

## ORIGINAL ARTICLE

## Examining Rural/Urban Differences in Prescription Opioid Misuse Among US Adolescents

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### Abstract

**Purpose:** This study examines differences in prescription opioid misuse (POM) among adolescents in rural, small urban, and large urban areas of the United States and identifies several individual, social, and community risk factors contributing to those differences.

**Methods:** We used nationally representative data from the 2011 and 2012 National Survey on Drug Use and Health and estimated binary logistic regression and formal mediation models to assess past-year POM among 32,036 adolescents aged 12-17.

**Results:** Among adolescents, 6.8% of rural, 6.0% of small urban, and 5.3% of large urban engaged in past-year POM. Net of multiple risk and protective factors, rural adolescents have 35% greater odds and small urban adolescents have 21% greater odds of past-year POM compared to large urban adolescents. The difference between rural and small urban adolescents was not significant. Criminal activity, lower perceived substance use risk, and greater use of emergency medical treatment partially contribute to higher odds among rural adolescents, but they are also partially buffered by less peer substance use, less illicit drug access, and stronger religious beliefs.

**Conclusions:** Researchers, policy makers, and treatment providers must consider the complex array of individual, social, and community risk and protective factors to understand rural/urban differences in adolescent POM. Potential points of intervention to prevent POM in general and reduce rural disparities include early education about addiction risks, use of family drug courts to link criminal offenders to treatment, and access to nonemergency medical services to reduce rural residents' reliance on emergency departments where opioid prescribing is more likely.

**Key words** demography, drug abuse, epidemiology, geography, sociology.

Prescription opioid misuse (POM) is a critical US public health issue. POM is responsible for over 16,000 US deaths annually<sup>1</sup> and has an estimated annual cost of nearly \$56 billion (2009 USD).<sup>2</sup> For every opioid-related death, there are 10 treatment admissions and 32 emergency department (ED) visits.<sup>3</sup> Of particular concern is the substantial increase in adolescent POM since the 1960s (0.4% in 1965 to 8% by 2012),<sup>4,5</sup> partly due to the

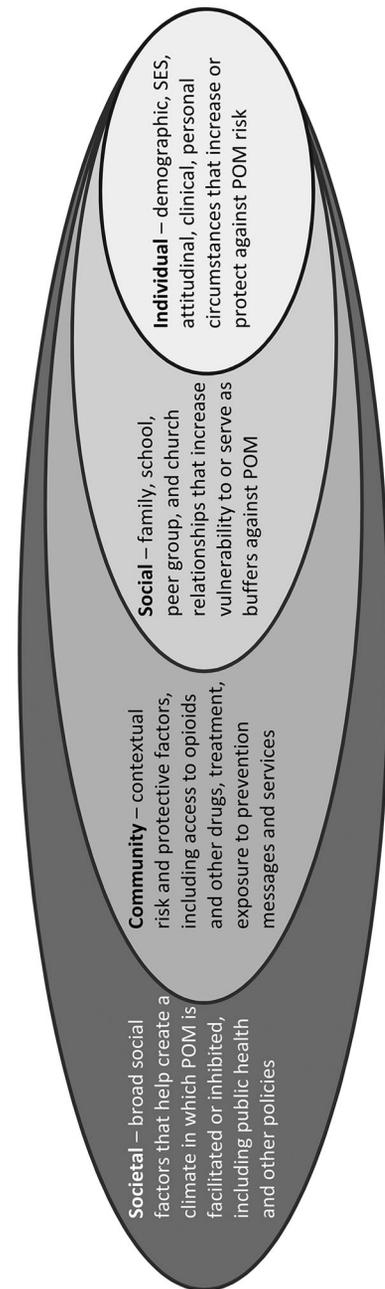
almost doubling of opioid prescriptions written for adolescents and young adults since 1994.<sup>6</sup>

Adolescence is a critical time to study POM because most substance use begins during this period,<sup>7</sup> and individuals who initiate use before age 18 are more likely to develop a POM disorder than those who initiate later in life.<sup>8</sup> Studies on risk factors for adolescent POM find risky attitudes and misconceptions regarding the illegality and

safety of prescription opioids make experimenting with opioids more attractive compared to illicit drugs.<sup>9</sup> In a systematic review of nationally representative studies,<sup>10</sup> low family income, poor mental health, receipt of mental health treatment, illicit drug use, delinquency, residential instability, ED use, peer norms, parental factors, and weaker bonds to school were all positively associated with adolescent POM. Although these risk factors differ between rural and urban areas, research on rural/urban differences in adolescent POM, and particularly the role of different risk and protective factors in explaining those differences, remains sparse.

Spatial variation in POM is of great interest to researchers and policy makers. Indeed, the origins of the POM epidemic can be traced to rural America, where reports of OxyContin abuse first surfaced.<sup>11</sup> Communities along the rural-urban continuum now struggle with high rates of opioid overdose deaths, excessive opioid diversion, and increased treatment admissions.<sup>12-15</sup> Yet, there is scant nationally representative research that includes rural/urban status in models predicting adolescent POM,<sup>16-19</sup> and only Havens et al<sup>16</sup> explicitly examine rurality as a main independent variable of interest, finding rural adolescents to be at greater risk than their urban counterparts, even after controlling for multiple confounders. Though informative, this study assessed lifetime rather than recent POM, and a focus on the specific risk and protective factors that contribute to rural/urban differences was beyond the scope of the paper. Dew and colleagues<sup>20</sup> propose a multidimensional approach to understanding substance use that accounts not only for individual circumstances, but also integrates social factors and community risk and prevention influences. This social-ecological model (Figure 1), popularized in sociological research on neighborhood effects<sup>21-24</sup> and increasingly employed in public health research,<sup>20,25</sup> allows us to consider the complex interplay between the multiple factors that put adolescents at risk of or buffer against substance abuse within rural and urban communities. To our knowledge, no existing research applies this framework to try to understand rural/urban differences in adolescent POM.

Broad societal trends, including deteriorating rural economic and employment conditions over the past 30 years,<sup>26,27</sup> historically high rates of opioid prescribing,<sup>28</sup> and expanded trafficking networks and Internet availability of opioids<sup>20</sup> have led to increased demand for and access to opiates in rural areas. Rural and urban social and community contexts vary in significant ways that may exacerbate the effects of these societal trends. Dew et al<sup>20</sup> suggest distinctive features of rural areas increase the likelihood of substance abuse, including higher poverty rates,<sup>26,27,29</sup> peer norms,<sup>30,31</sup> lack of recreational



**Figure 1** A Social-Ecological Model for Understanding Rural/Urban Differences in Adolescent POM.

activities, family and community denial about substance abuse, and an emphasis on self-reliance that leads to lack of treatment services and prevention efforts.<sup>20</sup> On the other hand, rural adolescents may be buffered by traditional family values that emphasize interpersonal support, organized religion,<sup>32</sup> and greater school involvement.<sup>33</sup> Rural adolescents may also be at reduced risk of POM due to greater isolation from drug markets.<sup>34</sup> Ultimately, the complexities of multiple intersecting risk and protective factors suggest rural adolescents may be simultaneously buffered by certain aspects of their families, schools, and communities and at increased risk of POM relative to urban adolescents as a result of other factors.

Understanding the factors that influence rural/urban differences in POM is important for tailoring interventions to the unique needs of adolescents in these different spatial environments. This study builds on previous research on rural/urban differences in POM by: (1) using a large nationally representative sample of US adolescents; (2) conceptualizing rural/urban status as a “trichotomy” (ie, large urban, small urban, rural) rather than the dichotomy commonly found in the literature; (3) employing a social-ecological framework that accounts for multiple individual, social, and community conditions that may contribute to rural/urban differences in POM; and (4) conducting formal mediation analyses to identify the specific contributions of each factor to rural/urban differences in POM.

## Methods

### Data

Data are from the 2011 and 2012 National Survey on Drug Use and Health (NSDUH),<sup>i,35,36</sup> an annual household survey of the US population aged 12 and older. The NSDUH includes a section on “youth experiences” making it ideal for studying risk factors for adolescent POM. Our analytic sample included 32,036 respondents aged 12-17.

### Measures

Our outcome was past-year POM. The NSDUH defines POM as use without a prescription from a doctor or use for the feeling or experience it causes. The independent variable was rural/urban trichotomy: lives in a core-based statistical area (CBSA) with 1 million or more persons (*large CBSA*), lives in a CBSA with fewer than 1 million persons (*small CBSA*), and does not live in a CBSA

(*rural*).<sup>ii</sup> Suburban areas are included within both large and small CBSAs.

We examined the contributions of individual, social, and community factors to rural/urban differences in adolescent POM. *Individual circumstances* included demographic characteristics (age, gender, race/ethnicity, number of people in the household), SES (annual family income, family receipt of public assistance [SNAP and/or cash assistance], adolescent health insurance), history of delinquency/substance use (committed crime in past year [gang fighting, carried handgun, sold illegal drugs, stole/tried to steal item worth \$50+, attacked someone with intent to seriously harm]; ever been arrested and booked; perceived substance use risk index; smoked average of 1+ pack of cigarettes/day in past year; past-year binge drinking, marijuana use, other illicit drug use [powder cocaine, crack, heroin, hallucinogens, LSD, PCP, ecstasy, inhalants, methamphetamine]; and misuse of nonopioid medications [tranquilizers, sedatives, and stimulants]), and clinical characteristics (poor/fair self-rated health and past-year major depressive episode, doctor’s diagnosis of anxiety, ED treatment, and overnight hospitalization for emotional treatment). Age of first substance use was strongly correlated with age, so we excluded it from our models. Statistical tests for multicollinearity (VIF, TOL) revealed no problems with any other predictors.

*Social factors* included family characteristics (both parents living in household, parent involvement index, parents’ attitudes toward substance use index), school factors (school connectedness index, past-year exposure to school-based prevention classes/activities), peer influences (peer substance use index, friends’ attitudes toward substance use index), religiosity (past-year religious service attendance, religious beliefs index), and characteristics encompassing all 3 social domains (past-year participation in school, community, or faith-based activities; lack of social/emotional support; and residential instability [moved in past 5 years]). Consistent with Ford,<sup>18</sup> respondents who were not attending school were assigned a score of 0 on school-specific items so we could include this important at-risk group.

*Community and environmental influences* included being approached by somebody selling illicit drugs in the past 30 days; drug access index; past-year participation in non-school-based self-help, counseling, or prevention (including AA/substance abuse prevention); and past-year exposure to non-school-based substance abuse prevention messages.

Specific variables included in each index, their anchors, and Cronbach’s alphas are shown in Table 1.