



Are mental disorders more common in urban than rural areas of the United States?



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ABSTRACT

Urban vs. rural residence is commonly cited as a risk factor for depression and other mental disorders, but epidemiological evidence for this relationship in the US is inconclusive. We examined three consecutive annual samples (2009–2011) of adolescents (age 12–17, $N = 55,583$) and adults (age 18 and over, $N = 116,459$) from the National Survey of Drug Use and Health (NSDUH) to compare the prevalence of major depression and other serious mental illness across four categories of urbanicity: 1) large metropolitan areas, 2) small metropolitan areas, 3) semi-rural areas, and 4) rural areas, with and without adjustment for other demographic risk factors. For adolescents, no association was observed between urbanicity and the prevalence of major depression, with or without statistical adjustments. For adults, no differences were found in the prevalence of major depression or serious mental illness between large metropolitan areas and rural areas, but the prevalence of both was slightly higher in the two intermediate urbanicity categories than in large metropolitan areas, with statistically significant odds ratios after adjustment ranging from 1.12 to 1.19. Contrary to expectations, the prevalence of mental disorders was not higher in the most urban compared with the most rural areas, suggesting that the move to identify mechanistic explanations for risk associated with the urban environment is premature. Evidence of slightly higher prevalence in small urban and semi-rural areas relative to large urban areas, reported for the first time, requires additional investigation.

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1. Introduction

Reports of high risk for depression and other common psychiatric disorders in urban relative to rural areas have motivated research designed to identify distinctive characteristics shared by urban areas that might play an etiological role in these disorders. Social factors, including lack of network ties and concentration of poverty (Marsella, 1998; Galea et al., 2007) have been suspected. Further, based on the assumption that urban areas are deleterious for mental health, studies have examined biological mechanisms through which postulated features of urban environments are hypothesized to cause disorder, including neurodevelopmental (Lederbogen et al., 2011) and epigenetic mechanisms (Galea, 2011; Galea et al., 2011). However, close examination of the literature regarding urban/rural differences in risk for psychiatric disorders suggests that the evidence for a deleterious effect of the urban environment on mental health is inconclusive, particularly for the United States.

The strongest evidence for a preponderance of psychiatric disorders in urban relative to rural areas comes from a widely cited meta-analysis published in 2010 that combined published data from 16 countries and reported pooled, unadjusted relative odds of depressive disorder of 1.39 (95% CI: 1.23–1.58) in urban compared with rural areas (Peen et al., 2010). It is important to note, however, that the meta-analysis results reflect the location, size and selection of the included studies and that extrapolation requires a strong assumption about the homogeneity of the underlying relationship. Moreover, the generalizability of the meta-analytic results to the US is also limited because the single US study in the meta-analysis did not include subjects drawn from a large metropolitan area. That study, conducted in the early 1980s, compared the prevalence of depression in a Southern college town with a population of 150,000 with the prevalence of depression in nearby rural counties (Blazer et al., 1985). The only US national study which has reported urban-rural comparisons in DSM disorders reported no significant differences (Kessler et al., 1994), while a national study based on a screening test for depression found evidence of higher risk in rural relative to urban areas (Probst et al., 2006).

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The paucity of evidence from the US for this widely referenced epidemiological phenomenon and the importance of this evidence for understanding cross-national heterogeneity motivated the current study. Three consecutive years of data were pooled from a large annual population survey, the National Survey of Drug Use and Health (NSDUH), which includes structured assessments of major depression in adolescents (age 12–17) and adults (age 18 and older). In addition, the adult sample was also assessed for serious mental illness (SMI), defined by a validated composite measure of psychological distress and functional impairment (Novak et al., 2010). Comparisons are made across four levels of urbanicity: large and small metropolitan areas, semi-rural areas (based around small urbanized zones with between 10,000 and 50,000 inhabitants that are commonly grouped with rural areas), and truly rural areas (i.e. those not integrated economically with an urbanized area). These data afford the opportunity for a direct and up-to-date empirical test of the common wisdom regarding urban-rural differences in the prevalence of depression and other serious mental illness in the US. In addition, this is the first study of urban-rural differences to include a representative sample of adolescents among whom selective migration is less likely to affect the association between urbanicity and the prevalence of psychiatric disorder.

2. Methods

National samples of youth (age 12–17) and adults (age 18 and over) were formed by combining three consecutive annual samples (2009–2011) from the National Survey of Drug Use and Health (NSDUH). (Substance Abuse and Mental Health Services Administration, 2013) The NSDUH is the nation's primary substance use and mental health surveillance survey. Conducted annually by the Substance Abuse and Mental Health Services Administration (SAMHSA), the survey conducts face-to-face computer assisted in-home interviews with a nationally representative sample of the civilian population living in households and non-institutional group living quarters (e.g. homeless shelters, dormitories, and rooming houses). Sensitive items are assessed using Audio Computer Assisted Self-Interviewing (ACASI) methods, where respondents use a laptop computer to confidentially answer questions that are read to them through headphones. The sample design is state-based, comprised of independent multi-stage area probability samples within each of the 50 states and the District of Columbia.

2.1. Mental health assessment

DSM-IV criteria for major depression are measured for youth and adults in the NSDUH using a fully structured diagnostic instrument based on depression module of the World Mental Health Version of the Composite International Diagnostic Instrument (WMH-CIDI) (Kessler and Ustun, 2004; Hedden et al., 2012). The impairment criteria are assessed with the Sheehan Disability Scale, a visual analog scale which asks respondents to rate their impairment during their worst episode in the past year in four role domains: household responsibilities, work, close relationships, and social life (Leon et al., 1992; Leon et al., 1997). Respondents who met symptom criteria and reported severe impairment in at least one domain during the past year were considered to have past-year major depression (Gfroerer et al., 2012; RTI International, 2012).

Serious mental illness (SMI) was defined using an algorithm which combines information on psychological distress, assessed with the K6, and functional impairment due, assessed with a shortened version of the World Health Organization Disability

Assessment Scale (WHODAS) (Rehm et al., 1999). The K6 is a six item psychological distress scale that maintains good precision in the top decile of the score distribution, i.e. the range in which clinical intervention is likely to be indicated (Kessler et al., 2002; Kessler et al., 2003). The 8-item version of the WHODAS, focusing on impairment due to “emotions, nerves or mental health” was developed from item response theory analyses of the full 16-item version employed in the 2002 NSDUH survey (Novak et al., 2010). The algorithm for combining scores was calibrated in the Mental Health Surveillance Study, a methodological study embedded within the 2008 fielding of the NSDUH in which 1500 respondents were re-interviewed with a structured clinical instrument for DSM Axis 1 disorders (Aldworth et al., 2010; Colpe et al., 2010). Models combining scores from the K6 and WHODAS in the NSDUH were compared with respect to their prediction of independent assessments of SMI from the clinical re-interviews (Liao et al., 2012).

2.2. Urban-rural definition

The public access NSDUH dataset includes two three-level geographic variables, one based on the US Department of Agriculture's Rural Urban Continuum Codes (RUCC) (USDA Economic Research Service, 2013), and the other based on the US Bureau of the Census's Core-Based Statistical Areas (CBSA) (United States Census Bureau, 2013). The RUCC-based variable distinguishes between large and small metropolitan areas and non-metropolitan areas. Large metropolitan areas have a densely populated center with 1,000,000 or more inhabitants and they include the surrounding economically integrated areas (RUCC = 1). Small metropolitan areas are similar except that the center has between 50,000 and 1,000,000 inhabitants (RUCC = 2 or 3). All other areas are defined as non-metropolitan (RUCC = 4 through 9). According to the CBSA-based criteria, areas are categorized as 1) large CBSAs if the core area has 1,000,000 or more inhabitants, 2) small CBSAs if the core area has between 10,000 and 1,000,000 inhabitants and 3) non-CBSA otherwise (i.e. not integrated with an area of concentrated population density with 10,000 or more inhabitants). The fact that the lower bound of the small CBSA category (10,000) is lower than that of the small metropolitan area category (50,000) allows us to define a fourth category of ‘semi-rural’ areas. ‘Semi-rural’ roughly corresponds to the Office of Management and Budget's definition of micropolitan areas in that it includes areas with between 10,000 and 50,000 urban inhabitants (Office of Management and Budget, 2010).

The four-levels of urbanicity formed by combining information from the RUCC- and CBSA-based categories are shown in Fig. 1 along with their population distribution. The categories are defined as follows:

1. Large Metropolitan Area: Meets criteria for both Large Urban Area (RUCC = 1) AND Large CBSA. Due to overlap, this group is equivalent to the Large CBSA group. Examples: New York, Chicago.
2. Small Metropolitan Area: Meets criteria for a Large or Small Urban area (RUCC = 2 or 3) AND Small CBSA. This group includes residents of metropolitan areas with as few as 50,000 inhabitants. Examples: Midland, Texas; Asheville, North Carolina.
3. Semi-Rural Area: Meets criteria for Non-Urban Area (RUCC = 4 through 9) AND Small CBSA. This group falls outside of a metropolitan area but inside of a CBSA. This definition approximates that of micropolitan areas, as defined the U.S. Office of Management and Budget (Office of Management and Budget, 2010). Examples: London, Kentucky (Laurel County); Paris, Texas (Lamar County).

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