

# UC Merced

## UC Merced Previously Published Works

### Title

Rural/Urban Disparities in Adolescent Nonfatal Suicidal Ideation and Suicide Attempt: A Population-Based Study

### Permalink

<https://escholarship.org/uc/item/9pt4z4g5>

### Journal

Suicide and Life-Threatening Behavior, 48(6)

### ISSN

0363-0234

### Authors

Goldman-Mellor, Sidra  
Allen, Kristina  
Kaplan, Mark S

### Publication Date

2018-12-01

### DOI

10.1111/sltb.12390

Peer reviewed



## Rural/Urban Disparities in Adolescent Nonfatal Suicidal Ideation and Suicide Attempt: A Population-Based Study

SIDRA GOLDMAN-MELLOR, PHD, KRISTINA ALLEN, BA, AND MARK S. KAPLAN, DRPH

Adolescent suicide rates exhibit stark geographic disparities, with rates highest in rural areas. The causes of this disparity remain unclear. We investigated whether adolescent *nonfatal* suicidal ideation and attempt—leading risk factors for suicide—demonstrate the same rural/urban disparity. Using adolescent data from the 2011–2014 waves of the population-representative California Health Interview Survey (CHIS;  $N = 4,616$ ), we estimated associations between residence in a rural area and suicidal ideation and suicide attempt, as well as access to psychological care. Survey-weighted logistic regression models controlled for individual- and family-level covariates. Results showed that rural adolescents were, compared to urban adolescents, substantially less likely to report recent suicidal ideation (OR = 0.25, 95% confidence interval [CI] = 0.10, 0.61) and suicide attempt (OR = 0.17, 95% CI = 0.05, 0.66). Suicidal youths in rural and urban areas were equally likely, however, to report receiving psychological care. In this study, rural adolescents in California reported lower rates of nonfatal suicidal behavior compared to urban peers. This pattern contrasts with rates of adolescent suicide fatality, which are higher in rural areas. Results suggest that reducing geographic disparities in youth suicide may require multifaceted public health approaches, in addition to better identification and treatment for high-risk adolescents.

Suicide is now the second leading cause of death among youths aged 10 to 24 years in the United States. There were more than 5,500 youth suicide deaths in 2014, a rate of 8 per 100,000 (Centers for Disease Control and Prevention, 2014a). Certain subgroups of youths are at disproportionately high risk. Although the risk factors garnering most research attention are individual-level characteristics (e.g., history of depression,

externalizing behavior, early childhood adversity), key features of the social environment also play an important role in suicide risk (Johnson, Gruenewald, & Remer, 2011; Kaplan et al., 2015; Rehkopf & Buka, 2006). One of the most potent social environment risk factors is geography: Adolescents who live in rural areas commit suicide at rates that are 84% higher compared to their peers in urban areas (Singh, Azuine, Siahpush, &

---

SIDRA GOLDMAN-MELLOR and KRISTINA ALLEN, Department of Public Health, School of Social Sciences, Humanities, and Arts, University of California, Merced, CA, USA; MARK S. KAPLAN, Department of Social Welfare, Luskin School of Public Affairs, University of California, Los Angeles, CA, USA.

Address correspondence to Sidra Goldman-Mellor, Department of Public Health, School of Social Sciences, Humanities, and Arts, University of California, Merced CA 95343; E-mail: sgoldman-mellor@ucmerced.edu

Kogan, 2013). Although this rural/urban disparity in suicide deaths is of long standing, the gap has widened significantly over the past 15 years (Fontanella et al., 2015). Understanding why young people in rural areas experience such high risk for suicide, and using that knowledge to effectively target preventive services, is a public health priority.

Nonfatal suicidal behaviors (i.e., suicidal ideation and suicide attempt), which are far more common than fatal suicides, are among the strongest predictors of youth suicide (Bridge, Goldstein, & Brent, 2006; Centers for Disease Control and Prevention, 2014b). Adolescents who contemplate suicide are approximately three times more likely than nonideating peers to subsequently attempt suicide (Miranda, Ortin, Scott, & Shaffer, 2014), and prior suicide attempt is associated with a twenty-fold increase in risk of suicide death (Kotila & Lonnqvist, 1989). One leading hypothesis for rural adolescents' disproportionately high suicide rates suggests that these youths are more likely than urban peers to contend with untreated psychological distress that culminates in suicidal thoughts, attempts, and eventual suicide death (Hempstead, 2006; Hirsch, 2006).

Empirical studies that explicitly test this hypothesis by examining nonfatal suicidal behavior in youths across the rural–urban spectrum, however, are surprisingly rare. Two surveys from the 1990s and early 2000s found that rural–urban differences in self-reported nonfatal suicidal behavior were largely nonexistent (Albers & Evans, 1994; Johnson et al., 2008). In a study using data from the 2001–2004 National Comorbidity Survey-Adolescent survey (NCS-A), prevalence of past-year suicidal ideation did not differ by rurality, but past-year suicide attempt was significantly *less* common among rural youths compared to those in metropolitan areas (Husky et al., 2012). A study using 2008 data from Washington State found no difference in the prevalence of past-year suicidal ideation between urban and rural youths (Murphy, 2014). Whether findings from the few existing prior studies (most from the early 2000s) remain relevant today

is uncertain, particularly because adolescents' rates of nonfatal suicide behavior have risen significantly over the past 10 years (Centers for Disease Control and Prevention, 2013, 2014b; Kann et al., 2016).

It is also unclear whether rural adolescents are more likely than urban peers to go without psychological treatment if they become suicidal. It is well documented that rural areas suffer from shortages of mental health professionals (particularly pediatric mental health specialists), lengthier travel distances to providers, and other access challenges (Bird, Dempsey, & Hartley, 2001; Peek-Asa, Zwerling, & Stallones, 2004). Nationwide, however, adolescents' self-reported mental health service utilization does not appear to vary by rural/urban location (Lipari, Hedden, Blau, & Rubenstein, 2016; Merikangas et al., 2011), and mental health workforce shortages do not appear to explain rural areas' high rates of adolescent suicide (Fiske, Gatz, & Hannell, 2005; Fontanella et al., 2015). No research, however, has examined whether self-reported mental health service utilization differs between suicidal youths in rural versus urban areas.

The primary goal of this study was to examine whether residence in a rural area is associated with self-reported nonfatal suicidal ideation and attempts. We also investigated whether residence in a rural area was associated with receipt of psychological care among youths reporting suicidality. The study used adolescent data from the 2011–2012 and 2013–2014 waves of the California Health Interview Survey (CHIS), a large, population-representative survey. The analyses included linked data on the CHIS adolescents' parent respondents, allowing for control for multiple individual- and family-level confounding variables.

## METHOD

### *Sample*

Data from the adolescent portions of the combined 2011/2012, 2013, and 2014

waves of the CHIS (described in detail elsewhere; California Health Interview Survey, 2014a,b,c,d,e) were used for the analysis (Goldman-Mellor, Margerison-Zilko, Allen, & Cerda, 2016). Briefly, the CHIS is a large, repeated cross-sectional statewide telephone survey that collects health, social, and demographic information on a representative sample of the noninstitutionalized civilian population of California. The CHIS uses a two-stage design that combines a landline sample, supplemental surname-listed samples, and a statewide cell phone sample. One adult per household is randomly selected for interview, and if that adult is the parent/guardian of at least one adolescent (aged 12–17 years), one adolescent is also randomly selected for interview. Household response rates ranged from 51.4% to 53.9%, and adolescent response rates from 41% to 42.7%, during the period 2011–2014. This is comparable to other random-digit dialing (RDD) surveys. Poststratification and other nonresponse adjustments correct for selective nonresponse on the basis of demographic and geographic factors.

The CHIS included data on 4,616 adolescents during the study period. Of this analytic sample, 54.8%, 24.2%, and 21% were from the 2011/12, 2013, and 2014 CHIS surveys. All survey questions used in the current analysis were identical across the survey years. This study was approved by the institutional review board of the University of California, Merced.

#### *Rural/Urban Residence*

The exposure variable was rurality/urbanicity of each adolescent's household residence. The CHIS uses CLARITAS data to assign households to rurality/urbanicity levels, based on population density of the household's ZIP code and surrounding areas. A four-level categorization of this variable was used: "rural/town" areas have the lowest population densities and include exurbs, farming communities, and other rural areas; "second-city" areas are population centers of their surrounding

communities (e.g., satellite cities located near major metropolitan areas); "suburban" areas have lower population densities and typically include areas surrounding urban areas; and "urban" areas have the highest population density and include downtown areas of major cities and their surrounding neighborhoods.

#### *Outcome Measures*

*Lifetime and Recent Suicidal Behaviors.* All adolescents were asked whether they had ever seriously thought about committing suicide. Those who reported lifetime suicidal ideation were then asked whether they had had these thoughts in the past 12 months, and, if so, in the past 2 months. Respondents who reported any lifetime suicidal ideation were also asked whether they had ever attempted suicide, and, if so, whether they had made an attempt in the past 12 months. Each suicidal behavior outcome was analyzed as a dichotomous variable.

*Receipt of Psychological Care.* All adolescents were asked whether they had received any psychological or emotional counseling in the past 12 months. Those who responded "yes" were considered to have received psychological care.

#### *Covariates*

Multiple individual- and family-level covariates were included in the analyses, based on their established associations with suicidal behavior (Bridge et al., 2006). Adolescents' age, gender, and racial/ethnic status were assessed during the CHIS interview and based on self-report. Female adolescents who reported drinking five or more alcohol drinks in a row (four for males) during the past 30 days were coded as engaging in binge drinking. Health insurance status was coded as private, public, or none. Adolescents' family socioeconomic status was assessed using both parental self-reported education and household income as a percent of the federal poverty level. Adolescents' parents' marital status was coded as married or living with

partner versus other. Finally, adolescents whose parent respondent received a past-year Kessler-6 score  $\geq 13$  were coded as having parental history of psychological distress (Kessler et al., 2002), and adolescents whose parent reported a lifetime suicide attempt were coded as having a parental history of suicidal behavior.

### *Statistical Analyses*

All analyses were weighted to be representative of the California population in 2013 and were adjusted for the CHIS complex survey design using the Taylor series approximation method. Descriptive statistics (*t* tests and chi-square tests) were used to examine the distribution of covariates in the CHIS sample by rural/urban residence. Logistic regression models were used to examine the associations between rurality of residence and each adolescent outcome variable. Indicator coding was used for the rurality variable, such that odds of the outcome among adolescents residing in rural, second-city, and suburban areas were each compared to odds of the outcome among adolescents residing in urban areas. We estimated these models controlling for all aforementioned covariates, as well as for survey year, as frequencies of several study outcomes increased slightly across survey cycle years. We then ran logistic regression models predicting receipt of psychological care from rural/urban residence using analytic samples that were restricted to adolescents who reported suicidal ideation in the past 12 months. All analyses were performed using Stata 14 (StataCorp LP, College Station, TX, USA).

## **RESULTS**

Individual- and family-level characteristics of the study population, as well as their prevalence of self-reported suicidal behaviors and receipt of psychological care are displayed in Table 1, according to rurality of residence. Ten percent of California adolescents lived in a rural area. Nearly

48% lived in an urban area, and 22.5% and 19.3% lived in suburban and second-city areas, respectively. Compared to adolescents in urban areas, rural adolescents were less likely to be Latino or African American, less likely to have parents who were not married, and less likely to have a parent who had not graduated from high school, but they were more likely to have parental history of psychological distress (*p* values for all  $\chi^2 < .05$ ). Binge drinking did not differ by rural/urban residence. Suburban and second-city youths were more likely than urban youths to have private insurance, but health insurance status did not differ between rural and urban youths.

Overall, 9.5% of California adolescents reported ever thinking seriously about attempting suicide, and 2.5% reported a lifetime suicide attempt. Approximately 5% of adolescents reported having thoughts of suicide within the past year, and 2.4% reported such thoughts in the past 2 months. Just 1.6% of youths reported a suicide attempt in the past year. (Covariate associations with suicidal behavior outcomes are shown in the Table S1.) Past-year receipt of psychological care was reported by 11.9% of all study adolescents.

Prevalence estimates for nonfatal suicidal behaviors, according to rural/urban location, are shown in Figure 1. Rural adolescents consistently reported the lowest rates of nonfatal suicidal behavior, although logistic regression results presented in Table 2 show that, after accounting for confounding factors, rural adolescents' odds of lifetime suicidal behavior did not differ significantly from those of urban adolescents. However, rural adolescents had marginally lower odds of reporting past-year suicidal ideation (OR = 0.57; 95% CI = 0.28, 1.13; *p* < .10), and they were significantly less likely than urban adolescents to report seriously considering suicide in the past 2 months (OR = 0.25; 95% CI = 0.10, 0.59) and to report a past-year suicide attempt (OR = 0.17; 95% CI = 0.05, 0.67).

We then examined whether rural/urban residence was associated with likelihood

**TABLE 1**

*Characteristics of 2011–2014 California Health Interview Survey Adolescents Residing in Rural, Second-City, Suburban, and Urban Areas*

	Rural	Second City	Suburban	Urban
	Unweighted <i>n</i> = 847	Unweighted <i>n</i> = 765	Unweighted <i>n</i> = 1,318	Unweighted <i>n</i> = 1,686
	Weighted, 10.4% <sup>a</sup>	Weighted, 19.3% <sup>a</sup>	Weighted, 22.5% <sup>a</sup>	Weighted, 47.8% <sup>a</sup>
<i>Individual Characteristics<sup>a</sup></i>				
Gender (% female)	46.7%	52.5%	46.0%	48.9%
Age (mean [SE])	14.6 (0.09)	14.7 (0.08)	14.5 (0.08)	14.6 (0.06)
Race/ethnicity				
Hispanic	25.2%	19.9%	32.8%	37.1%
White	46.4%	47.2%	39.5%	25.2%
Black	2.0%	4.1%	4.6%	7.5%
Asian	5.9%	16.2%	5.8%	13.7%
Other/multiple	20.6%	12.7%	17.4%	16.5%
Binge drinking in past 30 days	3.6%	5.1%	2.7%	3.8%
Health insurance status				
Private insurance	52.3%	58.3%	76.7%	49.5%
Public insurance	42.0%	36.3%	20.4%	44.9%
No insurance	5.7%	5.4%	2.9%	5.6%
Received psychological care in past year (%)	10.7%	10.1%	12.4%	12.8%
<i>Family Characteristics<sup>a</sup></i>				
Household income as percentage of the FPL				
Below 100% FPL	20.5%	9.3%	18.8%	25.6%
100%–199% FPL	27.4%	16.6%	26.3%	26.9%
200%–299% FPL	13.0%	10.1%	15.6%	12.7%
300% FPL and above	39.1%	64.0%	39.4%	34.9%
Parental educational attainment				
Less than high school	20.4%	7.7%	20.2%	27.9%
High school graduate	20.5%	18.0%	16.1%	16.7%
Some college	26.5%	22.2%	27.3%	21.3%
College graduate	32.7%	52.2%	36.5%	34.1%
Parental marital status				
Married or living with partner	77.0%	80.6%	72.4%	69.0%
Other	23.0%	19.4%	27.6%	31.0%
Parental history of psychological distress	15.9%	8.2%	9.2%	8.9%
Parental history of suicidal behavior	4.6%	1.7%	2.8%	3.6%
<i>Suicidal Behaviors</i>				
Lifetime suicidal ideation	7.8%	10.4%	9.4%	9.5%
12-month suicidal ideation	3.2%	5.6%	4.9%	5.4%
2-month suicidal ideation	0.8%	1.9%	1.9%	3.2%

(continued)

**TABLE 1**  
(continued)

	Rural	Second City	Suburban	Urban
	Unweighted <i>n</i> = 847	Unweighted <i>n</i> = 765	Unweighted <i>n</i> = 1,318	Unweighted <i>n</i> = 1,686
	Weighted, 10.4% <sup>a</sup>	Weighted, 19.3% <sup>a</sup>	Weighted, 22.5% <sup>a</sup>	Weighted, 47.8% <sup>a</sup>
Lifetime suicide attempt	2.0%	2.0%	2.3%	2.8%
12-month suicide attempt	***	1.8%	0.8%	2.2%

FPL, federal poverty limit; SE, standard error.

\*\*\*Estimate is unstable (coefficient of variation is > 30 %).

<sup>a</sup>Percentage estimates are weighted to be representative of the California population and are adjusted for complex survey design effects.

of receiving psychological care among adolescents with past-year suicidal ideation (unweighted *n* = 193). There was no indication that rurality affected access to care: 51.8% of suicide-ideating urban teens, 46.1% of second-city teens, 55.7% of suburban teens, and 59.1% of rural teens reported receiving any psychological care in the past year. In logistic regression analyses, differences between suicidal rural and urban adolescents were nonsignificant (OR = 1.02, 95% CI = 0.30, 3.51).

Lastly, because stigmatized behaviors such as suicidal ideation and suicide

attempts may be underreported in population surveys (Safer, 1997), we conducted a supplementary analysis to assess whether the observed rural/urban disparity was also apparent for symptoms of psychological distress. Adolescents' reports of past-month serious psychological distress were assessed using the Kessler-6, a widely used six-item measure of depression and anxiety symptoms designed to identify cases of diagnosable mental illness in population surveys (Kessler et al., 2002). Adolescents who received a K-6 score of greater than or equal to 13 were considered to have serious

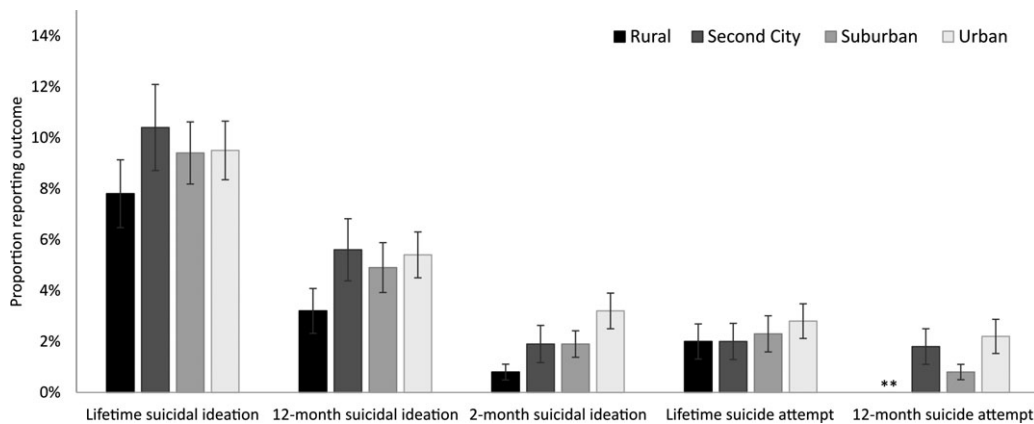


Figure 1. Prevalence of self-reported suicidal behavior among adolescents, according to rurality of their residential ZIP code. Error bars indicate standard errors. \*\*Indicates that the prevalence estimate for that group was too small to be stable.

**TABLE 2**  
*Associations Between Rurality of Residence and Nonfatal Suicidal Behavior Among CHIS Adolescents (2011–2014)*

Rurality	Lifetime Suicidal Behavior		Recent Suicidal Behavior	
	Suicidal ideation OR (95% CI) <sup>a</sup>	Suicide attempt OR (95% CI) <sup>a</sup>	Suicidal ideation (past 12 months) OR (95% CI) <sup>a</sup>	Suicidal ideation (past 2 months) OR (95% CI) <sup>a</sup>
Urban	1.0	1.0	1.0	1.0
Suburban	1.00 (0.67, 1.53)	0.88 (0.37, 2.11)	0.91 (0.50, 1.66)	0.61 (0.29, 1.28)
Second city	1.15 (0.74, 1.78)	0.87 (0.35, 2.15)	1.10 (0.61, 1.99)	0.62 (0.25, 1.54)
Rural	0.78 (0.49, 1.26)	0.69 (0.26, 1.85)	0.57 (0.28, 1.13)*	0.25 (0.10, 0.61)**

<sup>a</sup>Odds ratio adjusted for age, sex, CHIS survey year, race/ethnicity, binge drinking, health insurance, parental marital status, parental educational attainment, household income, parental history of psychological distress, and parental history of suicidal behavior.  
 \* $p < .10$ , \*\* $p < .05$ .

psychological distress. In the study sample overall, past-month serious psychological distress was reported by 4.4% of adolescents. In survey-weighted logistic regression models controlling for covariates, rural adolescents were significantly less likely than urban adolescents to report recent psychological distress (survey-weighted percentages of 1.9% vs. 5.2%; OR = 0.36; 95% CI = 0.16, 0.83).

## DISCUSSION

Adolescents in rural areas of the United States commit suicide at disproportionately high rates (Fontanella et al., 2015; Singh et al., 2013). The results of the current study, however, suggest that rural youths are actually less likely than urban youths to engage in *nonfatal* suicidal behavior. This “reverse” disparity, which survived adjustment for a wide range of individual- and family-level covariates, was of large magnitude (ORs of 0.17–0.57) and observed for both recent suicidal ideation and suicide attempt. These findings are consistent with, and of similar magnitude to, NCS-A data showing low rates of nonfatal suicide attempt among rural teens and elevated rates among urban teens (Husky et al., 2012). The current findings partly diverge, however, from other earlier analyses showing that rates of suicidal behavior and depression did not differ between rural and urban adolescents (Albers & Evans, 1994; Johnson et al., 2008; Murphy, 2014). Reasons for these inconsistencies are not known, but may include differing sample characteristics.

One alternative explanation for the study findings is that rural adolescents may be less likely to report suicidal behavior compared to urban adolescents, owing to regional differences in religiosity, cultural emphasis on individualism, or stigmatization of mental disorders (Hirsch, 2006). However, in supplementary analyses we also found a similar rural/urban disparity in adolescents’ symptoms of serious psychological distress, which are unlikely to be subject to



the same degree of self-report bias (Hunt, Auriemma, & Cashaw, 2003). This strengthens the inference that the observed rural/urban disparity in suicidal behavior is real.

Our results did not support the hypothesis that excess suicide rates among rural teens may be partially attributable to reduced access to and use of mental health services in rural areas (Fontanella et al., 2015; Singh et al., 2013). Rural and urban California adolescents—both in the sample overall and among the subsample reporting past-year suicidal ideation—were equally likely to report receiving psychological care. In general, their rates of psychological care were low, a finding that highlights the ongoing struggle to identify and counteract barriers to the recognition and treatment of serious mental health problems (Merikangas et al., 2011). Our findings are consistent with some evidence that adolescents' mental health service utilization nationwide does not vary by rural/urban location (Merikangas et al., 2011), at least for services received in specialty (inpatient or outpatient mental health) or educational settings (Lipari et al., 2016). However, they are inconsistent with other work, mostly in adults, showing that residents of rural areas receive less mental health treatment than those residing in more metropolitan areas (Hauenstein et al., 2007) and that rural suicide decedents in the United States are less likely than urban decedents to have a previous history of mental health treatment (Searles, Valley, Hedegaard, & Betz, 2014). While the reliability of adolescents' reports of mental health service utilization tends to be good (Merikangas et al., 2011; Stiffman et al., 2000), we did not have detailed information about the psychological care received by adolescents in our study. We thus could not assess whether aspects of mental health service beyond simple availability—such as quality of the care, specialty training of the provider, or quantity of treatment—differed by rural/urban residence.

Strengths of our study include its use of a large, general-population sample of

adolescents from the nation's most populous and diverse state, rigorous assessments of suicidal behavior, and statistical control for multiple individual- and family-level confounders (including parental history of mental health problems and adolescent binge drinking, which have been cited as a potential explanation for rural youths' high suicide rates; Hirsch, 2006).

This study has several limitations. First, adolescent response rates in CHIS were low (comparable with other population-based surveys in the current era of declining response rates), although research suggests that low response rates do not generally bias survey results (Keeter, Miller, Kohut, Groves, & Presser, 2006). Response rates in rural counties were generally higher than in more urbanized counties (California Health Interview Survey, 2014d); unfortunately, CHIS does not report response rates broken down by rurality of the ZIP code. CHIS uses standardized methods to correct for nonresponse (California Health Interview Survey, 2014a,e), but these approaches may not fully account for higher nonresponse rates among distressed and suicidal youths. If mental health-related nonresponse was more common in rural than in urban areas, our prevalence estimates could be biased. However, such an effect would have to be large in order to counteract the substantial and consistent rural/urban disparity patterns we observed; also, as described earlier, our supplementary analyses of psychological distress suggest that this possibility is unlikely. Second, our measure of rurality is based on ZIP code-level population density and proximity to metropolitan centers. Future research using other taxonomies of rurality/urbanicity would be warranted. We believe our use of a ZIP code-level measure, however, increases our findings' robustness, as county-level measures can fail to account for within-county demographic and economic heterogeneity (Hart, Larson, & Lishner, 2005). Lastly, as noted, we did not have measures of the quantity or quality of psychological care received by CHIS adolescents. We also did not have information

about the specific condition or symptoms (e.g., suicidality or some other problem) for which the adolescents sought psychological care.

Whether findings from our California-based study are applicable to other parts of the United States is unclear. Rates of nonfatal suicidal behavior appear to be somewhat lower among California adolescents compared to those nationally, although exact comparisons are difficult due to age differences in the populations surveyed (Kann et al., 2014). Adolescent suicide mortality rates are also lower (2.9 per 100,000 in California vs. 4.8 per 100,000 nationally in 2013; California Department of Public Health, 2015; Centers for Disease Control and Prevention, 2014a). Nevertheless, California exhibits the typical rural–urban disparity in suicide mortality, with a rural teen suicide rate that is approximately 2.4 times greater than that of urban teens (California Department of Public Health, 2015), suggesting that the patterns we observed may well generalize to other states. Additional research using national data is needed to identify whether the paradoxical findings we observed for rural youths in California—reduced risk of nonfatal suicidal behavior, despite their elevated risk for suicide fatality—are mirrored nationwide.

As with all health disparities, rural/urban disparities in adolescent suicide arise from a complex array of factors. The results of our study, however, suggest that disproportionate burden of suicidal distress among rural adolescents is unlikely to be the predominant driving force behind this particular disparity, at least in California. In light of this, other factors warrant additional consideration. One such factor is that rural youths tend to have access to and utilize more highly lethal means (e.g., firearms) when they do attempt suicide (Fontanella et al., 2015; Simonetti, Mackelprang, Rowhani-Rahbar, Zatzick, & Rivara, 2015). Although California gun storage regulations are strict, the firearms used in youth suicides in the state

are usually owned by a person in the victim's household (Wright, Wintemute, & Claire, 2008). This suggests that improving rural households' adherence to gun storage regulations may help firearm adolescent suicide prevention efforts, especially as suicides involving firearms frequently result from impulsive reactions to acute stressors (Bloch, 2016; Kaplan, McFarland, & Huguet, 2009). Nevertheless, the rural/urban disparity in adolescent deaths is apparent across all methods of suicide (Fontanella et al., 2015), highlighting the multifactorial nature of this public health problem.

Additional factors of potential importance include rural youths' poorer access to postsuicide attempt medical care—in particular, their greater distance from emergency medical service personnel and trauma care facilities (Grossman et al., 1997; Peek-Asa et al., 2004)—and greater stigma attached to mental health problems among rural communities, which may discourage emotionally distressed adolescents from disclosing their symptoms or seeking help (Hirsch, 2006). Public health and policy strategies that include enhanced compliance checks with firearm owners, family-oriented suicide education campaigns, improved access to emergency medical services, and stigma reduction campaigns would likely decrease the number of fatal suicides among all youths, but may be particularly effective for those in rural areas (Mann & Michel, 2016). Improved identification, treatment, and monitoring of high-risk youths in rural areas will also be necessary.

This study provides evidence that rural adolescents in California are substantially less likely to report nonfatal suicidal ideation and suicide attempts compared to adolescents in urban areas. These findings stand in striking contrast with rates of adolescent suicide fatality, which are notably higher in rural locales. Additional research investigating the generalizability and underlying causes of our findings is warranted and may have important public health benefits.

## REFERENCES

- ALBERS, E., & EVANS, W. (1994). Suicide ideation among a stratified sample of rural and urban adolescents. *Child & Adolescent Social Work Journal*, 11, 379–389.
- BIRD, D. C., DEMPSEY, P., & HARTLEY, D. (2001). *Addressing mental health workforce needs in underserved rural areas: Accomplishments and challenges*. Portland, ME: Maine Rural Health Research Center.
- BLOCH, M. H. (2016). Reducing adolescent suicide. *Journal of Child Psychology and Psychiatry*, 57, 773–774.
- BRIDGE, J. A., GOLDSTEIN, T. R., & BRENT, D. A. (2006). Adolescent suicide and suicidal behavior. *Journal of Child Psychology and Psychiatry*, 47, 372–394.
- California Department of Public Health. (2015). *EPICenter: California Injury Data Online*. Retrieved March 7, 2016, from <http://epicenter.cdph.ca.gov/Default.aspx>.
- California Health Interview Survey. (2014a). *CHIS 2011–2012 methodology series: Report 1 - Sample design*. Los Angeles, CA: UCLA Center for Health Policy Research.
- California Health Interview Survey. (2014b). *CHIS 2011–2012 methodology series: Report 2 - Data collection methods*. Los Angeles, CA: UCLA Center for Health Policy Research.
- California Health Interview Survey. (2014c). *CHIS 2011–2012 methodology series: Report 3 - Data processing procedures*. Los Angeles, CA: UCLA Center for Health Policy Research.
- California Health Interview Survey. (2014d). *CHIS 2011–2012 methodology series: Report 4 - Response rates*. Los Angeles, CA: UCLA Center for Health Policy Research.
- California Health Interview Survey. (2014e). *CHIS 2011–2012 methodology series: Report 5 - Weighting and variance estimation*. Los Angeles, CA: UCLA Center for Health Policy Research.
- Centers for Disease Control and Prevention. (2013). *Trends in the prevalence of suicide-related behavior, national YRBS: 1991–2013*. Retrieved March 2, 2017, from <http://www.cdc.gov/healthyyouth/yrbs/factsheets/index.htm>.
- Centers for Disease Control and Prevention. (2014a). *Web-based Injury Statistics Query and Reporting System (WISQARS): Fatal injury reports*. Retrieved September 2, 2016, from [www.cdc.gov/ncipc/wisqars](http://www.cdc.gov/ncipc/wisqars).
- Centers for Disease Control and Prevention. (2014b). *Web-based Injury Statistics Query and Reporting System (WISQARS): Non-fatal injury reports*. Retrieved January 27, 2016, from [www.cdc.gov/ncipc/wisqars](http://www.cdc.gov/ncipc/wisqars).
- FISKE, A., GATZ, M., & HANNELL, E. (2005). Rural suicide rates and availability of health care providers. *Journal of Community Psychology*, 33, 537–543.
- FONTANELLA, C., HIANCE-STEELESMITH, D., PHILLIPS, G., BRIDGE, J. A., LESTER, N., SWEENEY, H. A., ET AL. (2015). Widening rural-urban disparities in youth suicides, United States, 1996–2010. *JAMA Pediatrics*, 169, 466–473.
- GOLDMAN-MELLOR, S., MARGERISON-ZILKO, C., ALLEN, K., & CERDA, M. (2016). Perceived and objectively-measured neighborhood violence and adolescent psychological distress. *Journal of Urban Health*, 93, 758–769.
- GROSSMAN, D. C., KIM, A., MACDONALD, S. C., KLEIN, P., COPASS, M. K., & MAIER, R. V. (1997). Urban-rural differences in prehospital care of major trauma. *Journal of Trauma and Acute Care Surgery*, 42, 723–729.
- HART, L. G., LARSON, E. H., & LISHNER, D. M. (2005). Rural definitions for health policy and research. *American Journal of Public Health*, 95, 1149–1155.
- HAUENSTEIN, E. J., PETTERSON, S., ROVNYAK, V., MERWIN, E., HEISE, B., & WAGNER, D. (2007). Rurality and mental health treatment. *Administration and Policy in Mental Health and Mental Health Services Research*, 34, 255–267.
- HEMPSTEAD, K. (2006). The geography of self-injury: Spatial patterns in attempted and completed suicide. *Social Science and Medicine*, 62, 3186–3196.
- HIRSCH, J. K. (2006). A review of the literature on rural suicide: Risk and protective factors, incidence, and prevention. *Crisis*, 27, 189–199.
- HUNT, M., AURIEMMA, J., & CASHAW, A. C. (2003). Self-report bias and underreporting of depression on the BDI-II. *Journal of Personality Assessment*, 80, 99–103.
- HUSKY, M. M., OLFSON, M., HE, J. P., NOCK, M. K., SWANSON, S. A., & MERIKANGAS, K. R. (2012). Twelve-month suicidal symptoms and use of services among adolescents: Results from the National Comorbidity Survey. *Psychiatric Services*, 63, 989–996.
- JOHNSON, F. W., GRUENEWALD, P. J., & REMER, L. G. (2011). Suicide and alcohol: Do outlets play a role? *Alcohol: Clinical and Experimental Research*, 33, 2124–2133.
- JOHNSON, A. O., MINK, M. D., HARUN, N., MOORE, C. G., MARTIN, A. B., & BENNETT, K. J. (2008). Violence and drug use in rural teens: National prevalence estimates from the 2003 youth risk behavior survey. *The Journal of School Health*, 78, 554–561.
- KANN, L., KINCHEN, S., SHANKLIN, S. L., FLINT, K. H., KAWKINS, J., HARRIS, W. A., ET AL.

- (2014). Youth risk behavior surveillance—United States, 2013. *Morbidity and Mortality Weekly Report. Supplements*, 63, 1–168.
- KANN, L., MCMANUS, T., HARRIS, W. A., SHANKLIN, S. L., FLINT, K. H., HAWKINS, J., ET AL. (2016). Youth risk behavior surveillance — United States, 2015. *Morbidity and Mortality Weekly Report. Surveillance Summaries*, 65, 1–29.
- KAPLAN, M. S., HUGUET, N., CAETANO, R., GIESBRECHT, N., KERR, W. C., & MCFARLAND, B. H. (2015). Economic contraction, alcohol intoxication and suicide: Analysis of the national violent death reporting system. *Injury Prevention*, 21, 35–41.
- KAPLAN, M. S., MCFARLAND, B. H., & HUGUET, N. (2009). Characteristics of adult male and female firearm suicide decedents: Findings from the national violent death reporting system. *Injury Prevention*, 15, 322–327.
- KEETER, S., MILLER, C., KOHUT, A., GROVES, R. M., & PRESSER, S. (2006). Consequences of reducing nonresponse in a national telephone survey. *Public Opinion Quarterly*, 64, 125–148.
- KESSLER, R. C., ANDREWS, G., COLPE, L. J., HIRIPI, E., MROCZEK, D. K., NORMAND, S. L. T., ET AL. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine*, 32, 959–976.
- KOTILA, L., & LONNQVIST, J. (1989). Suicide and violent death among adolescent suicide attempters. *Acta Psychiatrica Scandinavica*, 79, 453–459. <https://doi.org/10.1111/j.1600-0447.1989.tb10287.x>
- LIPARI, R., HEDDEN, S., BLAU, G., & RUBENSTEIN, L. (2016). *The CBHSQ report: Adolescent mental health service use and reasons for using services in specialty, educational, and general medical settings*. Bethesda, MD: SAMHSA.
- MANN, J. J., & MICHEL, C. A. (2016). Prevention of firearm suicide in the United States: What works and what is possible. *American Journal of Psychiatry*, 173, 969–979.
- MERIKANGAS, K. R., HE, J., BURSTEIN, M., SWENDSEN, J., AVENEVOLI, S., CASE, B., ET AL. (2011). Service utilization for lifetime mental disorders in U.S. adolescents: Results of the National Comorbidity Survey-Adolescent Supplement (NCS-A). *Journal of the American Academy of Child and Adolescent Psychiatry*, 50, 32–45.
- MIRANDA, R., ORTIN, A., SCOTT, M., & SHAFFER, D. (2014). Characteristics of suicidal ideation that predict the transition to future suicide attempts in adolescents. *Journal of Child Psychology and Psychiatry*, 55, 1288–1296.
- MURPHY, S. M. (2014). Determinants of adolescent suicidal ideation: Rural versus urban. *The Journal of Rural Health*, 30, 175–185.
- PEEK-ASA, C., ZWERLING, C., & STALLONES, L. (2004). Acute traumatic injuries in rural populations. *American Journal of Public Health*, 94(10), 1996–1998.
- REHKOPF, D. H., & BUKA, S. L. (2006). The association between suicide and the socio-economic characteristics of geographical areas: A systematic review. *Psychological Medicine*, 36, 145–157.
- SAFER, D. J. (1997). Self-reported suicide attempts by adolescents. *Annals of Clinical Psychiatry*, 9, 263–269.
- SEARLES, V. B., VALLEY, M. A., HEDEGAARD, H., & BETZ, M. E. (2014). Suicides in urban and rural counties in the United States, 2006–2008. *Crisis*, 35, 18–26.
- SIMONETTI, J., MACKELPRANG, J., ROWHANI-RAHBAR, A., ZATZICK, D., & RIVARA, F. (2015). Psychiatric comorbidity, suicidality, and in-home firearm access among a nationally representative sample of adolescents. *JAMA Psychiatry*, 72, 152–159.
- SINGH, G. K., AZUINE, R. E., SIAHPUSH, M., & KOGAN, M. D. (2013). All-cause and cause-specific mortality among US youth: Socioeconomic and rural-urban disparities and international patterns. *Journal of Urban Health*, 90, 388–405.
- WRIGHT, M. A., WINTEMUTE, G. J., & CLAIRE, B. E. (2008). Gun suicide by young people in California: Descriptive epidemiology and gun ownership. *Journal of Adolescent Health*, 43, 619–622.

Manuscript Received: April 21, 2017

Revision Accepted: June 15, 2017

## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

**TABLE S1** Covariate Associations with Recent Suicidal Behavior Among 2011–2014 California Health Interview Survey Adolescents