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Association Between Rural Residence and Nonfatal Suicidal Behavior Among California Adults: A Population-Based Study

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Abstract

Objective.—Suicide mortality rates in rural areas of the United States are twice that of rates in urban areas, and identifying which factors—eg, higher rates of suicidal distress, lower rates of help-seeking behaviors, or greater access to firearms—contribute to this rural/urban disparity could help target interventions.

Method.—Using 2015–2016 data on adult respondents to the California Health Interview Survey (n=40,041), we examined associations between residence in a rural (vs. non-rural) census tract and nonfatal suicidal ideation and attempt.

Results.—We found that living in a rural area was not associated with nonfatal suicidal behavior (OR for past-year suicidal ideation = 0.87, 95% CI: 0.63–1.20; OR for past-year suicide attempt = 0.55, CI: 0.20–1.48). Women living in rural areas had higher odds of lifetime suicidal ideation compared to women living in non-rural areas, but this difference was not significant (OR = 1.17, CI: 0.94–1.44). We also found that, among individuals reporting suicidal behavior, there were few rural/non-rural differences in perceived need for treatment, such as seeing a physician or taking a prescription for mental health problems.

Conclusions.—Our results do not suggest higher suicidal distress or lower treatment-seeking behaviors as explanations for the rural/urban disparity in suicide mortality rates. Further attention is needed to the unique risk factors driving suicidality in rural areas, as well as exploring heterogeneity in these factors across different rural contexts.

Keywords

mental health; rural; suicidal attempt; suicidal ideation; suicide

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Suicide is now the 10th leading cause of death among adults in the United States, and the 5th leading cause among adults aged 35–64 years.[1] While suicide risk emerges from a complex array of social, psychological, and biological factors,[2–4] increasing evidence suggests that where individuals live—particularly their residence in rural vs. urban areas—may play an

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important role in their likelihood of dying by suicide.[5–7] A recent analysis of suicide deaths in the US between 1999 and 2015 showed that suicide rates are consistently higher in rural counties compared to urban counties, and that this rural/urban gap has increased dramatically over the past 10 years.[8] This geographic disparity exists across age groups and for both men and women. Identifying what factors influence the high and increasing rates of suicide in rural areas of the US is a public health priority, with implications for intervention targeting and resource allocation.

Potential explanations for this rural/urban geographic disparity in suicide rates include (1) higher rates of social isolation, mental illness, and corresponding suicidal distress among rural populations;[9,10] (2) more limited access to, or uptake of, mental health care services in rural areas;[5,10,11] and (3) more widespread access to and use of firearms when rural individuals do attempt suicide, resulting in higher case fatality rates.[12–14] Evidence for the third explanation is relatively strong.[15] Evidence for the first and second explanations is considerably sparser, even though the research literature and government reports often emphasize these mechanisms as the dominant causes of the rural/urban suicide disparity.[10,16]

Notably, few epidemiologic studies have empirically tested whether rural residence is associated with suicidal distress, or whether access to/uptake of mental health services is lower among suicidal individuals living in rural vs. urban areas. Data from the National Comorbidity Study showed no association between rural residence and nonfatal suicidal behaviors, but that study was conducted in 1990–1992, before the recent emergence of a large rural/urban disparity in suicide mortality.[17] Another early study in this small literature reported that nonfatal suicide attempt hospitalization rates in New Jersey were not associated with population density.[9] Another study, using national survey data, found that rural residence was not associated with prevalence of major depression or other serious mental illness, but suicidality was not assessed.[18] We previously found that rural residence predicted *lower* risk of self-reported suicidal ideation and suicide attempts among adolescents in California,[19] but these results may not be generalizable to adults. We are not aware of any other population-based studies of US adults examining associations between rural residence and suicidal ideation or suicide attempts. Other US studies have shown that people with mental disorders are less likely to receive mental health services if they live in rural vs. urban areas,[20] and that mental health professional shortages are common in rural areas.[11,21,22] However, rural adolescents reporting suicidal ideation were equivalently likely as their urban peers to report receiving psychological care.[19] To our knowledge, no studies have explicitly examined rural/urban disparities in perceived need for treatment among adults reporting suicidality.

In this paper, our objective was to assess whether nonfatal suicidal behaviors, ie, suicide ideation and attempts, were associated with living in a rural area. We also examined whether the association between rurality and nonfatal suicide behaviors differed by gender, race/ethnicity, or educational attainment. Finally, we explored whether perceived need for mental health treatment differed by rural/non-rural status among adults reporting suicide ideation or attempt.

Methods

Data and Study Sample

We used data on adult respondents to the California Health Interview Survey (CHIS, described elsewhere[23–26]), combining data from the 2015 and 2016 waves. CHIS is a large, statewide representative telephone survey that collects health, social, and demographic information from a sample of the non-institutionalized population of California. CHIS uses a 2-stage sample design to interview 1 adult member per household. Adult response rates for 2015 and 2016 were 47.2% and 44.6%, respectively. Non-response is adjusted for using post-stratification and non-response adjustments. CHIS included 21,034 and 21,055 adult respondents aged 18 years and over in 2015 and 2016, respectively, for a total sample size of 42,089. We restricted our analytic sample to adults who reported living at their current address for at least 6 months, for a sample size of 40,041. This study was approved by the Institutional Review Board at Michigan State University.

Measures

Our primary outcomes were nonfatal suicidal behaviors. We also examined help-seeking behaviors among individuals reporting suicidal behaviors.

Nonfatal suicidal behaviors were based on self-report and included 5 outcomes. These comprised lifetime suicidal ideation ("Have you ever seriously thought about committing suicide?"), suicidal ideation in the past 12 months ("Have you seriously thought about committing suicide at any time in the past 12 months?"), suicidal ideation in the past 2 months ("Have you seriously thought about committing suicide at any time in the past 2 months?"), lifetime suicide attempt ("Have you ever attempted suicide?"), and suicide attempt in the past 12 months ("Have you attempted suicide at any time in the past 12 months?"). Each nonfatal suicidal behavior variable was analyzed as a dichotomous variable.

Perceived need for treatment included the following variables, also dichotomized: needing help for an emotional/mental health or alcohol/drug problem in past year; having seen a primary care physician for mental health, alcohol, or drugs in the past year; having seen a psychiatrist for mental health, alcohol, or drugs in the past year; and taking a daily prescription for emotional or personal problems at any time in the past year. These outcomes were assessed among respondents who reported suicidal ideation in the past 12 months, and among those who reported making a suicide attempt in the past 12 months.

Rurality was our primary exposure measure. The CHIS uses data from the commercial company Claritas, LLC (Cincinnati, Ohio) to assign a level of urbanicity/rurality to households based on the population density of the census tract.[19,27] "Urban" areas have the highest population density and include downtown areas of major cities and their surrounding neighborhoods (>4,150 persons/sq mi); "suburban" areas have lower population densities and typically include areas surrounding urban areas (1,000–4,500 persons/sq mi); "second-city" areas are population centers of their surrounding communities (eg, satellite cities located near major metropolitan areas, with >1,000 persons/sq mi but not in a population center); and "rural/town" areas have the lowest population densities (<1,000 persons/sq mi)

and include exurbs, farming communities, and other rural areas. For this analysis, we coded rurality as a binary variable: living in a rural or non-rural (which combined the 3 other categories) area.

Covariates included age in years and also categorized (18–24, 25–39, 40–64, and 65 or older), race/ethnicity (Hispanic; white, non-Hispanic; black, non-Hispanic; Asian, non-Hispanic), gender (female, male), educational attainment (<12 years; high school diploma/12 years; some college or vocational school; college degree or more), marital status (married/living with a partner, widowed/divorced/separated, never married), and employment status (working or with a company, not working or looking for work).

Statistical Analyses

We first examined the data descriptively using unweighted frequencies and weighted percentages or weighted means and standard errors. We then conducted bivariate analyses to assess the unadjusted associations between rurality as well as each of the covariates and the 5 nonfatal suicidal behavior outcomes. Then, we fit multivariate logistic regression models (1 for each outcome) including rurality as the primary predictor, as well as the covariates that were associated with that outcome in bivariate analyses with a *P* value of < .05. To assess whether associations between rurality and each outcome differed by age category, race/ethnicity, gender, or educational attainment, we then fit models with interaction terms and used a global f-test to determine whether the interaction was significant, with a *P* value cutoff of .10.[28]

Among individuals reporting either suicidal ideation or attempt in the past 12 months, we also examined the prevalence of perceived need for treatment by rural/non-rural status. The sample sizes for these sub-analyses (168 rural residents reported suicidal ideation in the past 12 months, and 10 rural residents reported suicide attempt in the past 12 months, see Table 1) were too small to permit adjustment for covariates or tests of interaction.

All analyses were conducted using SAS version 9.4 (SAS Institute Inc., Cary, NC). Analyses were weighted to be representative of California's population in 2015 and 2016, and they were adjusted for the CHIS sampling design using Taylor series approximation methods.

Results

Table 1 displays the descriptive characteristics of our sample as unweighted frequencies and weighted percentages, overall and by rural/non-rural residence. About one-third of the sample was Hispanic; 42% was white, non-Hispanic; 14% was Asian, non-Hispanic; and 5.5% was black, non-Hispanic. About 40% of adults had a high school education or less, while 37% had a college degree or more. The majority (56%) of adults were married, and 58% were employed/working.

About 12% of participants resided in rural ZIP Codes. Adults living in rural census tracts were more likely than non-rural adults to be over 65, non-Hispanic white, married, and not working or looking for work; rural adults were less likely to be Hispanic, non-Hispanic black, or non-Hispanic Asian and less likely to have a college degree or more education.

Nonfatal suicidal behaviors were relatively rare: 9% of participants reported lifetime suicidal ideation, 2% in the past year, and 1% in the past 2 months; 3% reported ever attempting suicide, and less than 1% reported attempting suicide in the past year. Rural adults were more likely to have lifetime suicide ideation (9.9% vs. 9.1%) or attempt (3.6% vs. 3.2%), but non-rural adults were more likely to have suicide ideation (2.0% vs. 2.3%) or attempt (0.0% vs. 0.3%) in the past year. However, bivariate analyses (data available by request) showed that these rural/non-rural differences in nonfatal suicidal behaviors were not statistically significant. Bivariate analyses also showed that age, race/ethnicity, education, marital status, and employment status were significantly associated with almost all nonfatal suicidal behaviors, thus these variables were included as covariates in all analyses. (Race/ethnicity was not significantly associated with suicide ideation or attempt in the past year.)

Results of multivariable analyses are shown in Table 2. These models confirmed that rural residence was not statistically significantly associated with any of the nonfatal suicidal behaviors. Odds ratios for the associations between rural residence and lifetime suicidal ideation, suicidal ideation in the past 2 months, and lifetime suicide attempt were close to the null. Rural residence was associated with reduced odds of both suicidal ideation and attempt in the past 12 months, but confidence intervals were wide and included the null (OR: 0.87, 95% CI: 0.63–1.20 and OR: 0.55, 95% CI: 0.20–1.48, respectively).

In general, individuals identifying as a race/ethnicity other than white, non-Hispanic had lower odds of nonfatal suicidal behaviors compared to white, non-Hispanics. Females had lower odds of nonfatal suicidal behaviors than males. Those who were never married or were widowed/divorced/separated, and those not working, had higher odds of suicidal behaviors compared to married and working individuals, respectively. Increasing age was negatively associated with suicidal behaviors. Education below a college degree was associated with higher odds of suicide attempt, but not with suicide ideation.

In interaction models, we found that the association between rural residence and lifetime suicide ideation differed significantly by gender ($P = .05$). For women, living in a rural area was associated with a non-significant increase in odds of lifetime suicidal ideation (OR: 1.17; 95% CI: 0.94–1.44), whereas for men the odds ratio was non-significantly lower for rural residents (OR: 0.84; 95% CI: 0.65–1.08). We did not find any other significant interactions between rural residence and gender, age (categorical), race, or educational attainment for nonfatal suicidal behaviors.

Among individuals reporting either suicidal ideation (n=812) or suicide attempt (n=89) in the past 12 months, we compared the prevalence of perceived need for treatment among residents of rural and non-rural areas (Table 3). We found that rural and non-rural individuals did not differ significantly in their probability of reporting needing help for a mental health problem in the past year, having seen a primary care physician for mental health/drug/alcohol problems in the past year, having seen a psychiatrist for mental health/drug/alcohol problems in the past year, or taking a daily prescription for emotional problems in the past year.

Discussion

In this representative sample of California adults, we did not find that living in a rural area was associated with any difference in odds of nonfatal suicidal behaviors (ideation or attempt). Our data indicated that women living in rural areas had higher odds of suicidal ideation compared to women living in non-rural areas, but this difference was not significant and may have been due to chance. We also found that, among high-risk individuals—ie, those reporting nonfatal suicidal behaviors in the past 12 months—there were few and inconsistent rural/non-rural differences in perceived need for treatment, such as seeing a physician or taking a prescription for mental health problems.

These results were contrary to our original hypothesis, which was that rural (vs. non-rural) residence would be associated with prevalence of nonfatal suicidal behaviors. The results also did not provide strong support for our secondary hypothesis that prevalence of self-reported access to/uptake of mental health care would be lower among rural vs. non-rural residents experiencing suicidal thoughts and behaviors. However, our analysis was underpowered to detect these differences in perceived need for treatment, and future research should examine this question using larger samples.

Our results add to a growing literature showing that nonfatal suicidal behaviors and diagnoses of depression and other serious mental illness are equally common in rural and non-rural areas.[9,17,18] Previous analyses using CHIS data on California adolescents, however, showed that rural residence was associated with significantly *lower* odds of self-reported suicidal behaviors.[19] Rural adolescents in California may thus start out at lower risk for suicidal thoughts and attempts compared to non-rural youths, but experience increases in these behaviors during early adulthood that culminate in population-level risk equivalent to that of their non-rural peers.

Rates of suicide death are consistently higher in rural areas of the United States compared with urban areas, including in California.[16,29] Explanations often invoked to explain this pattern suggest that geographic disparities in suicide deaths arise from higher levels of (perhaps untreated) psychological distress that in turn give rise to suicidal ideation and nonfatal suicide attempt, in line with established theories of the development of suicidal behavior.[10,30,31] Our findings here suggest that other explanations may be more strongly related to rural/urban disparities in suicide death, at least in California. For example, rural residents have a higher likelihood of using lethal means such as firearms to attempt suicide, and thus higher likelihood of dying at an index attempt.[12–14] Prior research has shown that firearm ownership rates are more important that underlying rates of suicidal behavior in determining variation in suicide mortality across the US.[32] However, information about firearm access was not available in CHIS data, and we do not know how it differed for urban vs. rural respondents. Secondly, we did document rural/urban differences in treatment by a psychiatrist (including psychiatric medication) among suicidal individuals, and there may be additional differences in access to important mental health treatments that we could not assess, such as non-psychiatry counseling services and emergency mental health care.[10,33] Such gaps in access can severely hinder efforts to ensure suicidal individuals' safety in times

of acute distress. Rural communities are also farther from emergency medical care in the event of a suicide attempt, potentially increasing mortality rates.[22,34]

It is also possible that rural CHIS respondents were more reluctant than urban respondents to divulge suicidal thoughts and attempts, as well as treatment-seeking for mental health problems, as a result of stigma around mental illness, rural populations' beliefs about self-reliance, or other factors.[10,35] However, prior work suggests that rural residents are willing to talk about suicide.[33]

Strengths and Limitations

Our study had several notable strengths, including its use of a large, representative sample of adults from the nation's most populous and diverse state. The CHIS data also includes a rigorous assessment tool for nonfatal suicidal behaviors, and we were able to control for multiple individual-level confounders. The overall prevalence estimates we observed for past-year suicidal ideation (2.3%) and suicide attempt (0.3%) are similar to those reported in national samples (3.9% and 0.5%, respectively), strengthening our confidence in the reliability of these estimates.[36] National data on urban/rural differences in these behaviors are not currently available.

An important limitation to the current analysis is that the CHIS data may not be generalizable outside of California, particularly because rural areas in other parts of the US can differ in terms of demographics and social contexts from those in California. Rural areas in California and those nationwide have identical poverty rates (16.4%) and similar unemployment rates (5.5% and 4.7%, respectively); however, there are more per-capita rural health clinics and critical access hospitals in California's rural communities compared to those nationwide.[37] Nonetheless, these statistics do not capture broad heterogeneity across rural areas of the US in racial/ethnic make-up, economic base, health insurance coverage, cultural norms, and other important factors. Exploring differences in both suicidality and suicide mortality among heterogeneous rural areas represents an important area for future research. We also acknowledge that the nonfatal suicidal behaviors examined here are based on self-report; however, prior research suggests that such reports are reasonably reliable.[38] As described above, we did not have information on important information such as treatment-seeking of non-psychiatric counseling services and emergency mental health care, as well as firearm access. Despite using data from the largest state health survey in the US, our study was also limited by small cell sizes because nonfatal suicidal behaviors are relatively rare. Future research is needed using national data on nonfatal suicidal behaviors in rural areas.

Conclusion

In conclusion, our study finds that rural adults do not differ significantly in terms of suicidal distress behaviors compared to non-rural adults, and they do not appear to differ in terms of perceived need for mental health treatment. In light of the persistent rural disadvantage in suicide mortality in the US, these findings suggest the need for further attention to the unique risk factors driving suicidality in rural areas, as well as exploration of heterogeneity

in these factors across different rural contexts. Future research should examine how primary care, specialty, and emergency clinicians can better identify and serve rural individuals at immanent risk of suicide, including through the use of firearm safety planning[39] and culturally sensitive care.[33] Finally, federal and state policies that support the presence of behavioral health and emergency providers in rural areas will reduce disparities in access to care and could help ensure that distressed individuals receive potentially life-saving treatment.

Acknowledgments

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Table 1.

Descriptive Analyses for Subgroup Who Has Lived in Neighborhood for at Least 6 Months, Overall and by Rural/Non-rural Census Tract; CHIS 2015 and 2016 (n=40,041).

Characteristics of sample	Overall	Rural	Non-rural	
	Unweighted n (weighted %)			P value[a]
Rural census tract	8,387 (11.5)			
Age				< .01
18–24	2,995 (12.1)	465 (10.1)	2,530 (12.3)	
25–39	5,721 (26.2)	931 (20.3)	4,790 (27.0)	
40–64	16,299 (43.3)	3,485 (44.3)	12,814 (43.2)	
65	15,026 (18.4)	3,506 (25.3)	11,520 (17.5)	
Race/ethnicity				< .01
Hispanic	9,609 (35.1)	1,489 (27.6)	8,120 (36.0)	
White, non-Hispanic	22,737 (42.3)	6,254 (63.5)	16,483 (39.5)	
Black, non-Hispanic	2,101 (5.5)	103 (1.7)	1,998 (6.0)	
Asian, non-Hispanic	4,173 (14.3)	153 (3.2)	4,020 (15.7)	
Other or multiple races	1,421 (2.8)	388 (3.9)	1,033 (2.7)	
Educational attainment				< .01
<12 years	4,472 (17.2)	854 (16.0)	3,618 (17.3)	
High school diploma/12 years	9,143 (21.9)	2,166 (25.5)	6,977 (21.5)	
Some college or vocational	10,311 (23.6)	2,563 (26.5)	7,748 (23.3)	
College degree or more	16,115 (37.2)	2,804 (31.9)	13,311 (37.9)	
Marital status				< .01
Married/living with partner	20,570 (56.0)	4,646 (62.8)	15,924 (55.0)	
Widowed/divorced/separated	11,372 (17.5)	2,532 (17.9)	8,840 (17.5)	
Never married	8,099 (26.5)	1,209 (19.3)	6,890 (27.4)	
Employment status				< .01
Working or with a company	17,999 (57.9)	3,503 (51.8)	14,496 (58.7)	
Not working or looking for work	22,042 (42.1)	4,884 (48.1)	17,158 (41.3)	
Suicidal ideation				
Ever	3,796 (9.2)	888 (9.9)	2,908 (9.1)	.26
In past year	812 (2.3)	168 (2.0)	644 (2.3)	.31
In past 2 months	359 (0.9)	73 (1.0)	286 (0.9)	.73
Suicide attempt				
Ever	1,345 (3.3)	318 (3.6)	1,027 (3.2)	.38
In the past year	89 (0.3)	10 (0.0)	79 (0.3)	.07

[a] P values derived from Rao-Scott Chi-Square test.

Table 2.

Multivariate Associations Between Rurality and Covariates and Odds of Nonfatal Suicidal Behaviors for CHIS 2015 Participants Who Have Lived in Their Neighborhood for at Least 6 Months (n=40,041).

	Suicide ideation ever	Suicide ideation past 12 months	Suicide ideation past 2 months	Suicide attempt ever	Suicide attempt past 12 months
Rural census tract (vs. non-rural)	1.00 (0.85–1.18)	0.87 (0.63–1.20)	1.06 (0.64–1.75)	1.01 (0.77–1.33)	0.55 (0.20–1.48)
Race/ethnicity					
Asian, non-Hispanic	0.54 (0.39–0.73)	0.82 (0.40–1.66)	0.61 (0.26–1.44)	0.52 (0.31–0.89)	1.01 (0.24–4.28)
Black, non-Hispanic	0.53 (0.39–0.72)	0.96 (0.52–1.78)	0.85 (0.36–2.00)	0.68 (0.43–1.09)	1.35 (0.31–5.89)
Hispanic	0.38 (0.31–0.45)	0.58 (0.41–0.80)	0.56 (0.34–0.93)	0.43 (0.31–0.59)	0.63 (0.29–1.37)
Other or multiple races	1.15 (0.85–1.54)	1.22 (0.74–2.00)	1.62 (0.81–3.24)	1.81 (1.18–2.77)	1.84 (0.60–5.65)
White, non-Hispanic	Ref	Ref	Ref	Ref	Ref
Female (vs. male)	0.95 (0.82–1.09)	0.60 (0.44–0.81)	0.47 (0.32–0.70)	1.39 (1.11–1.74)	0.80 (0.45–1.44)
Age (years)	0.98 (0.97–0.98)	0.97 (0.97–0.98)	0.98 (0.97–0.99)	0.97 (0.96–0.98)	0.96 (0.93–0.99)
Educational attainment					
<12 years	0.89 (0.69–1.16)	1.17 (0.70–1.96)	0.95 (0.45–2.01)	1.68 (1.09–2.60)	7.16 (2.47–20.80)
High school diploma/12 years	1.10 (0.91–1.33)	1.14 (0.79–1.66)	1.16 (0.70–1.91)	1.48 (1.04–2.10)	2.38 (0.85–6.62)
Some college or vocational	1.26 (1.07–1.50)	1.58 (1.09–2.30)	1.41 (0.82–2.42)	1.53 (1.15–2.04)	4.41 (1.45–13.46)
College degree or more	Ref	Ref	Ref	Ref	Ref
Marital status					
Married/living with partner	Ref	Ref	Ref	Ref	Ref
Never married	1.51 (1.24–1.84)	1.66 (1.08–2.56)	2.26 (1.18–4.33)	1.37 (0.96–1.94)	1.86 (0.43–8.07)
Widowed/divorced/separated	1.82 (1.51–2.20)	1.78 (1.23–2.58)	1.88 (1.13–3.13)	2.13 (1.49–3.03)	1.07 (0.43–2.63)
Employment status					
Working or with a company	Ref	Ref	Ref	Ref	Ref
Not working or looking for work	1.47 (1.27–1.72)	1.97 (1.47–2.63)	3.60 (2.38–5.44)	1.72 (1.33–2.23)	4.56 (2.16–9.62)

Table 3.

Perceived Need for Treatment by Rural/Non-rural Status Among Participants Reporting Nonfatal Suicidal Behaviors (n=812 for suicidal ideation; n=89 for suicide attempt) in the Past 12 Months.

	Needed help for emotional/mental health or alcohol/drug problem in past year	Seen primary care physician for mental health or alcohol/drug problem in past year	Seen psychiatrist for mental health or alcohol/drug problem in past year	Take a daily prescription for emotional/person problem in past year
	n(%)			
Participants reporting suicidal ideation in past 12 months (n=812)				
Rural	137 (83.3)	76 (41.5)	88 (46.6)	97 (51.9)
Non-rural	502 (79.4)	262 (41.1)	319 (51.4)	335 (45.8)
P value[a]	.48	.96	.54	.44
Participants reporting suicide attempt in past 12 months (n=89)				
Rural	6 (47.4)	6 (59.1)	6 (55.9)	* Suppressed
Non-rural	67 (77.6)	40 (58.5)	53 (67.5)	* Suppressed
P value[a]	.14	.97	.52	

[a] P value derived from Rao-Scott Chi-Square test.