Urbanized areas consist of a central city or cities and the contiguous closely settled territory outside the city's political boundaries that combined have a total population of at least 50,000 residents (10). All remaining areas are considered rural.

Limitations of the measure include that the designations of urban areas are based on decennial census data and are not updated during the 10-year intercensal period. In addition, the boundaries are not limited to preexisting county lines making them more difficult to use in data analysis. Also, the Census Bureau's urban area concept does not apply to towns, cities, or population concentrations of less than 2,500. Those living nearby but outside the limits of smaller cities or towns are not counted as part of an ''urban'' area although the ''suburban'' population may be large and economically integrated with the town. Numerous such towns that are considered ''rural'' by virtue of the fact that they are outside of an urbanized area and have a population of 2,500 or less, would be considered urban if the population immediately surrounding the corporate area were included. Conversely, some might argue that the definition by the Census Bureau would incorrectly classify small towns as urban that have populations over 2,500 but are located far from a large population center.

The OMB MSA is an economically and socially integrated geographic unit centered on a large urban area. An MSA includes a large population center and adjacent communities that have a high degree of economic and social integration with that center (11). This contrasts with Census's urban area, which is defined solely on the basis of population size and density. According to standards adopted for the 1980 census, a MSA must have a city with 50,000 or more residents or an urbanized area (as defined by the Census Bureau) with at least 50,000 people that is part of a county or counties that have at least 100,000 people. MSA's often include more than one county, that is, one or more central counties containing the area's main population concentration and outlying counties that have close economic and social relationships with those central counties. To be included in the MSA, the outlying counties must have a specified level of commuting to the central counties.

A limitation of this measure is that it may include nonsuburban areas located in the outlying sections of a MSA. On the other hand, a MSA may exclude suburban areas just across the county line. For example, a county with a suburban population that commutes to a neighboring MSA may be excluded from the MSA because it also includes a large, sparsely populated section (12). Conversely, if non-MSA's are used to define rural areas, large towns and cities that are located outside of MSA's, of which many have populations exceeding 25,000 residents, would be included as rural.

Analysts at USDA have attempted to refine these geographic indicators by defining a typology of urbanization for nonmetropolitan counties based on two dimensions: the aggregate size of the county population and the adjacency to metropolitan counties (13). A nonmetropolitan county's adjacency to a MSA is defined by shared boundaries (adjoining a MSA at more than a single point) and by commuting patterns (at least 1 percent of the county's labor force commutes to the central county or counties of the MSA). This classification scheme also includes three types of metropolitan counties based on MSA total population: large (1 million or more), medium (250,000 to 999,999), and small (less than 250,000). These adjacency codes are:

A. Metropolitan (MSA) counties:
   1. Greater metropolitan counties of MSA's having a population of at least 1 million.
      a. Core counties—counties containing the primary

central city of greater metro areas.
   b. Fringe counties—suburban counties of greater metro areas.
2. Medium metropolitan—these counties make up the MSA's of 250,000 to 999,999 population.
3. Small metropolitan—these counties make up the MSA's of between 50,000 to 249,999 population.

B. Nonmetropolitan (non-MSA) counties:

1. Urbanized adjacent—counties contiguous to MSA's and having an aggregate urban population of 20,000 to 49,999 residents.
2. Urbanized not adjacent—counties not contiguous to MSA's and having an aggregate urban population of 20,000 to 49,999 residents.
3. Less urbanized adjacent—counties contiguous to MSA's and having an aggregate urban population of 2,500 to 19,999 residents.
4. Less urbanized not adjacent—counties not contiguous to MSA's and having an aggregate urban population of 2,500 to 19,999 residents.
5. Totally rural adjacent—counties contiguous to MSA's and having less than 2,500 population.
6. Totally rural not adjacent—counties not contiguous to MSA's and having less than 2,500 population.

This typology still masks differences among non-MSA counties. For example, a county with one town of 20,000 and a county with eight towns of 2,500 would both be considered urbanized under this scheme. However, this typology has the advantage of incorporating both population size and proximity to a larger metropolitan area in one measure. This is useful in determining the degree of isolation a county experiences internally with respect to its population size and externally with respect to its proximity to larger populated areas.

The adjacency code from the ARF, a county-level data base maintained by the Health Resources and Services Administration (14) was merged with the 1991 HPDP file. The adjacency code is not on the NHIS public use tapes to protect confidentiality related to small area identification.

While health behaviors such as alcohol and tobacco uses were prominent in both the 1990 (15) and year 2000 (16) health promotion objectives, mental health was first included as a priority area for health objectives for the year 2000. Examining levels of negative mental health by geographic measures such as urban and rural county designations are important in mental health promotion activities for several reasons. First, there is substantial evidence of the relationship between negative mental health indicators and other adverse health behaviors such as alcohol and tobacco use (17–23). Second, there is also evidence that levels of negative mental health indicators vary by race, sex, and educational level (4). Third, there is limited information whether or not any systematic differences exist between levels of negative mental health indicators and the density of settlement, for example, urban versus rural. Differences may relate to population size and composition; the stress of urban living or conversely the degree of separation—physical, social, and/or psychological; or one's experiences based on the location of one's residence. Furthermore, any differences may be more prominent based on one's race, sex, and educational level. It is hypothesized that negative mental health may vary systematically by the various aspects of geographic variables aforementioned. It is further hypothesized that such differences may be more prominent among certain race, sex, and educational subgroups.

While the main purpose of this report is to provide descriptive information comparing levels of negative mood in urban versus rural areas, a second objective is to outline and incorporate measures of urban versus rural area designations that are more accurate representations of population size and proximity to larger metropolitan areas.

Methods

The negative mood and urban versus rural area information comes from the 1991 NHIS-HPDP supplement (1). The 1991 NHIS-HPDP questionnaire was administered to obtain data for tracking the year 2000 national health promotion objectives. The 1991 NHIS-HPDP was a component of the NHIS, a household survey which has gathered information on the health of the U.S. resident population since 1957. One adult per family was randomly selected from the full NHIS sample for a personal interview with the health promotion questionnaire. A total of 43,732 adults 18 years of age and older responded to the 1991 NHIS-HPDP. The overall response rate was 87.8 percent. Self-response was required for all questions in the HPDP.

The 1991 NHIS-HPDP contained a range of questions on personal health behaviors, including a short section on mental health composed of the negative affect items of the Bradburn Affect Balance Scale (24,25). The questions related to negative moods in the 1991 NHIS-HPDP were introduced by telling respondents that they would be asked how they had been feeling emotionally. Respondents indicated whether or not they had experienced each affect "during the past 2 weeks." To measure negative affect, the respondent was asked how often he had felt "bored," "so restless that you could hardly sit still," "depressed or very low about something," "upset because of something someone said about you," or "very lonely or abandoned." All five items use the following response categories: "never, rarely, sometimes, often, very often." This negative affect scale has been shown to be related to other mental health scales including the Center for Epidemiological Studies Depression Scale (CES-D) and the Brief Symptom Inventory (26). These emotions have also been shown to be associated with other indicators of mental health status such as anxiety, job dissatisfaction, and marital tension (24,25,27). However, the scale is not synonymous with psychiatric diagnoses. For example, a person who reported being often depressed in the 1991

NHIS-HPDP may or may not be clinically depressed or considered to have major depressive disorder according to psychiatric diagnostic criteria (28–30). In this report, the terms negative mood and negative affect are used interchangeably.

The negative affect scale is the sum of these responses across all five items. Therefore, with codes ranging from ''0'' (never) to ''4'' (very often), the scale varies from ''0'' to ''20'' with higher scores representing stronger presence of negative mood. To arrive at a measure of negative mood, we divided the scale in half letting scores of ''0'' through ''9'' represent lesser presence of negative mood and scores of ''10'' through ''20'' represent stronger presence of negative mood.

Costa et al. (31) demonstrated that level of negative affect is relatively stable over time in a 9-year longitudinal study among 4,942 adults initially 25–74 years of age using data from the first National Health and Nutrition Examination Survey (NHANES I) Epidemiologic Followup Study (NHEFS). Given the size and representativeness of the sample, this is strong evidence of the stability of mean levels of negative affect in adulthood. Since information supporting the stability of negative affect level is available for adults 25 years of age and over, this present analysis is also restricted to respondents 25 and over.

The Census' urban/rural designation and OMB's MSA/non-MSA designation are also available on the NHIS-HPDP file. Table 1 shows the cross-tabulation for these two measures for the population 25 years of age and over. Approximately 27 percent of the population is identified as rural using the Census definition while 23 percent is identified as living in non-MSA counties using OMB's designation. However, about 48 percent of the Census-defined rural population live within MSA's and 17 percent of the MSA population live in Census-defined rural areas. Conversely, 12 percent of the Census-defined urban population live within non-MSA's and 37 percent of the non-MSA population live in Census-defined urban areas. Thus, there is substantial overlap between these two designations.

To incorporate measures in this report that are more accurate representations of urban versus rural areas, we have looked at separate geographical measures to capture county population size and proximity to larger metropolitan areas. In addition, while the 10 categories of the adjacency code can form the basis for examination of variation in outcomes such as rates of negative mood, they are not conducive to further analysis in this report as breakdowns by other sociodemographic variables would result in sparse sample sizes. Thus some data reduction was needed, that is the county population size and the proximity measure. The county population size measure can be taken directly from the adjacency code that we have grouped as residents in counties with a population of 1 million or more, 50,000 to 999,999, 20,000 to 49,999, and less than 20,000.

The proximity measure was developed as a combination of looking at the MSA/non-MSA residence variable from the NHIS-HPDP and the adjacency code. The MSA/non-MSA residence variable further categorizes MSA residents into central city and not central city areas. The central city of a MSA is defined as the largest city in a MSA. One or two additional cities may also be designated central city areas in the MSA on the basis of either of the following conditions: The additional city or cities must have a population one-third or more of the largest city and have a minimum population of 25,000, or the additional city or cities must have a population of at least 250,000. The residents of a MSA not central city area, is defined as all of the MSA that is not part of the central city or cities. The adjacency code separates non-MSA counties into those adjacent and not adjacent to MSA's. Taken together, these two measures form a continuum from the center of metropolitan areas to outlying nonmetropolitan areas. This proximity measure has been grouped into four categories:

1. MSA central city—these are residents of central cities in MSA's
2. MSA not central city—these are residents of MSA's who reside outside of the central city
3. non-MSA adjacent to MSA—these are residents of non-MSA's whose county is contiguous to a MSA (adjacency codes 1, 3, and 5 for nonmetropolitan counties)
4. non-MSA not adjacent to MSA—these are residents of non-MSA's whose county is not contiguous to a MSA (adjacency codes 2, 4, and 6 for nonmetropolitan counties)

Statistics in this report were produced using Survey Data Analysis (SUDAAN) software (32). SUDAAN is a software package for the analysis of complex survey data that takes into account the effects of the complex sample design in the calculation of standard errors. The SUDAAN Proc

Table 1. Cross-tabulation of place of residence: Census defined urban versus rural places by OMB-defined MSA versus non-MSA designations: Estimates for United States population 25 years of age and over, 1991

(Cell entries: population in thousands, row percent, column percent)

Census	*MSA*	*OMB non-MSA*	*Total*
Urban	95,273	12,492	107,765
	(88.4%)	(11.6%)	(100.0%)
	(82.9%)	(37.3%)	(72.6%)
Rural	19,599	20,968	40,567
	(48.3%)	(51.7%)	(100.0%)
	(17.1%)	(62.7%)	(27.4%)
Total	114,872	33,460	148,332
	(77.4%)	(22.6%)	(100.0%)
	(100.0%)	(100.0%)	(100.0%)

NOTES: The population estimates represent thousands of people. OMB is Office of Management and Budget. MSA is metropolitan statistical area.

Descript procedure was used to compute prevalence estimates and their associated standard errors. In tables 2 and 3 the prevalence estimates for the negative affect scale are presented for race, sex, age, education, and the various measures of place of residence discussed previously. In figures 1–6 the prevalence estimates for the negative affect scale are shown by various combinations of race, sex, age, education, and proximity. In these tables and figures, the 95 percent confidence limits of the prevalence estimates are presented to give a picture of the stability of these estimates. Significance testing for these descriptive presentations was not conducted. The SUDAAN Proc Logistic procedure was used to test the hypothesis that geographic proximity is related to negative mood after controlling for age, race, sex, and educational level and is shown in figure 7.

Results

Table 2 shows the prevalence of respondents reporting high negative mood by sex, race, education, and age group. Overall, it is estimated that 11.5 million persons experience high negative moods representing 7.8 percent of the study population. Negative affect prevalence was higher for females, black persons, respondents with less than a high school education, and persons 25–44 years of age. Rates were nearly 50 percent higher for females compared with males, almost 20 percent higher for persons 25–44 years of age compared with persons over 44 years of age, and twice as high for black persons compared with white persons and for persons with less than a high school education compared with those with a high school education or more.

Table 3 shows the prevalence of respondents reporting high negative mood by Census defined urban versus rural places, OMB defined MSA versus non-MSA designations, adjacency code, population size in county of residence, and by proximity to MSA's. Negative affect prevalence was higher for urban (8.1 percent) versus rural (7.0 percent) places. Negative affect prevalence was virtually constant for MSA (7.7 percent) versus non-MSA (7.9 percent) designations. With respect to the adjacency code, negative affect prevalence was highest in totally rural not adjacent group (9.3 percent) and lowest in the greater metropolitan fringe group (6.2 percent). The rates were mixed for MSA county groups being higher for greater core and medium metropolitan counties and lower for greater fringe and small metropolitan counties. The rates for non-MSA county groups were consistently higher for ''not adjacent'' categories as compared with ''adjacent'' categories. Negative affect prevalence varied less with respect to population size ranging from 7.6 to 8.5 percent in comparison with the proximity measure, which ranged from 6.7 to 9.3 percent. For the proximity measure, rates were highest for counties in MSA central city areas (9.3 percent) and for counties in non-MSA not adjacent to MSA areas (9.1 percent) and lowest for counties in MSA not central city areas (6.7 percent). Thus counties that are in the central city areas and those that are most removed from such areas are both higher. This represents a U-shaped relationship with respect to proximity. The rates in MSA central city counties and non-MSA not adjacent to MSA counties were 39 percent and 36 percent higher than rates for MSA not central city counties, respectively. Since the negative mood rates varied more by the proximity measure, the remaining results focus on the proximity measure particularly as it relates to the race, sex, age, and educational level of the respondents.

Figure 1 shows the proportion of high negative mood for all respondents by race and sex. Rates varied from 5.8 percent for white males, 8.1 percent for white females, 10.9 percent for black males, and 16.4 percent for black females. Thus the rates for black females were nearly three times higher than for white males.

Figure 2 shows the proportion of high negative affect for all respondents by race, sex, and education. Rates varied from a low of 4.8 percent for white males with 12 years or more education to a high of 20.1 percent for black females with less than 12 years of education. Thus the rates for less educated black females were over four times higher than for more educated white males. The overall pattern of rates by race and sex, that is white males being lowest followed by white females, then black males, with black females being highest, was consistent for both less educated and more educated respondents.

Table 2. Prevalence (unadjusted) of high negative affect by sex, race, education, and age group: United States, 1991

Sex, race, education, and age	*Population with high negative affect (in thousands)*	*Prevalence*	*95-percent confidence limits*
Total	11,512	7.8	7.4, 8.2
Sex			
Male	4,398	6.3	5.9, 6.7
Female	7,114	9.1	8.6, 9.6
Race			
White	9,222	7.0	6.7, 7.3
Black	2,290	14.0	12.6, 15.4
Education			
Less than 12 years	3,916	12.9	11.9, 13.9
12 years or more	7,554	6.4	6.1, 6.7
Age			
25–44 years	6,365	8.4	7.9, 8.9
45–64 years	3,124	7.1	6.5, 7.7
65 years or more	2,023	7.1	6.5, 7.7

NOTES: Prevalence rates are per 100 people. Population estimates do not correspond to total due to missing data.

Table 3. Prevalence (unadjusted) of high negative affect by Census-defined urban versus rural places, OMB-defined MSA versus non-MSA designations, adjacency code, size of population in county of residence, and by proximity to metropolitan statistical areas: United States, 1991

Measures of place of residence	*Population with high negative affect (in thousands)*	*Total population (in thousands)*	*Prevalence*	*95-percent confidence limits*
Total	11,512	148,332	7.8	7.4, 8.2
Census				
Urban	8,675	107,765	8.1	7.7, 8.5
Rural	2,837	40,567	7.0	6.3, 7.7
OMB				
MSA	8,862	114,872	7.7	7.3, 8.1
non-MSA	2,650	33,460	7.9	7.0, 8.8
Adjacency				
MSA counties:				
Greater core	3,466	40,964	8.5	7.8, 9.2
Greater fringe	1,632	26,320	6.2	5.5, 6.9
Medium metropolitan	3,013	36,944	8.2	7.6, 8.8
Small metropolitan	718	10,389	6.9	5.3, 8.5
non-MSA counties:				
Urbanized adjacent	557	6,894	8.1	6.9, 9.3
Urbanized not adjacent	446	4,847	9.2	5.9, 12.5
Less urbanized adjacent	645	9,923	6.5	5.1, 7.9
Less urbanized not adjacent	695	7,814	8.9	7.4, 10.4
Totally rural adjacent	96	1,075	8.9	6.1, 11.7
Totally rural not adjacent	212	2,278	9.3	6.2, 12.3
Size				
1 million or more	5,098	67,284	7.6	7.1, 8.1
50,000–1 million	3,731	47,333	7.9	7.3, 8.5
20,000–50,000	1,003	11,741	8.5	7.1, 10.0
Less than 20,000	1,648	21,089	7.8	6.7, 8.9
Proximity				
MSA central city	4,053	43,441	9.3	8.6, 10.0
MSA not central city	4,776	71,176	6.7	6.3, 7.1
non-MSA adjacent	1,298	17,893	7.3	6.4, 8.2
non-MSA not adjacent	1,353	14,938	9.1	7.7, 10.5

NOTES: The total population column represents the number of people living in the described county. Prevalence rates are per 100 people. The population size of county was taken from the adjacency code. The proximity measure was developed as a combination of the MSA/non-MSA variable and the adjacency code. Population estimates do not correspond to the total due to missing data. OMB is Office of Management and Budget. MSA is metropolitan statistical area.

Figure 3 shows the proportion of high negative affect for all respondents by sex and proximity categories. The U-shaped relationship persisted for both males and females with rates highest among MSA central city and non-MSA not adjacent proximity categories and lowest among MSA not central city and non-MSA adjacent proximity categories. Rates were highest for females in MSA central city counties (10.9 percent) and lowest for males in MSA not central city counties (5.2 percent).

Figure 4 shows the proportion of high negative affect for all respondents by race and proximity categories. The U-shaped relationship persisted for both white and black persons. For white persons, higher rates were observed among MSA central city and non-MSA not adjacent categories as compared with MSA not central city and non-MSA adjacent categories. For black persons, the rates for MSA central city, non-MSA not adjacent and non-MSA adjacent were elevated in comparison to the MSA not central city category. Rates were highest among black persons in MSA central cities (15.0 percent) and lowest among white persons in MSA not central city (6.4 percent) categories.

Figure 5 shows the proportion of high negative affect for all respondents by age and proximity categories. The U-shaped relationship persisted for all three age groups but was most pronounced among the 25–44 and 45–64-year-old groups. For 25–44 year olds, the rates for MSA central city (9.9 percent) and non-MSA not adjacent (9.7 percent) were elevated in comparison with the MSA not central city category (7.3 percent). For 45–64 year olds, similar patterns were observed. For the 65-year-old and over, the rates for MSA central city and non-MSA not adjacent were only slightly higher.

Figure 6 shows the proportion of high negative affect for all respondents by educational level and proximity categories. For 12 years or more of education, the U-shaped pattern persisted with higher rates observed among MSA

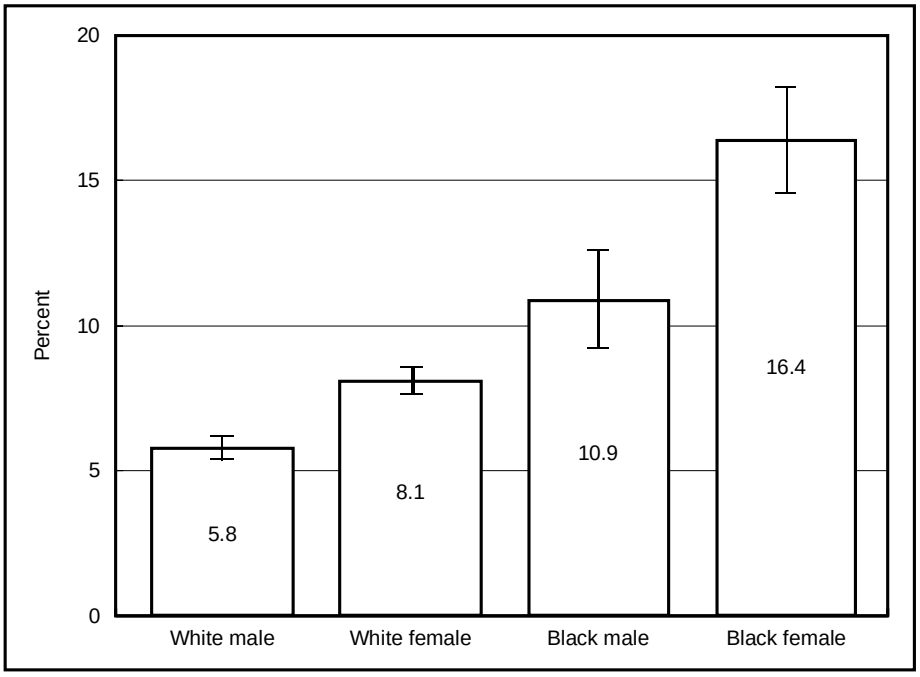

Figure 1. Proportion high negative affect for all respondents, by race and sex

central city and non-MSA not adjacent as compared with MSA not central city and non-MSA adjacent categories. For less than 12 years of education, the non-MSA adjacent category had the lowest rate; however, the standard error of this rate and for the non-MSA not adjacent category were higher than the other categories. The rates for MSA central city (14.4 percent) and non-MSA not adjacent (14.8 percent) were elevated in comparison with the non-MSA adjacent category (10.5 percent). Rates were highest among respondents with less than 12 years of education in non-MSA not adjacent (14.8 percent) and lowest among respondents with 12 years or more of education in MSA not central city (5.6 percent) categories.

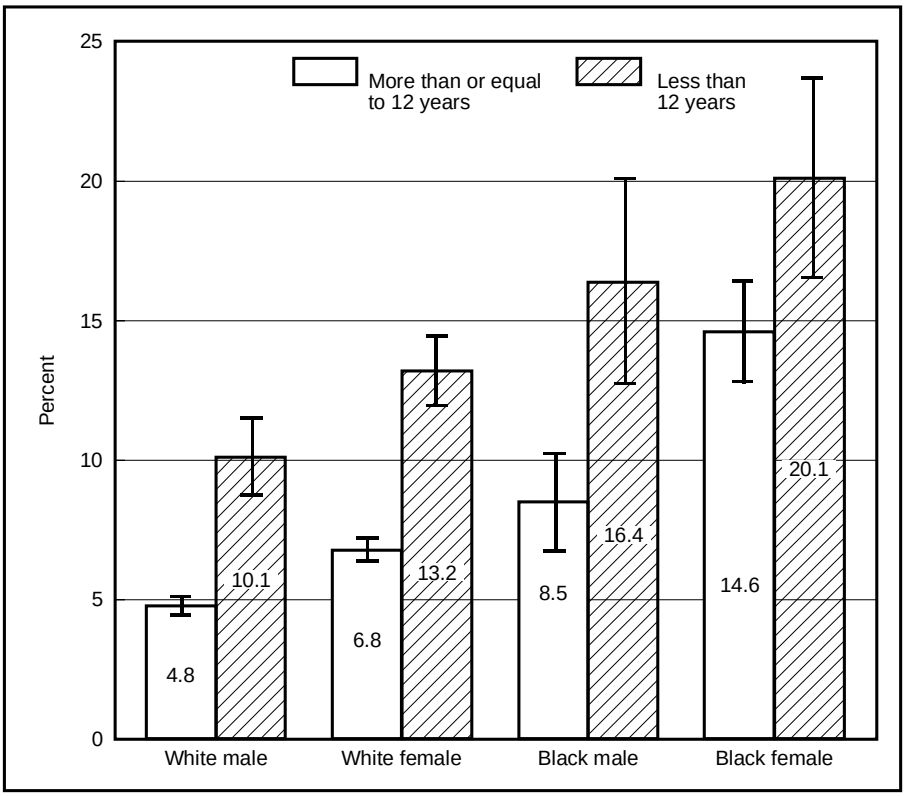

Figure 2. Proportion high negative affect for all respondents by race, sex, and education

To determine if the proximity measure was significantly associated with negative affect after controlling for age, sex, race, and education, a logistic regression was performed on the entire sample. The odds ratios for the proximity groups were calculated controlling for these other factors. The odds ratio is used as an approximation of relative risk. Relative risk is the rate of a given condition among individuals with a specific attribute divided by the rate among individuals with a different attribute. In this analysis, the condition in question is negative mood and the specific attribute is each of the four proximity groups.

Figure 7 presents the odds ratios and 95 percent confidence limits for each of the three proximity groups: the MSA central city, the non-MSA adjacent to MSA, and the non-MSA not adjacent, as compared with MSA not central city, the reference group. Interaction terms of the three proximity groups with age, sex, race, and education were entered into the regression model. The interaction effects for sex, race, and education were not significant (eight of the nine terms were nonsignificant) and thus dropped from the final model. The pattern of interactions for age was inconsistent and thus also dropped from the final model. The odds ratios were 1.24 (95 percent confidence limits [CL]=1.11,1.38) for MSA central city and 1.26 (95 percent CL=1.05,1.52) for non-MSA not adjacent to MSA. Thus residents of MSA central city counties and non-MSA not adjacent to MSA counties were 24 percent and 26 percent more likely, respectively, to experience negative mood than residents of MSA not central city counties. The odds ratio for non-MSA adjacent to MSA was not significantly different from MSA not central city.

Discussion

The results of this study indicate that differences with respect to self-reported negative affect as measured by

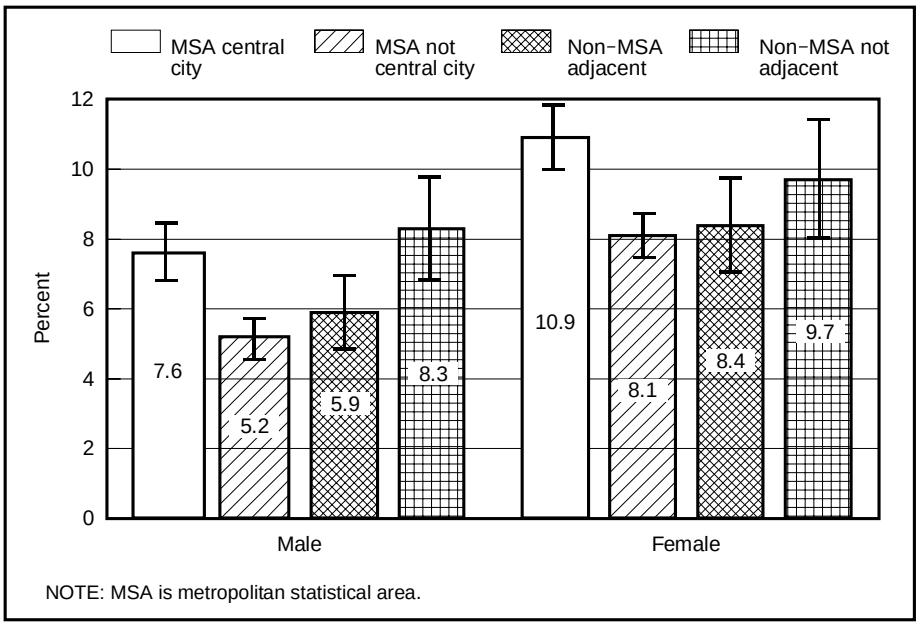

Figure 3. Proportion high negative affect, by sex and proximity categories

the Bradburn scale exist by proximity to MSA's. Rates were highest at the two ends of the proximity measure: in the central city areas of MSA's and in non-MSA counties not contiguous to MSA's, namely outlying nonmetropolitan areas. As expected, negative affect is associated with race, sex, and educational level. The highest rates are found among black persons, women, and the less educated. Rates are particularly high for combinations of these demographic risk factors; black females have the highest rates, and rates for black females with less than 12 years of education are even higher. The U-shaped pattern of association between the negative affect scale and the proximity measure held up for separate analyses broken down by race, sex, or educational level. This pattern continued to hold up generally for separate analyses analyzed by combinations of race, sex, and educational level groups. When combinations of race, sex, and educational level were analyzed by the proximity measure (not shown), there were considerable differences in rates of high negative affect, for example, the highest rate was 26.2 percent for less educated black females in outlying nonmetropolitan areas (non-MSA not adjacent). In contrast, the lowest rate was 4.1 percent for more educated white males in suburban areas (MSA not central city).

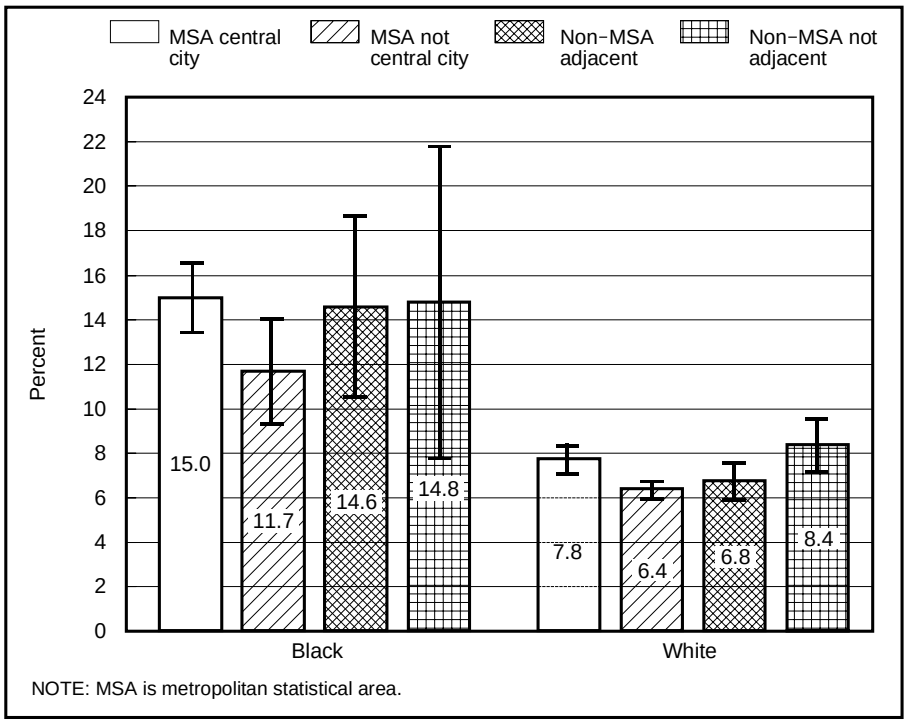

Figure 4. Proportion high negative affect, by race and proximity categories

The proximity measure has several potential advantages over the MSA/non-MSA or urban/rural designations. First, it contains information from the MSA/non-MSA designation regarding adjacency to the central city for counties within MSA's and information regarding adjacency to MSA areas for non-MSA counties. Since it is a typology that incorporates an ''adjacent-to-MSA'' measure, it is a more sensitive measure of the level of access to services. Second, its coding scheme offers greater discrimination with respect to prevalence rates of negative affect than either MSA/non-MSA or urban/rural designations. In particular, the differences in negative affect prevalence are revealed using this proximity measure while almost totally concealed using the MSA/non-MSA measure. Third, the proximity definition disentangles some ambiguity found in either MSA/non-MSA or urban/rural designations, particularly in the non-MSA or rural categories. Table 1 showed that nearly one half the rural respondents lived in MSA's and over one third of the non-MSA respondents lived in urban places. Since this measure showed greater ability to discriminate negative affect prevalence than either MSA/non-MSA, urban/rural designations or population, its use is potentially relevant to other public health outcomes as an alternative to these other designations.

The proximity measure has an important potential limitation. It is a contextual measure of proximity to MSA's. The measure is area based and

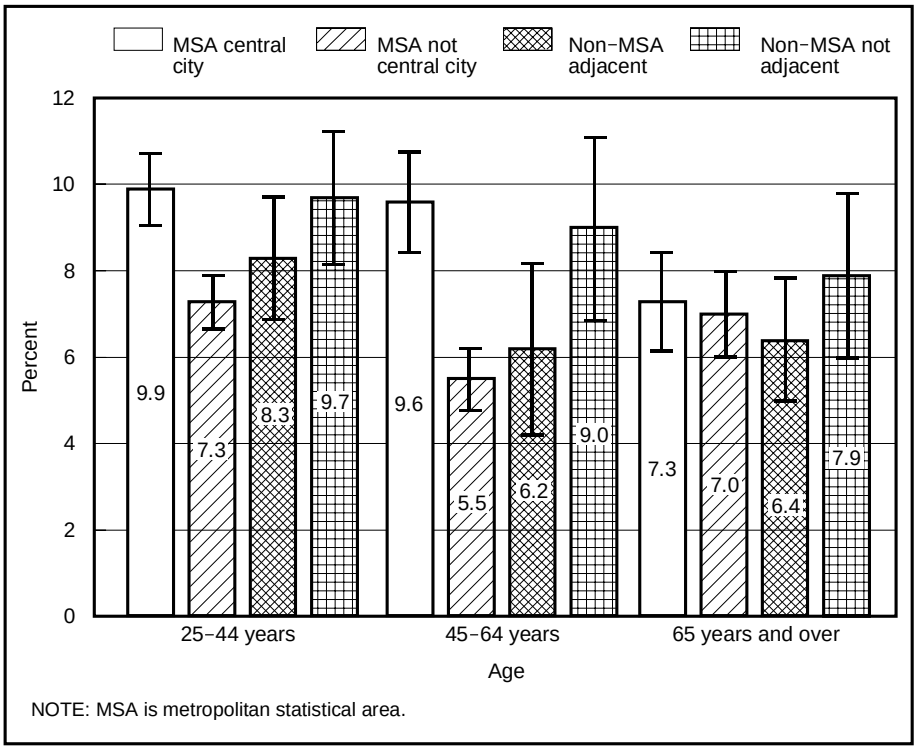

Figure 5. Proportion high negative affect, by age and proximity categories

thus may mask differences in proximity for any given individual's place of residence. For example, the National Rural Health Association (NHRA) has expanded the non-MSA not adjacent concept to include ''urbanized rural areas'' and ''frontier areas.'' Urbanized rural areas are counties with 25,000 or more residents but distant from a MSA. Frontier areas are counties with population densities of less than six persons per square mile and are therefore considered the most remote areas. This expanded categorization measures an important distinction not covered in the proximity measure.

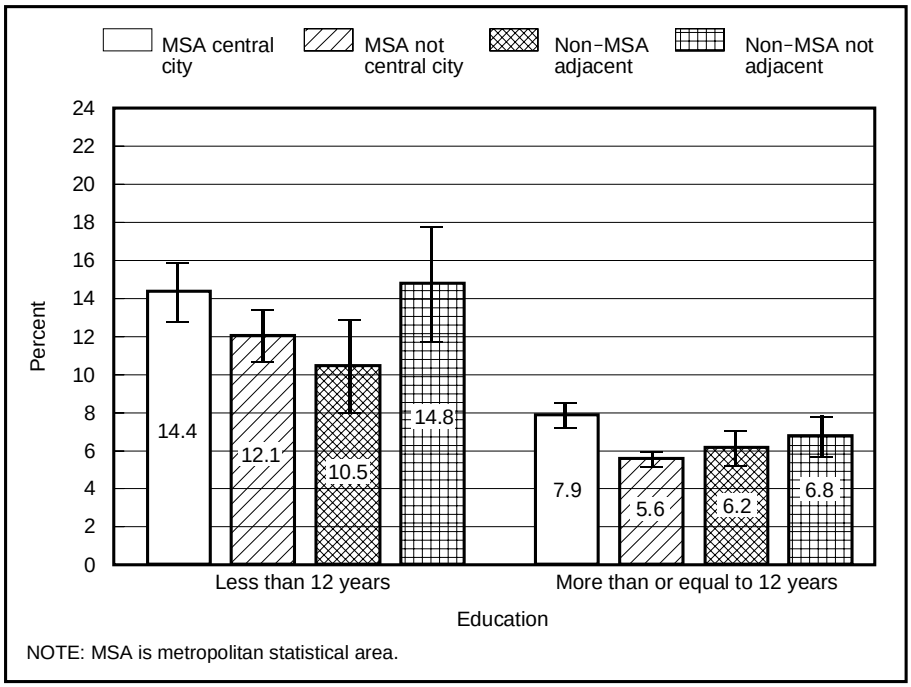

Figure 6. Proportion high negative affect, by educational level and proximity categories

Additionally, it could be argued that this distinction is relevant to other proximity categories. For example, residents of a non-MSA adjacent county may well live in a remote area of that county. However, the categories in the NHRA expanded scheme are not mutually exclusive. For example, 3 of the 14 counties in Arizona—Apache, Coconino, and Mohave—would be both urbanized rural areas and frontier areas because the counties' populations exceed 25,000 residents and the population density is less than six persons per square mile. Thus, this measure would be complicated to use in data analysis.

These findings have several implications for current mental health research activities. First, it supports that there is an association between self-reported negative affect and proximity to MSA's as a measure of residence, namely that persons residing in central city areas of MSA's and those residing in nonmetropolitan areas that are not adjacent to MSA's have higher rates than those persons living outside central city MSA areas and those living in non-MSA areas adjacent to MSA's. Since the association with proximity persisted after controlling for age, sex, race, and education, it cannot be explained as a function of population composition. In other words, it appears that place of residence has an independent effect on mood after accounting for the age, sex, race, and education of the respondents. Second, when analyses were shown by age, sex, race, and education, there is considerable variation by the proximity measure, with central city and remote nonmetropolitan counties generally having the highest rates. Since negative affect has been shown to be related to other health behaviors such as tobacco and alcohol use, further investigation of alcohol and tobacco use, negative mood, and place of residence may be warranted. Finally, self-reported measures of negative mood are thought of as affecting a variety of persons: those with mental health disorders, as well as persons more susceptible to negative moods as a result of normal stresses of everyday life.

The consistent finding that negative affect is more prevalent in metropolitan central city areas and outlying nonmetropolitan areas offers intriguing counterpoint as to how this stress may

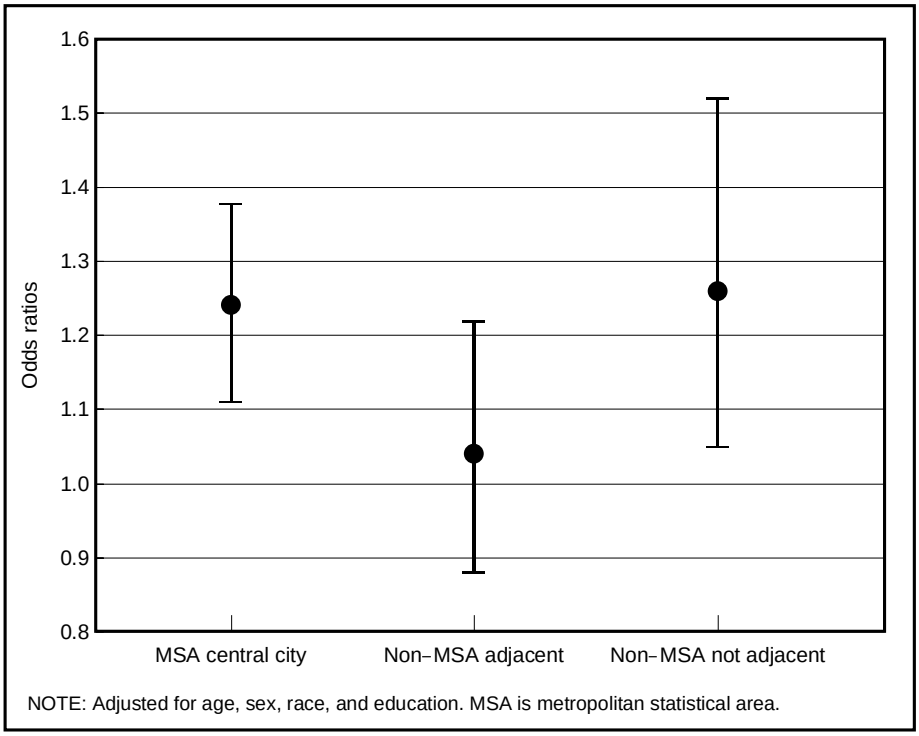

Figure 7. Adjusted odds ratios for negative affect by MSA central city, non-MSA adjacent, and non-MSA not adjacent as compared with MSA not central city

operate. The apparent rise in affective disorders over the past century has sometimes been attributed to the fact that larger proportions of the total population have been exposed to the stresses of urban life. Data collected supports this notion, particularly in that a high rate of negative affect is found in the central city areas of MSA's. However, the equally high rates found in non-MSA not adjacent areas suggest that residents removed from large urban areas also experience distress. Whether this is due to physical, psychological, and social separation from larger urban areas, or lack of adequate resources and/or services for such individuals is not well understood. However, this report provides evidence that where one lives may also influence the degree to which certain individuals may be more at risk of experiencing negative moods. Further research exploring reasons for these differences may help explain to what degree negative mood and, by implication, other negative health behaviors, are geographically determined.

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Technical notes

Target population

The estimates presented in this report are based on data from the National Health Interview Survey (NHIS), an ongoing survey of households in the United States conducted by the National Center for Health Statistics. Each week, a probability sample of the civilian noninstitutionalized population of the United States is interviewed by personnel of the U.S. Bureau of the Census. Interviewers obtain information about the health and other characteristics of each member of the households included in the NHIS sample.

Description of the survey

The NHIS consists of two parts: a basic health and demographic questionnaire that remains almost the same from year to year and is completed for each household member, and special topic questionnaires that vary from year to year and usually are asked of just one person in each family. In 1991, the special topic included health promotion and disease prevention, encompassing environmental health; tobacco; nutrition; immunization and infectious disease; occupational safety and health; heart disease and stroke; other chronic and disabling conditions; clinical and preventive services; physical activity and fitness; alcohol; mental health; and oral health. Other special topics in 1991 were pregnancy and smoking; child health; Acquired Immunodeficiency Syndrome (AIDS) knowledge and attitudes; and drug and alcohol use. With the exception of the questions on drug use, all 1991 special topic questionnaires were administered in a face-to-face interview, with telephone followup as needed. Self-response was required for all items. The drug questionnaire was self-administered, with no telephone followup permitted. Data tapes for these surveys are available from the Division of Health Interview Statistics and can be linked for investigation of crosscutting research issues.

Response rates

The total sample interviewed for 1991 for the basic health questionnaire consisted of 46,761 households containing 120,032 individuals. The response rate for the basic health and demographic questionnaire was about 95.7 percent, with proxy responses accepted for household members not home at the time of interview. For the NHIS-HPDP, one adult per family 18 years of age or over was selected for interview and self-response was required. A total of 43,732 HPDP questionnaires were completed, representing 91.7 percent of respondents identified as eligible at the time of the household interview and an overall response rate of 87.8 percent (the product of the response rate for the basic questionnaire and the response rate for the special topic questionnaire). For the mental health scale, the Bradburn item nonresponse ranged from 1.3 to 2.1 percent.

Sample design and statistical testing

Because the estimates shown in this report are based on a sample, they are subject to sampling error. The standard errors for the statistics shown in this report were calculated using Software for Survey Data Analysis (SUDAAN), developed by the Research Triangle Institute (33). SUDAAN is a software package designed specifically for analysis of complex survey data, which takes into account the effects of the complex sample design in the calculation of standard errors (34). The sampling design of the NHIS has been fully described elsewhere (35). Briefly, the NHIS has a multistage sampling design with stratification and clustering. The first stage of the NHIS sample selection is the selection of 198 primary sampling units (PSU's) from approximately 1,900 geographically defined PSU's. Within the sample PSU area, segments are systematically selected, and then clusters of housing units are selected within the sample segments. Finally, a sample person within each household is selected for the HPDP survey. Generally, variances and standard errors are larger for such designs than for simple random samples of the same size. The SUDAAN procedures used were Proc Descript and Proc Logistic.

Definition of terms

Negative mood score—Additive score of five negative moods experienced in the 2 weeks preceding the interview: depressed, lonely, restless, bored, and upset. Response options for each were: 0=never; 1=rarely; 2=sometimes; 3=often; and 4=very often.

Urban, rural, metropolitan statistical area, adjacency code—See text.

Odds ratio—The odds ratio is an approximation of relative risk. Relative risk is defined as the probability of a particular outcome (high negative mood) among exposed individuals (persons living in a high-risk place of residence), divided by the probability of this outcome among unexposed individuals (persons living in a low-risk place of residence). In mathematical terms, it is the exponential of the beta coefficient generated by SUDAAN's logistic regression procedure (Proc Logist).

95-percent confidence limits of the odds ratio—In 95 percent of the cases, the true odds ratio will fall within these limits. When the lower limit exceeds 1.0, the odds ratio is statistically significant. For this report, the statistically significant odds ratio implies that those in the exposed group (persons living in a high-risk place of residence) are more likely to experience high negative mood than those in the unexposed group (persons living in a low-risk place of residence). In mathematical terms, these limits were calculated as the exponential of the beta coefficient (generated by Proc Logist) ±1.96 times the standard error of the beta coefficient.

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