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Health Disparities among Rural Individuals with Mental Health Conditions: A Systematic Literature Review

Alyssa Edwards¹, Rina Hung¹, Jennifer B. Levin¹, Larry Forthun², Martha Sajatovic², Molly McVoy¹

¹Case Western Reserve University School of Medicine and University Hospitals of Cleveland Medical Center

²Family, Youth and Community Sciences, University of Florida

Abstract

There is growing concern about the availability of healthcare services for rural patients. This systematic literature review evaluates original research on health disparities among rural and urban populations with mental health conditions in North America. Using PRISMA guidelines, we used four electronic databases (Pubmed, Cochrane, PsychInfo, Web of Science) and hand searches and included original research conducted in the United States or Canada before July 2021 that compared health outcomes of patients with any mental health disorder in rural versus non-rural areas. Both qualitative and quantitative data were extracted including demographics, mental health condition, health disparity measure, rural definition, health outcome measures/main findings, and delivery method. To evaluate study quality, the modified Newcastle Ottawa Scale was used. Our initial search returned 491 studies and 17 studies met final inclusion criteria. Mental health disorders included schizophrenia (4 studies), PTSD (10), mood disorders (9), and anxiety disorders (6). Total sample size was 5,314,818 with the majority being military veterans. Six studies (35.2%) showed no significant rural-urban disparities while eleven (64.7%) identified at least one. Of those, nine reported worse outcomes for rural patients. The most common disparities were diagnostic differences, increased suicide rates and access problems. This review found mixed results regarding outcomes in rural patients with mental health disorders. Disparities were found regarding risk of suicide and access to services. Telehealth in addition to in person outreach to these rural communities may be alternatives to impact these outcomes.

Keywords

mental illness; health disparities; inequities; rural; non-urban

Introduction

Mental illness is one of the leading causes of disability worldwide (Rehm and Shield 2019). Estimated to affect 51.5 million adults and over 4 million children in the United States alone, mental illness includes common diagnoses such as depression, anxiety, and post-traumatic

Correspondence concerning this article should be addressed to Dr. Molly McVoy, 10524 Euclid Ave, Cleveland OH, 44106, United States. Molly.McVoy@uhhospitals.org.

stress disorder (Ghandour et al., 2019; Merikangas et al., 2010). The global burden of mental illness accounts for 32.4 percent of years lived with disability, and recent data suggest that its prevalence has only increased since the beginning of the COVID-19 pandemic (Nochaiwong, et al., 2021; Vigo et al., 2016). For individuals living with mental health conditions, the consequences are far-reaching. Suicide remains the second leading cause of death among 15–19 years olds in both the US and Canada, and approximately 32 percent of US adults and 20 percent of Canadian adults with mental illness also experience substance use disorders and higher rates of unemployment (Centers for Disease Control and Prevention, n.d.; National Alliance on Mental Illness of Mental [NAMI], n.d.; Rush et al., 2008).

Rural populations experience many health disparities in comparison to their urban counterparts in the United States and Canada. Accounting for over 15 percent of the American population and over 18 percent of the Canadian population, rural families experience higher rates of poverty and less access to healthcare/health insurance coverage (Friesen, 2019; Warshaw, 2017). Rural North Americans also experience greater mortality rates when compared to those living in urban areas, a disparity that could be exacerbated by hospital closures (Cross et al., 2021; Friesen, 2019). Rural veterans may be particularly vulnerable to these healthcare barriers, and with almost a quarter of all active military personnel residing in rural areas, it is important to study the disparities within this population (Cross et al., 2021).

Much less is known about the differences in access, outcomes and care in individuals with mental health disorders in urban vs. rural settings in North America. There is research looking specifically at rural mental health outcomes and urban mental health outcomes in North American, but less directly comparing the outcomes of these groups (Fox and Kim-Godwin 2011, Hauenstein and Peddada 2007, Hoyt et al. 1997, Okkels et al. 2018, van der Wal et al. 2021). There is research regarding outcomes on Traumatic Brain Injury (TBI)(Feiss et al. 2022), cognitive impairment and dementia(Chuang et al. 2021, Rahman et al. 2020), substance use disorders(Kiang et al. 2021, Turvey et al. 2020, Nguyen et al. 2019) and literature regarding rural differences internationally(Khare et al. 2020, Forthal et al. 2019, Souza, Caranha and Herkrath 2022). However, to our knowledge, this is the first review of the literature on the disparities between those living in rural vs. urban settings with mental illness in North America(Batterham et al. 2022).

The aim of this systematic literature review was to describe and assess the state of original research on rural-urban health disparities among individuals with mental health conditions in North America (United States and Canada). Understanding how urban-rural health disparities can affect patients with mental health conditions may inform clinical care planning for rural mental health patients and guide future policy and research. We hypothesized that rural patients with mental illness in the United States and Canada would experience more health disparities compared to their urban-dwelling counterparts.

Methods

A. Literature search

PubMed, Cochrane, PsycInfo and Web of Science were the four databases used to extract original outcome studies and clinical trials written in the English language evaluating health disparities among rural individuals with mental health disorders before July of 2021. The search strategy included the following key terms: mental illness, psychiatric illness, rural, non-urban, farming communities, health disparities, under-served inequities, care access, mortality, and other closely related search words. Our search yielded a total of 491 studies. Key sources from extracted literature were hand-searched and advice from a University Liberian was sought for further sources of literature for unpublished work or included dissertations. All abstracts were reviewed by one of the first two authors. Full texts were reviewed by both of the first authors and disagreements regarding inclusion were resolved by discussion with the remaining coauthors.

B. Inclusion and Exclusion Criteria

The inclusion of the studies selected were based upon the following criteria: (1) all ages (both children and adults); (2) original research reports; (3) Studies conducted in North America (US + Canada); (4) Studies comparing health outcomes in rural individuals with any mental health disorder(s) versus some other geographic region (urban, whole population, etc.); (5) Diagnosis for psychiatric illness based on chart diagnosis, specific rating scale (screening tools, i.e. PHQ-9), clinical evaluation, diagnostic scale or self-reported.

Exclusion criteria included: (1) Reports that describe the rural sub-group but do not conduct specific analyses that investigate health outcomes of rural versus the other group; (2) A primary focus on substance use (recreational drugs, alcohol, tobacco); (4) A focus on autism, intellectual disability, or conduct disorder/oppositional defiant disorder; (5) A focus on gender dysphoria; (6) A focus on learning disorders or dyslexia; (7) Opinion pieces, editorials or book chapters; (8) Other literature reviews; (9) Case reports; (10) Reports that describe case rates of psychiatric disorders in rural versus urban settings.

C. Data extraction

The following components were used to adequately extract data from the included studies: number of participants, rural status, mental health condition reported, health outcomes, strengths/limitations, mechanism of service delivery. Quantitative and qualitative data were both collected regarding health disparities and psychiatric illness. Data was extracted from each study by 2 authors using a standardized template. Critical appraisal of the studies was performed using the Newcastle-Ottawa Quality Assessment.

D. Study Quality Assessment

The included studies were assessed for methodological quality using a modified Newcastle-Ottawa Quality Assessment (NOS;19). Three categories were included 1) selection of cohort and ascertainment of exposure (rural status), 2) compatibility between the groups, 3) ascertainment of the outcome (health disparity).

Results

Study Identification and Description

The literature search returned a total of 526 studies from the 4 databases that were used: PubMed (274), Web of Science (113), PsycInfo (112), Cochrane (37). After the removal of 45 duplicates, a total of 481 studies were screened. After abstract screening, 450 studies were excluded based on inclusion /exclusion criteria and 31 studies underwent full-text review to assess further eligibility and data extraction. After careful consideration using the established criteria, a total of 17 studies were included in the final systematic review. The article-selection process is summarized in Figure 1.

A total of 5,314,818 participants with mental health disorders in rural and urban communities were analyzed in the included studies. Baseline demographics such as sample size, population, study setting, and study duration were extracted from the studies (see Table 2). All seventeen studies were observational studies that directly compared individuals with mental health disorders in rural versus urban regions on various outcome measures. Eight of the 17 studies were retrospective chart review studies. Four of the studies were cross-sectional analysis, three were a retrospective cohort design and two were a prospective cohort study. All the study participants were from the United States (n=16 studies) or Canada (n=1 study from the province of Ontario).

Included Participants

Demographic and clinical data were extracted from the aggregate sample descriptions. The mean age of participants was reported in 9 of 17 studies. Of those, the sample age ranged from 31 to 60.1 years. The percent of males ranged from 0 percent (Weaver) to 93 percent, and among the 10/17 (58.8 percent) studies who provided data on race, the proportion of African Americans/Black individuals ranged from 2.1 percent (Onoye) to 81 percent (Weaver), and the proportion of Asians ranged from 1 percent to 29.2 percent (Brooks et al., 2014; Cully et al., 2010; Whealin et al., 2014). Rost et al.'s (2011) sample included 8.9 percent Hispanic/Latino individuals.

Multiple mental health diagnoses were identified in the studies. In 4 of the 17 studies (23.5 percent), PTSD was the only condition that was observed; however, in 11 of the 17 studies (64.7 percent), PTSD was one of multiple diagnoses that were included in the study. Two studies (11.7 percent) looked solely at individuals with a diagnosis of schizophrenia. Anxiety was reported in 6 of the 17 studies (35.2 percent), depression was reported in 7 (41.1 percent), and other mood disorders like dysthymia, bipolar disorder, and eating disorders were mentioned in 5 of the studies (29.4 percent). Of the selected studies for this review, the majority included multiple diagnoses as seen in Table 3.

Quality Metrics of Studies

The Modified Newcastle-Ottawa scale (NOS) criteria are described in Table 1a. The NOS (Table 1b) has a maximum, highest quality score of 9 points. Points were given based on how rurality was defined, sampling of serious mental illness and comparability between

rural and urban groups. The scores for the included studies ranged from 7 to 9, with a mean score of 8.2, such that higher scores reflected greater methodological quality.

Rural Definition

Each included paper was evaluated based on the specificity of the definition of rurality and how it was measured within the study. The methods of classification of rurality were diverse; however, most studies used some variation of a classification system developed for use by national governmental agencies. For example, five of the studies defined rurality by comparing the zip code of residence to a US government rural designation developed by either the US Census Bureau, US Department of Agriculture (USDA), or US Veterans Health Administration (VHA) (Abel et al., 2018; Brooks, 2012; Elhai et al., 2004; Watanabe-Galloway et al., 2017) (McCarthy et al. 2012). Three studies used the US Census Bureau County level statistics to determine urban/rural areas, and Parikh et al. used an assignment for rurality based upon Statistics Canada guidelines for rural strata within Ontario's 42 Public Health Units. Hudson and Lund used the USDA's Rural-Urban Commuting Area (RUCA) classification system (Brooks et al., 2014; Hudson et al., 2014), while Mott, Weaver and Cully used a related classification system from the USDA, the Rural-Urban Continuum Codes (RUCC), where 1 is a metro area with more than 1 million inhabitants and rural (6–9) is less than 20,000 individuals (Mott et al., 2015) (Weaver, Taylor and Himle 2015, Cully et al. 2010). More broadly, Whealin et al. (2014) defined rural residents as those not living in a US census-defined urbanized area, Rost et al. (2011) looked at rurality as a non-metropolitan statistical area with less than 50,000 persons, and Brooks et al. (2014) defined rural areas based on a VHA classification scheme of having fewer than 7 people per square mile. Among those who did not use national government classification systems, Onoye et al. (2015) based rurality on the geographic location of residents on a specific island in the US state of Hawaii as well as residence regions connecting to communities near and around a school complex.

Rural versus Urban Health Outcomes

From the 17 included studies, eleven (64.7 percent) identified a health difference in health outcomes in rural vs. urban patient populations. From these eleven studies, nine reported that rural patients had worse mental health outcomes compared to their urban counterparts. In contrast, the other two studies found that rural populations had positive health outcomes when compared with urban populations.

Negative Health Outcomes in Rural Patients: For the nine studies that showed worse outcomes for rural patients, six found lower mental health service utilization, one found increased ED visits for psychiatric services, one found increased benzodiazepine prescriptions and a final one found increased rates of suicide amongst rural patients. For example, both Brooks and Parikh found that rural veterans have lower rates of mental health service utilization and fewer service visits than urban-dwelling veterans (Brooks, 2012; Parikh et al., 1996). Mott found that rural veterans were less likely to receive psychotherapy and that sessions were less frequent compared to urban veteran patients (Mott et al., 2015). Cully specifically measured access to and utilization of psychotherapy services and found that newly diagnosed rural veterans were significantly less likely to receive psychotherapy

compared to their urban counterparts who were twice as likely to receive four or more psychotherapy sessions (Cully et al., 2010).

Psychiatric emergencies were reported to occur more frequently in rural patient populations than in urban populations. Onye et al found that patients with serious mental illness in rural areas were more likely than urban patients to utilize ED services inappropriately, which may reflect the relative scarcity of mental health resources beyond urban centers (Onye et al., 2013). McCarthy et al reported on higher rates of both completed and attempted suicide in rural veterans when compared to their urban counterparts.(McCarthy et al. 2012) Branas et al reported that rural residents experienced 1.54 times the rate of firearm related suicides than urban counterparts.(Branas et al. 2004)

Diagnostic Differences in rural vs. urban—McCarthy and colleagues reported rural patients were less likely than urban patients to have had a diagnosis of bipolar disorder, schizophrenia, or substance use disorders, and they were more likely to have had a diagnosis of depression, PTSD, and other anxieties. Weaver, et al reported mixed results, finding increased rates of a Major Depressive Disorder (MDD) diagnosis for rural non-Hispanic white women and a lower rate of MDD diagnosis for rural black women when compared to their urban counterparts.(Weaver et al. 2015)

Positive Health Outcomes in Rural Patient Populations—Two studies showed better outcomes for rural patients. One noted that rural veterans were more likely to use mental health services and the other found that rural schizophrenia patients were more adherent to the standard of treatment compared to the urban population (Rost et al., 2011; Whealin et al., 2014). Whealin looked at access to service utilization including the following: psychotropic medications, psychotherapy, community mental health treatment, clergy or spiritual leader, alternative healer, self-help group, and videoconference / internet program attendance. Results showed that rural veterans were more likely than urban veterans to access veteran readjustment centers but both groups made similar use of other services (Whealin et al., 2014).

Clinical variables associated with worse health disparities

Disparities based on race and other demographic factors were measured in 6 of the included studies (35.2%) (Lehman et al., 1998; McCarthy et al., 2012; NAMI, n.d.; Onye et al., 2013; Rost et al., 2011; Weaver et al., 2015). Watanabe-Galloway measured differences by rurality and baseline demographics and reported that the percentage of patients covered by Medicaid was highest in rural children (Watanabe-Galloway, 2017). Brooks found that rural women veterans were less likely to present to the VA for women's specific care and mental health care than urban women (Brooks, 2012).

Abel et al. (2018) measured access to MyHealthVet and Clinical Video telehealth and found that African American and Latino patients with schizophrenia or schizoaffective and low-income patients in rural settings who met criteria for free care were significantly less likely to engage in Clinical Video Telehealth or use My HealthVet when compared with the urban population. Weaver et al found racial differences in rates of diagnosis of MDD in rural vs urban women. Rural black women had lower rates of MDD than their urban counterparts

whereas non-Hispanic white women had higher rates of MDD in rural populations when compared to urban women(Weaver et al. 2015).

Recommendations to Reduce Health Disparities

The disparities seen in outcomes in rural individuals with mental health disorders called for two different types of interventions. One, interventions that capitalize on technology to expand access to care, including telehealth.(Abel et al. 2018, Brooks et al. 2014, Mott et al. 2015) Two, “on the ground” person to person reach out to these rural populations, especially to address the suicide rates and gun violence rates in rural populations.(Weaver et al. 2015, McCarthy et al. 2012)

One of the primary potential benefits of telehealth is the increased access to high quality, specialized mental health services that are often in short supply in rural areas. Cully et al. (2010) mentioned that telepsychology interventions would not only increase access to quality mental health services but also reduce travel barriers, which may be of particular benefit to rural patients. And, for rural patients who do not live in close proximity to others, group teletherapy can serve as a convenient means of connecting them with others experiencing the same conditions (Mott et al., 2015).

There is some evidence in these studies that telehealth could already be playing a role in reducing healthcare disparities. Indeed, rural veterans are utilizing telepsychotherapy at higher rates than urban veterans, even though their urban counterparts are more likely to receive psychotherapy in general (Mott et al., 2015). Telepsychotherapy may also prove particularly useful as an alternate resource to benzodiazepine prescriptions, which have higher rates of use in rural veterans (Lund et al., 2013). Furthermore, telepsychotherapy can help care coordination between rural primary care/emergency services and behavioral specialists located in urban settings. Existing workforce shortages in mental health might be remedied with easier access to remote mental health services and remove the heavy cost burden of inappropriate ED usage (Onye et al., 2013).

On the other end of the spectrum, several studies recommended direct in person outreach to rural communities at risk to reduce disparities.(Weaver et al. 2015, McCarthy et al. 2012) Weaver et al describe that in person community may be one reason for the lower risk of MDD among black rural women when compared to their urban counterparts. Higher rates of MDD among non-Hispanic white women suggest that social supports and community supports may be lacking this rural population and outreach should be aimed at that.(Weaver et al. 2015) Several studies found elevated rates of suicide amongst rural North Americans and suggest improving and expanding mobile crisis outreach that can connect with individuals in crisis in person in rural settings is necessary.(McCarthy et al. 2012, Branas et al. 2004)

Discussion

Our systematic review of original research studies revealed health disparities in rural vs. urban patients in North America, although not all studies reported worse outcomes for rural patients when compared with urban counterparts. Higher rates of suicide in rural veterans

is consistent with previous literature.(Kohlbeck, Fumo and Hargarten 2021, Tarlow, Johnson and McCord 2019) In addition, disparities found for rural residents with mental disorders in our sample included lower rates of mental healthcare usage, higher rates of ED use, and higher rates of benzodiazepine prescriptions (Lund et al., 2013; Onye et al., 2013).

The patterns of health disparities found in most studies suggest that reduced access to regular, timely or appropriate care may lead to increased use of crisis services (the ED) or medication management that is short-term or symptomatic (benzodiazepine). Studies suggested that root causes of limited access to care included travel/distance burden, high costs of services or not being able to get provision of specialized services that might include a preference for using a specific care network.

It is worth noting that relatively few studies investigated whether sociodemographic characteristics such as race, gender, and insurance status might be additional drivers of rural health disparities. The few studies that looked at person-specific factors that impacted these rural disparities provided interesting results showing both gender and racial differences. Men were more likely to die by a firearm suicide than women and rural black women showed lower rates of MDD than their urban counterparts. More research is needed to understand what subset of rural individuals require what type of intervention and, conversely, what subset of rural individuals have resilience factors that put them at lower risk. Future healthcare initiatives aiming to address person-specific disparities would therefore benefit from a targeted regional investigation of their patient population.

Based on suggestions by authors of studies including in this review, telehealth services appear to a strong solution for delivering local care for rural patients who may be reluctant to use in-person services because of stigma (Brooks et al., 2014; Whealin et al., 2014). Telehealth has been shown to improve communication between clinicians, support services and patient family members as well as improve health care delivery and reduction in cost (Hirko et al., 2020). In 2016, Marcin et al. found that telehealth improved access to care and quality of care to rural populations. Taken together, telehealth may help reduce rural health disparities.

With focused efforts towards telehealth use, it is important to address barriers patients may face using technologies. For example, lack of broadband access to the internet remains a prominent barrier (Hirko et al., 2020). Appropriate resources must be allocated for training on equipment and conduction of interventions (Cully et al., 2010). This review looked at studies prior to the COVID-19 era, which has seen broader use and acceptable use of telehealth generally (Patel et al., 2021). It is possible that efforts and initiatives to expand phone and internet access to bigger segments of the population could particularly benefit rural residents (Clark & Yarborough, 2013).

There are several limitations to this study. One limitation within this review was that the number of studies that focused on non-veterans, children or elderly patients were under-represented. An important element of our report is that eight studies in our sample (over 57 percent) targeted veterans with mental health conditions. Veterans have access to services and resources provided by the Veteran's Health Administration which non-veterans do not

have and thus, findings from this review may not be entirely generalizable to the general population. Only one paper included children in their study criteria and no studies included information on the geriatric population. This appears to reflect the paucity of research on rural disparities, particularly at the extremes of the lifespan distribution. Lastly, this review included studies prior to the COVID-19 pandemic. As such, it is likely not reflective of current telepsychiatry practices in rural areas.

The systematic review findings also suggest areas for future research. The COVID-19 pandemic continues to evolve and the use of telemedicine is more prevalent now than ever. Future studies addressing the use of telepsychiatry and rural health populations with mental health conditions post COVID-19 are urgently needed.

Conclusions

This review did suggest that rural patients with mental health conditions are disadvantaged compared to urban patients, particularly regarding access to care, suicide rates and utilization of mental health services. However, these differences were not universal and impacted subsets of rural populations differently. Given increasing use during the COVID-19 pandemic, telehealth may help minimize rural health disparities.

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PRISMA 2009 Flow Diagram

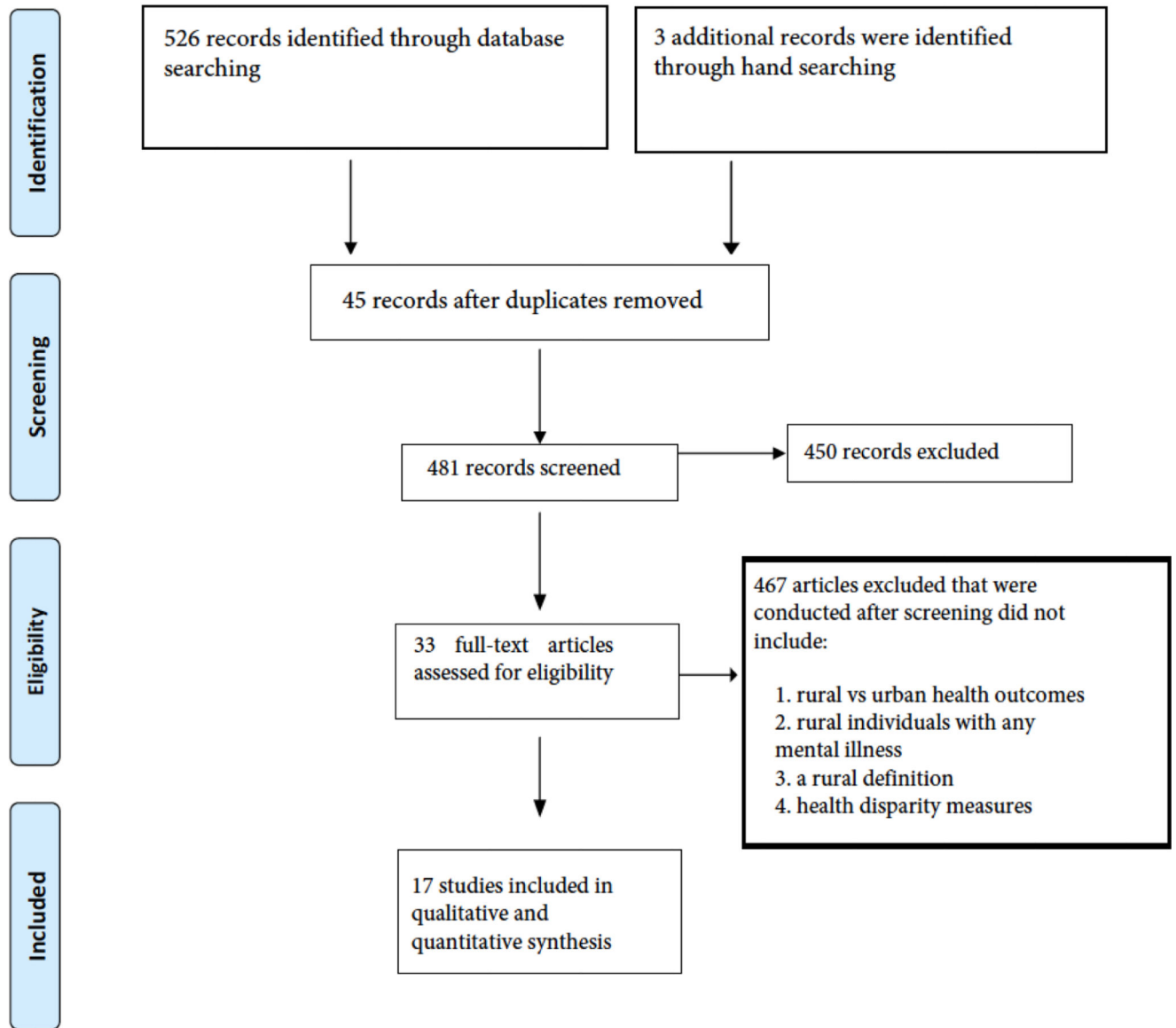


Figure 1. Article Selection (a) Inclusion/ Exclusion criteria (b) CONSORT Flow Diagram
 From: Moher D, Liberab A, Tetzlaft J, Altman DG, The PRISMA Group (2009). Preferred Reporting /tems for Systematic Reviews and MetaAnalyses: The PRISMA Statement. PLoS Med 6(6): e1000097. doi: [10.1371/journal.pmed1000097](https://doi.org/10.1371/journal.pmed1000097)
 For more information, visit www.prisma-statement.org.

Table 1a.

Modified Newcastle-Ottawa Quality Assessment Scale Criteria

Modified Newcastle-Ottawa Quality Assessment Scale (NOS)	
Selection	
Representativeness of the exposed cohort (exposed cohort = Patients with Serious Mental Illness)	
0	No description of sampling strategy
1	Somewhat representative
2	Truly representative (database or epidemiological study)
Ascertainment of exposure (exposure = rural status)	
0	Self-report
1	Hospital location
2	Patient home (e.g. zip code of residential area)
Comparability	
Comparability of groups	
0	No groups
1	No matching of subjects
2	Subjects of the groups were comparable, as determined by the matching of demographic or clinical factors
Outcome	
Ascertainment of outcome (outcome = health disparity: mortality, prevalence, health utilization, etc)	
0	No description or self-report
1	Record linkage
2	Independent or blind assessment stated in the paper, or confirmation of the outcome by reference to secure records
Statistical test	
0	The statistical test is not appropriate, not described, or incomplete
1	The statistical test is appropriate, completed, and described in a comprehensive manner, with measures of association presented

Table 1b.

Scoring

Modified Newcastle-Ottawa Quality Assessment Scale (NOS) Scoring						
Study	Patients with Mental Health Condition Sampling	Rural Status Definition	Comparability	Health Disparity Ascertainment	Statistical Test	Total NOS
Whealin, 2014	2	2	2	1	1	8
Brooks, 2011	2	2	2	1	1	8
Elhai, 2004	1	2	2	2	1	8
Parikh, 1996	2	2	2	2	1	9
Abel, 2018	2	2	2	2	1	9
Brooks, 2014	2	2	2	1	1	8
Cully, 2010	2	2	2	2	1	9
Lund, 2013	2	2	2	1	1	8
Watanabe-Galloway, 2015	2	2	2	1	1	8
Mott, 2015	2	2	1	1	1	7
Onoye, 2013	2	2	2	1	1	8
Rost, 2011	2	1	2	1	1	7
Hudson, 2014	2	2	2	1	1	8
Lehman, 1998	2	2	2	2	1	9
McCarthy, 2012	2	2	2	2	1	9
Weaver, 2015	2	2	2	1	1	8
Branas, 2004	2	2	2	2	1	9

Table 2.

Background Demographics of Included Papers

Author (First Author, Year)	Study Design	Study Period	Sample Size; US or Canada	Age (Average)	Gender (% male)	Race/Ethnicity
Whealin, 2014	cross-sectional survey	Nov. 2010 – Jan. 2011	233 Veterans in Hawaii (116 rural, 117 urban)	36.7	86.70%	Native Hawaiian (32.2%), Asian American (29.2%), Caucasian (23.2%), Other (36.5%)
Brooks, 2011	retrospective chart review	Oct. 2007 – Sep. 2008	414,748 veterans with posttraumatic stress disorder	N/A	93.00%	Caucasian (65%), American Indian (1%), African American (17%), Asian (1%), Native Hawaiian (1%)
Elhai, 2004	cross-sectional survey		100 Veterans (48 urban and 52 rural) at a VA Medical outpatient clinic.	53.15	100%	58% Caucasian and 42% African American
Parikh, 1996	prospective cohort	Aug. - Nov. 1990	9953 individuals (7107 urban and 2856 rural)	N/A	74.70%	N/A
Abel, 2018	retrospective cross-sectional analysis	2007 – 2012	2,171,325 Veterans	60.11	91.51%	Caucasian (77%), African American (18.59%), Latino(0.65%), Other (26.15%)
Brooks, 2014	retrospective chart review	Oct. 1, 2010- Sep. 30, 2011	327,785 rural women veterans	N/A	N/A	N/A
Cully, 2010	retrospective administrative database study	Oct.1, 2003 to Sep. 30, 2004.	410,923 Veterans (rural - 65,044 and urban - 149,747)	58.5	90.03%	N/A
Lund, 2013	retrospective chart review	Oct.1, 1998- Sep. 30, 2009	VHA enrollees with PTSD diagnosis (170,685 in FY 1999 and 498,081 in FY 2009)	53.8	92.50%	N/A
Watanabe-Galloway, 2015	retrospective chart review	May 2012-Dec 2013	1,869 children (1373 urban, 376 rural, 115 remote)	N/A	60.30%	N/A
Mott, 2015	retrospective chart review	Fiscal Year 2007 and 2010	Urban vets (192,347 in 2007 and 231,471 in 2010) Rural vets (72,923 in 2007 and 81,905 in 2010)	60.7	93%	N/A
Onoye, 2013	retrospective chart review	2000 1st quarter to 2010 4th quarter	74,787 ED visits, or 49,235 unique patients in Hawaii	N/A	43.40%	White (42.8%), Native Hawaiian (12.6%), Japanese (9.1%), Filipino (11.1%), African American (2.1%), Chinese (1.8%), Other Asian (0.4%), Other Pacific Islander (0.4%), Other (18.6%)
Rost, 2011	retrospective chart review	1999–2007	3,359 outpatient schizophrenia visits	N/A	54.10%	Non-Hispanic white (59%), non-Hispanic black (21.8%), Hispanic (8.9%), Other (10.2%)
Hudson, 2014	retrospective cohort design	1/1/2008– 3/17/2009	4,782 OEF/OIF* veterans (3,553 urban, 621 large rural towns, 608 small towns/rural areas)	31	88%	67% Caucasian, 23% non-Caucasian, 10% unknown

Author (First Author, Year)	Study Design	Study Period	Sample Size; US or Canada	Age (Average)	Gender (% male)	Race/Ethnicity
Lehman, 1998	cross-sectional survey	1998	719 adults with schizophrenia	N/A	65.20%	White (44.2%), African American (50.7%), Other (5%)
McCarthy, 2012	retrospective cohort	Oct. 1, 2003 – Sep. 30, 2008	5447 patients alive at the start 2004 and 5709 patients alive at the start of 2006	62.8	93.8%	N/A
Weaver, 2015	prospective cohort	Feb. 2001 – June 2003	1803 Women	59.8	0%	African American (81%) and Non-Hispanic white women (19%)
Branas, 2004	retrospective cohort	1989–1999	584,629 individuals deaths from intentional injuries	NA	NA	NA

* OEF – Operation Enduring Freedom; OIF – Operation Iraqi Freedom

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Table 3.

Characteristics of Included Papers

Author (First Author, Year)	Mental Health Condition Reported	Rural Definition	Health Disparity Measure (if applicable)	Health Outcomes Measure / Main Findings	Virtual aspects? What can we do to help?
Whealin, 2014	PTSD	Not living in a U.S. Census-defined urbanized area.	Access to mental health service utilization	Rural veterans were more likely than urban veterans to have accessed Veteran Readjustment Centers.	Mental health services that are integrated telehealth and online mental health services provide solutions for rural veterans who are deterred by stigma.
Brooks, 2011	PTSD	Zip Code Crosswalk to match patients' residential zip codes to a rural designation.	Access to services (outpatient care)	Veterans from rural or highly rural areas had 19% and 25% fewer visits than urban veterans. Veterans from rural/highly rural areas had fewer visits to PTSD clinics than urban.	VA should build on existing efforts for outreach/ care opportunities, including telemental health and specialized PTSD services, in rural areas.
Elhai, 2004	PTSD	1990 US census data, judged from each zip code of residence.	Distance (in miles) and estimated driving time (in minutes) from participants' home zip codes to the VA.	Results indicated a lack of substantive differences between rural and urban combat PTSD patients.	Even though rural settings are much less likely to have MH providers and clinics, veterans with PTSD living rurally may need and benefit from services.
Parikh, 1996	Major Depression, Dysthymia, and Manic Episode	Statistics Canada guidelines (1993).	Utilization of Services and present disability	3.6% of rural respondents had an affective disorder with specific rates for major depression being 4.2%. Both urban and rural mood disorder participants are more likely to be poor, unemployed, female, and unmarried.	N/A
Abel, 2018	Schizoaffective disorders, PTSD, anxiety, or bipolar disorder	Zip code of residence using VHA Office of commuting areas system	Access to MyHealthVet and Clinical Video telehealth	African American, Latino, patients, low-income patients with schizophrenia in rural setting were less likely to use Clinical Video Telehealth or use My HealthVet.	Address barriers patients face using eHealth technologies. Understand barriers and disparities could inform outreach efforts to increase adoption and use.
Brooks, 2014	Addiction, PTSD, Anxiety, Mood disorder, eating disorder, hypertension, diabetes	Classification system by VA Office of Policy and Planning.	Access to care (# services in one visit to reduce travel burden: % accessing any service)	Diagnostic rates were similar between groups for several mental health disorders, hypertension, and diabetes. Rural women veterans were less likely to present to the VA for women's specific care and mental health care than urban women.	Telehealth technologies and increased outreach, perhaps peer-based, should be considered.
Cully, 2010	Depression, anxiety, or PTSD	Living within classification codes.	Access to and utilization of psychotherapy services	Newly diagnosed rural veterans were less likely ($P < .0001$) to receive psychotherapy. Urban veterans were twice as likely to receive 4 or more psychotherapy sessions ($P < .001$).	Focused efforts are needed to increase access to psychotherapy services provided to rural veterans with depression, anxiety, and PTSD.
Lund, 2013	PTSD	Rural-Urban Commuting Areas (RUCA) System.	Rate of benzodiazepine prescriptions	Rural veterans with PTSD were more likely to receive benzodiazepines in the Midwest and South.	Rural veterans are more likely to be combat veterans to

Author (First Author, Year)	Mental Health Condition Reported	Rural Definition	Health Disparity Measure (if applicable)	Health Outcomes Measure / Main Findings	Virtual aspects? What can we do to help?
					provide options for telepsychotherapy.
Watanabe-Galloway, 2015	ADHD, Anxiety, depression, mood disorders, developmental, PICA and 7 other SMIs	USDA 2013 Urban Influence Codes (UIC).	Case rate differences by rurality and demographics.	The percentage of patients covered by public insurance (i.e. Medicaid) was the highest in rural (51.06%), followed by remote (43.48%) and urban (35.56%).	N/A
Mott, 2015	PTSD, anxiety, depression	USDA 2013 RUCC codes.	Differences in the likelihood of receiving psychotherapy and frequency of psychotherapy sessions	Rural veterans were consistently less likely to receive psychotherapy and engage in any mental health services.	Rural vets have higher proportions of telepsychotherapy use. This modality can be considered as a method to improve group therapy usage.
Onoye, 2013	PTSD, anxiety disorder, mood disorder	Residence region corresponding to communities near and around a school complex area.	Rural-urban disparity in the rates of ED utilization	ED visits with a diagnosis of PTSD or other anxiety disorders showed statistically significant results of highest utilization in rural areas. Mood disorder rates were highest in suburban areas.	Policies that strengthen rural health collaborations with specialists by telemedicine may help improve access.
Rost, 2011	schizophrenia	Non-metropolitan statistical area (rural) or metropolitan statistical area (urban)	Differences in prescription management and hospitalizations based on age, gender, race-ethnicity, insurance, rurality, and region.	No differences were found for either antipsychotic prescription management or hospitalizations.	N/A
Hudson, 2014	PTSD, depression	Rural-Urban Commuting Area (RUCA) classification system.	Rural-urban differences in screening rates, diagnosis rates, psychotherapy receipt and number of sessions, pharmacotherapy rates	Rural veterans were screened, diagnosed, and treated at similar or better rates for depression and PTSD than urban veterans.	Telepsychotherapy available may increase the utilization rates.
Lehman, 1998	schizophrenia	1990 US Bureau of Census county-level statistics	rural-urban differences in conformance rates to schizophrenia standard of treatment.	Treatment of rural patients was more consistent with schizophrenia standard of treatment compared to treatment of urban patients.	N/A
McCarthy, 2012	PTSD, bipolar disorder, depression, schizophrenia, SUD.	US Census categories, assessed by categorizing patients zip codes of areas of residence as rural or urban based on VA Office of Rural Health	Reduced access to health services, fewer alternatives to VA care, distance to facility, as well as firearm possession.	Rural patients have higher suicide rates (38.8/100,000) and rural residence had 20% greater suicide risks.	VA pioneered health system suicide prevention initiatives such as web-based suicide prevention and crisis lines, and support for prevention programs.
Weaver, 2015	Major depressive disorder, mood disorder	Rural-Urban Continuum codes developed by US Department of Agriculture measured by population size and adjacency to metropolitan area	High poverty rates, social isolation, financial; pressure, limited access to resources and services.	Rural African American women had significantly lower odds of meeting criteria for lifetime and 12 month MDD and mood disorder. Rural non-Hispanic white women had higher prevalence of meeting criteria for lifetime	Further research is needed on rural residence and race/ethnicity on women's depression.

Author (First Author, Year)	Mental Health Condition Reported	Rural Definition	Health Disparity Measure (if applicable)	Health Outcomes Measure / Main Findings	Virtual aspects? What can we do to help?
				or 12-month mood disorder and MDD.	
Branas, 2004	Intentional suicide	Urban-Rural County Classification Codes from the US Department of Agriculture	Intentional firearm death compared to other mechanisms of intentional injury death (suicide or homicide)	Firearm suicide in rural counties is a significant public health concern. Rural counties experienced 1.54 times (95% CI – 1.29, 1.83) adjusted suicide rate of the most urban counties.	Investment should be made for greater prevention of firearm suicide especially in remote rural communities; enhanced access to activities, goods, services that are not often available in isolated areas and reduced access to firearms.

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