COMMUNITY CHARACTERISTICS AND METHAMPHETAMINE USE: A SOCIAL DISORGANIZATION PERSPECTIVE

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The current study applied the first macro-level analysis of methamphetamine use. The extant literature on macro-level drug use has suggested that areas with high levels of social disorganization experience high rates of drug use. In this study it was expected that school districts with low SES and high rates of ethnic heterogeneity, residential instability and family disruption will experience high rates of methamphetamine use. In addition, it was expected that rural and suburban school districts would show higher rates than urban school districts. Social disorganization hypotheses were partially supported as low economic status and residential instability are associated with methamphetamine use. Interestingly, a high percentage of white population is positively associated with methamphetamine use. Further, school districts in the southwest region of Michigan were significantly more likely to have higher percentages of methamphetamine users.

INTRODUCTION

Recently, there have been several findings that indicate the use of methamphetamine in the United States has reached an unprecedented level and has spread throughout the Midwest and Southeast regions, especially in rural areas (Herz & Murray, 2000, 2003; National Drug Intelligence Center [NDIC], 2004; Weisheit, 2004). In 2005, the National Association of Counties (NACO) reported that 87 percent of responding law enforcement agencies in the U.S. reported increases in methamphetamine-related

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arrests in the past three years. The same report noted that 58 percent of counties stated that methamphetamine was their largest drug problem (NACO, 2005). While many media accounts are often sensationalized (see Sommers & Baskin, 2006), these agency and governmental reports indicate reasons to be concerned with dangers associated with substantial levels of methamphetamine use that warrant further policy considerations and exploration of the influences surrounding methamphetamine use.

In 1996 Congress passed the Comprehensive Methamphetamine Act, under which the Methamphetamine Interagency Task Force (MITF) was created. The task force stated the following in its final report:

Of particular concern, methamphetamine use is emerging in cities and rural settings previously thought to be largely unaffected by illicit drug use and is increasing among populations not previously known to use this drug. Methamphetamine use is a particularly serious problem in some rural areas, many of which lack the infrastructures necessary to deal with a major drug problem. For example, many rural jurisdictions do not have local treatment providers or the expertise to respond to methamphetamine abusers. (National Institute of Justice and Office of National Drug Control Policy, 2000)

To control the use and production of methamphetamine, criminal justice agencies at federal, state and local levels have attempted to implement numerous strategies (see Office of National Drug Control Policy, 2007). Recently, a provision to restrict the sale of over-the-counter medicine and increase penalties for smuggling and manufacturing methamphetamine was included within the USA Patriot Improvement and Reauthorization Act (U.S. Patriot Act, 2006). Many of these prevention and intervention efforts are geared toward individual offenders rather than the social structural, community-level factors that influence methamphetamine use. (e.g., Herz, 2000).

Akers (1998) has noted that in addition to individual-level factors, macro-level explanations of drug use are needed to more fully understand the phenomenon. The extent to which the variation in methamphetamine use across regions and within high-use regions is associated with variation in features of the social structure is not well understood at this time. Despite increases in government expenditures to address the social problem of methamphetamine use, there has yet to be an examination of its structural correlates. Through an empirical examination of the relationships between social context and a community’s level of methamphetamine use we can provide a more thorough understanding of this current issue.

If some social contexts are more conducive to methamphetamine use than others, it is important to identify them for the sake of both improved understanding of the phenomenon and contributing to the social problem. Social context is seen as important in many structural (e.g., macro-level, ecological) studies of crime and delinquency. At the community level, social characteristics have been identified as important, robust, and consistent correlates of crime rates (Pratt & Cullen, 2005). Though as Pratt and Cullen (2005) suggest, several theoretical perspectives overlap in their predictions regarding the effects on rates of crime. Social disorganization theory has been the central focus in the economic deprivation hypothesis. Nonetheless, their analyses indicate that place-based poverty, as an indicator of socioeconomic status, is key to social disorganization theory; it is also a common indicator of some of the structural (e.g., macro-level, ecological) characteristics of central focus in the economic deprivation hypothesis. Social disorganization theory has been cited as important, robust, and consistent correlates of crime rates (Pratt & Cullen, 2005). Though as Pratt and Cullen (2005) suggest, several theoretical perspectives overlap in their predictions regarding the effects on rates of crime.

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phenomenon and to inform policy making. In several early and a few recent studies, sociologists have provided strong evidence that social context affects substance use (e.g., Baumer, 1994; Dai, 1937; Faris & Dunham, 1939). We used self-report data aggregated from the Michigan Alcohol and Other Drugs Survey, and linked Census 2000 data at the school district-level, to conduct a macro-level analysis of methamphetamine use.

Whereas the extant literature contains numerous studies of the characteristics of individuals who use methamphetamine, the current study examines the extent to which variation in social characteristics of different environments explains the variation in the prevalence of methamphetamine use across those environments. Simply put, why do some places have high rates of methamphetamine use while others have low rates? Evidence from previous ecological (i.e., macro-level, structural) studies of drug use, and crime in general, suggests that exogenous correlates of social disorganization influence such rates and should also impact rates of methamphetamine use. Therefore, the social disorganization perspective guides the current analyses. This perspective, along with the extant literature surrounding community-level studies of drug use will be discussed in the following section.

**Theoretical and Empirical Foundation**

**Social Disorganization Theory**

Macro-criminology, with its focus on the variation in crime and drug use rates across various social aggregates, holds an important place in criminology as a whole and contributes to a more complete sociological understanding of crime and drug use than micro-level studies can on their own. A recent meta-analysis of macro-level studies of crime identify many social structural characteristics of various aggregates as important, robust, and consistent correlates of crime rates (Pratt & Cullen, 2005). Structural factors including poverty, family disruption, and percent black have strong effects on rates of crime (Pratt & Cullen, 2005). Though as Pratt and Cullen (2005) suggest, several theoretical perspectives overlap in their predictions regarding the connection between many structural factors and crime. Poverty for example, as an indicator of socioeconomic status, is key to social disorganization theory; it is also of central focus in the economic deprivation hypothesis. Nonetheless, their analyses led Pratt and Cullen (2005) to conclude that there is considerable support for social disorganization theory; thus, we use its theoretical narrative to guide our analyses.

In *Juvenile Delinquency and Urban Areas*, Shaw and McKay (1942) suggested that places with high rates of poverty, residential instability, and racial/ethnic heterogeneity likely experience a weakened ability to achieve community goals, including socialization and social control, thereby allowing delinquency and crime to flourish. Low economic status indicates a lack of resources within a community, which is hypothesized to affect levels of social disorganization. Several reasons have
been proposed for explaining the direct effect of low SES upon social disorganization and the indirect effect upon crime (see the discussion of Bursik & Grasmick, 1993). Included within this discussion is the effect of deindustrialization (Bluestone & Harrison, 1982), the inability of low SES communities to offer community activities (Beggs, Hurlbert, & Haines, 1996), and the inability to establish ties to government resources (Bursik & Grasmick, 1993; Warner, 1997).

According to Shaw and McKay (1942), communities with diverse populations experience greater difficulty forming social cohesion as there is a lack of communication across racial and ethnic groups. When diverse populations inhabit the same community, consensual values and norms are difficult to define, in turn making it more difficult to provide adequate social control. As Pratt and Cullen (2005) reveal, numerous studies have operationalized ethnic/racial heterogeneity as either an index measuring the relative size and number of different groups or, alternatively, as racial composition (i.e., percent black or percent nonwhite). As a theoretical dimension, Pratt and Cullen (2005) find support for the hypothesis that ethnic/racial heterogeneity or racial minority composition increase rates of crime with an effect that is moderate to strong.

Residential instability exhibits a similar effect as a high rate of mobility among members of a community often signifies a lack of interpersonal relationships (Crutchfield, Geerken, & Gove, 1982; Smith & Jarjoura, 1987). According to this perspective, when people relocate across different communities they are less likely to become involved in community organizations and maintain informal social networks that provide socialization and social control toward members.

Family disruption also has been considered an important concept within tests of social disorganization theory. As Byrne and Sampson (1986) have noted, family structure has important consequences related to the informal control of not only children, but also adults. Blau and Blau (1982) argue that family disruption serves as a proxy indicator of personal disorganization within adult relationships and thus affects the extent to which adults are controlled by such intimate relationships. Sampson and Wilson (1990) suggest that a prevalence of divorced or otherwise disrupted families in a community impedes the community’s ability to monitor youth and respond to delinquency and crime.

Bursik (1988) imposed a causal structure to previously correlational-based discussions and tests of social disorganization theory such that low economic status is expected to lead to residential instability and racial/ethnic heterogeneity. Sampson and Groves (1989) emphasized Shaw and McKay’s assertion that social disorganization, the inability to socially control residents, mediated the impact of the more distal or exogenous correlates of crime. By including specific measures of social disorganization, including local friendship networks, organizational participation,
and youth-supervision, they made a notable contribution to the research literature. Generally, their results support the notion that the ability of a community to supervise and control, as indicated by local friendship networks and local participation in formal and voluntary organizations, mediates some of the effects of low SES, ethnic heterogeneity, residential stability, urbanization, and family disruption upon crime rates (Sampson & Groves, 1989). More recent developments of social disorganization theory include Sampson, Raudenbush, and Earls (1997) who expanded the concept of social disorganization into collective efficacy by introducing the notion of social capital and the extent to which community members communicate, trust, and support one another.

As noted by Kubrin and Weitzer (2003), it is important for community-level research to recognize the significance of informal control, social ties, social capital, and collective efficacy. It is posited by theory that these variables mediate the effect of structural constraints, and also directly influence community crime and disorder. Recent advances, particularly by Sampson and colleagues (e.g., Morenoff, Sampson, & Raudenbush, 2001; Sampson & Raudenbush, 1999) have shown that collective efficacy is a strong predictor of neighborhood crime rates. Social controls and social ties also influence community crime rates (e.g., Bellair, 1997, 2000; Sampson, 1997). Importantly, Reisig and Cancino (2003), for example, report evidence that these types of influences can extend beyond metropolitan areas.

Unfortunately the current study was unable to include these mediating variables. We agree with Kubrin and Weitzer (2003) that to fully test social disorganization theory and to improve its theoretical efficacy, more complex models attending to the various nuances of community structure and organization noted above are critical. Nonetheless, we also contend that as a first step, an examination of the exogenous predictors of social disorganization as potential correlates of methamphetamine use is important.

**THE ECOLOGICAL STUDY OF DRUG USE**

Most tests of social disorganization theory and most macro-studies in general focus on crime rates, including violent crime, property crime and overall crime rates (Pratt & Cullen, 2005). Nonetheless, a review of the literature reveals several macro-level studies of drug use. In early ecological studies of drug use it was established that centrally-located communities that displayed personal and social disorganization experienced high rates of drug use. Social structural characteristics such as poor housing, disrupted families, transient populations, and low economic status were often linked to drug use (Dai, 1937; Farris & Dunham, 1939). Similarly, in response to the urban heroin problem in the 1960s, ecological studies were performed to examine the larger social context in which it was most likely to occur. These studies found that rates of heroin use, as well as of drug use in general, were correlated
with community levels of poverty, unemployment, out-of-wedlock birth, juvenile delinquency, and financial assistance (e.g. Chein, Gerard, Lee, & Rosenfeld, 1964).

Recently, ecological analyses have noted that areas with high rates of property crime and violence are related to drug use within a community. McBride and McCoy (1981) found that narcotics users and individuals engaged in property crime are drawn from the same neighborhoods. In addition, Baumer (1994) reported that arrestee cocaine use had a positive effect on robbery and homicide rates, and also reported that arrestee cocaine use was related to extreme poverty.

Taken as a whole, these studies suggest that rates of drug use show patterns across social contexts. The findings tend to support hypotheses derived from social disorganization theory such that more disadvantaged communities, and thus, more disorganized communities, experience higher rates of drug use. However, up to this point an analysis of the structural correlates of methamphetamine use has not been explored. The primary goal of this study is to extend the social disorganization approach to account for variations in rates of methamphetamine across communities. This extension to methamphetamine use also requires us to apply social disorganization theory to communities that vary in their "urbanness." Such an extension is not unprecedented or unwarranted.

**Signs of Social Disorganization in Rural Communities**

The diffusion of methamphetamine across rural areas is likely related to changes in the economic and social structure. Within recent decades, many rural areas in the United States have experienced a transformation in social structural characteristics that has created distinct challenges for areas unfamiliar with rapidly changing populations and the accompanying problems. As Johnson (2003) has expressed:

> For rural areas with histories of population loss that have recently rebounded to growth, an influx of new people presents communities with both challenges and opportunities. Recent arrivals may differ from the existing population along multiple dimensions of race and ethnicity, socioeconomic status, life cycle, and work experience and knowledge. They may also have different life experiences, networks of acquaintances, and social and business contacts. Finally, their expectations for the future of the community may differ from those of long-term residents. (p. 19)

Between 1990 and 2000, the rural population grew by 10.3 percent and 74 percent of all rural counties in the U.S. experienced a population increase. Growth in racial and ethnic diversity has also contributed to population transformations experienced in many rural areas (Johnson, 2003). Along with population shifts, changes in local economies have often had a dramatic effect upon rural communities. In recent years, traditional industries have offered decreasing employment opportunities to rural residents. Likewise, service-sector jobs have also been on the decline. Interestingly, Lowery et al. (2002) found an increased dependence on service-sector employment.

Rural areas have been described as experiencing social disorganization, as in urban areas, yet rural areas are often characterized by communities that have been described as unfamiliar with rapidly changing populations and the accompanying problems. As Johnson (2003) has expressed:

> It is clear that indications of low economic status, ethnic heterogeneity, residential mobility and family disruption exist outside the metropolis. Therefore, ecological studies of rural areas tend to show the connections between places (e.g., Barnett & Mencken, 2002; Lee & Ousey, 2001; Osgood & Chambers, 2001), showing the connections between social disorganization variables and crime across rural areas. (p. 19)

Importantly,OLEs, such as the social disorganization perspective, has been described as the predictor of crime and sometimes described as the "ecology of places" (p. 19). These perspectives of crime and drug use in rural areas have exposed similarities across three types of communities and the connections between crime rates and social context variables.

**Hypotheses**

Consistent with the social disorganization perspective, we hypothesized that:

- In rural areas, the predictors of drug use and disorganization are similar to those in urban areas.
- Disadvantaged communities are more likely to experience drug use and disorganization.

ACKNOWLEDGMENTS

The authors would like to thank the anonymous reviewers for their helpful comments on an earlier draft of this manuscript.
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residents. Like urban areas, rural areas have experienced an increase in service-sector jobs due to the decrease in formerly traditional jobs (McGranahan, 2003). Interestingly, Bellair and Roscigno (2000) found that adolescent delinquency was positively related to living in communities with a high concentration of low-wage service-sector employment and unemployment. Moreover, low-wage service sector employment was shown to specifically affect adolescent drug use.

Rural areas often experience higher poverty rates than most urban areas, and the overall gap between the poverty rates of rural and urban areas has increased recently. Contributing to the problems of rural poverty is a lack of availability of appropriate levels of employment, training, education, and community resources within many rural communities (Jensen, McLaughlin, & Slack, 2003). In addition, as in urban areas, there is an important relationship between family structure and poverty within rural areas. Snyder and McLaughlin (2004) reported that single parent households increased in rural areas from 1980 to 2000; further, poverty was a slightly larger problem for female-headed households in rural areas compared to female-headed households in suburban and urban areas.

It is clear that indications of low economic status, ethnic heterogeneity, residential instability and family disruption exist outside the metropolis. Therefore, ecological perspectives that examine crime and drug use in rural areas must consider these characteristics (Weisheit & Wells, 1996). While rural areas have not traditionally been described as experiencing social disorganization, there have been recent attempts to apply a social disorganization approach to this field of study. These studies of rural communities have exposed similar social contextual patterns that show the connections between social disorganization variables and crime across places (e.g., Barnett & Mencken, 2002; Lee & Ousey, 2001; Osgood & Chambers, 2000; Petee & Kowalski, 1993; Reisig & Cancino, 2003; Wells & Weisheit, 2004). Importantly, in an ecological study of property and violent crime that included many social disorganization variables, Wells and Weisheit (2004) reported that “many of the predictor variables were the same in rural and urban counties, but the magnitude, and sometimes the direction, of their influence differed across rural and urban areas” (p.19). Acknowledging the proliferation of methamphetamine across rural communities and the connections between crime rates and social context variables in rural areas, a logical step toward explaining methamphetamine use was to use an ecological approach that examined relationships across rural areas in addition to metropolitan areas. Therefore, the current study examined methamphetamine use across three types of communities: urban, suburban and rural.

HYPOTHESES

Consistent with the social disorganization perspective, we hypothesized that low economic status, high ethnic heterogeneity, residential mobility and family
disruption would be positively associated with methamphetamine use, controlling for other factors including type of community (i.e., rural to urban). The expectation was that high levels of these structural characteristics increase the likelihood of social disorganization (though unmeasured), which then increases rates of methamphetamine use. Because we are not measuring social disorganization, we are estimating direct effects of the exogenous predictors, effects that would at least be weakened if indicators of disorganization were included. While Shaw and McKay (1942) problematized ethnic heterogeneity, researchers since then have sometimes substituted racial composition (e.g., minority proportion) expecting it to similarly impact disorganization and crime and drug use (e.g., Pratt & Cullen, 2005). Accordingly, we also include a measure of racial composition, though unlike most studies that include percent black, we also include percent white. A high percentage of white population was expected to have a positive association with methamphetamine use. This hypothesis, while contrary to the social disorganization perspective, is included because micro-level studies suggest the majority of users are white (Michigan Department of Community Health [MDCH], 2003). Also, rates of methamphetamine use were expected to be higher in rural communities than suburban and urban communities, and in the southwest region of Michigan. Population variables were added as controls.

METHODS

SAMPLE

The data for the current study were collected by the Michigan Alcohol and Other Drugs (MAOD) survey. The non-probability sample includes 202 school districts that were selected from urban, suburban and rural areas that applied to have the survey conducted in their district. The version of the survey containing questions regarding methamphetamine use was administered to 8th, 10th and 12th graders in Michigan schools in the 2001-2002, 2002-2003, 2003-2004, and 2004-2005 school years. The survey was designed as a cross-sectional instrument though some school-districts availed themselves of the option for subsequent administrations and thus participated in the survey multiple years allowing individual school trend analyses. For comparison purposes, because we are not interested in trends at this time, and since many school districts only participated in the survey once, we use only wave 1 data for all districts. The survey provides a measure of lifetime methamphetamine use for students from each participating school district. The participating school districts were from all regions of Michigan. The average number of student participants per school district was 465 (SD = 635); on average 35 percent of the students were in the 8th grade, 36 percent in the 10th grade, and 27 percent in the 12th grade.

The use of the school district as the unit of analysis is somewhat different than most community-level studies. Most community-level research has used county,
community characteristics and methamphetamine use

City, census tract, or neighborhood as the unit of analysis. That said, school districts have been used in previous studies that have examined variation in rates of crime and delinquency (Eitle & Eitle, 2003; Ennet, Flewelling, Lindrooth, & Norton, 1997). We feel that school-districts provide an adequate unit of analysis for the research questions included in the current study, particularly due to the fact that the dependent variable is measured using school-aged respondents. It even seems possible that using school-districts as the unit of analysis may offer advantages since people often form ties to the community based on the school they have attended or send their children to.

This sample was used for two primary reasons. First, Michigan is a state that has experienced an influx of methamphetamine use similar to several other states. Second, it included advantages over other common sources of aggregate-level drug use data. These three sources of commonly-used aggregate drug use data include the FBI’s Uniform Crime Report (UCR), the Arrestee Drug Abuse Monitoring program (ADAM, previously known as Drug Use Forecasting program [DUF]), and the Drug Abuse Warning Network (DAWN). These sources provide city-level data that have been used in a number of previous ecological studies of drug use. However, drug-specific offense data in the UCR cannot be distinguished from one another. Therefore, methamphetamine-specific arrest rates cannot be identified. In addition, while ADAM and DAWN data provide comparable drug use measures, they only offer measures for a limited number of cities, whereas the MAOD offered a much larger sample.

Measures

Dependent Variable: Methamphetamine Use

The MAOD utilized a paper-and-pencil questionnaire that included several questions about recent and lifetime drug use, personal attitudes toward drug use, and perceptions of parental and peer attitudes toward drugs. Self-report responses to the following question were utilized to measure lifetime use, “On how many occasions (if any) have you taken methamphetamine in your lifetime?” We aggregated individual student responses for each school district allowing us to examine the dependent variable in two versions: the count of students who responded that they had used methamphetamine at least once in their lifetime and the percent of such students using the total number of survey students as the denominator.

The MAOD was designed after the Monitoring the Future (MTF) survey. These types of studies offer several advantages including the ability to assess the characterization of users of relatively rare substances, and to identify respondents in a certain school district. They also provide a low non-response rate common in school settings and a high degree of individual anonymity. Self-report surveys are capable of providing researchers with theoretically derived, reliable, and valid data.
Nonetheless, we also acknowledge the various limitations of self-report data (e.g., Mosher, Miethe, & Phillips, 2002; Thornberry & Krohn, 2003).

When using self-report data on drug use, several respondent-based shortcomings, such as memory failures, concealment of the less desirable aspects of one’s life and over and underreporting, and their implications should be considered (Cooper, Sobell, Maisto, & Sobell, 1980). Johnson and Richter (2004) discuss several important issues related to differences in accurate reporting across gender, age, race/ethnicity and cultural backgrounds.

Research has found that the accuracy of self-reported substance use is influenced by the population involved in the survey and the context in which the survey is conducted. That is, levels of under- or over-reporting of substance use vary to some extent across communities and individuals. This has been attributed to differences in social characteristics such as neighborhood segregation, race/ethnicity, and age (e.g., Fendrich & Xu, 1994; Golub, Liberty, & Johnson, 2005; Richardson, Fendrich, & Johnson, 2002). We control for the number of survey students in each district, as well as various district level population characteristics. As in the case of most school administered surveys, it should be noted that the participating students in the MAOD survey included only those present on the day the survey was administered; thus absentees and students who had dropped out of school were not included. As a result, the rates of methamphetamine use may slightly underestimate actual use rates since absentees and dropouts are likely to have higher rates of drug use (e.g., Chavez, Edwards, & Oetting, 1989; Johnston, O’Malley, & Bachman, 1987). Also, it has been found that the accuracy of reporting is influenced by the setting in which the questionnaire is given. Fendrich and Johnson (2001) reported that underreporting is more likely when surveys are administered at home rather than at school. It is important to consider these methodological differences when comparing the results of studies within this area of research. The MAOD study used an anonymous, in-school questionnaire across several different types of schools which allowed for more reliable data in comparison to other data collection methods.

INDEPENDENT VARIABLES

Data for the school-district level indicators were gathered from the 2000 U.S. Census provided by the National Center for Education Statistics (2006). The variables included the three hypothesized determinants of social disorganization, residential instability, ethnic heterogeneity, and low economic status. In addition, family disruption was included to examine the extent to which methamphetamine use varies according to this indicator of community capacity for socialization and supervision and family or couple level disorganization.

Residential instability has traditionally been defined as the percentage of persons who had moved from another dwelling in the previous five years (e.g., Sampson, 1985; Warner, 2000). Ethnic heterogeneity is measured as the percentage of persons of the population that is non-white. Low economic status is measured as percent below the poverty level, with median household income as a measure of median incomes, as well as various district level population characteristics. As in the case of most school districts, we included a set of controls for grade level (our best available proxy for socioeconomic status). In addition, family disruption was included to examine the extent to which methamphetamine use varies according to this indicator of community capacity for socialization and supervision and family or couple level disorganization.

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Low economic status was measured using a principal component analysis. The eigen value for the factor analysis is 2.125 and 70.82 percent of the variance is explained. All three variables have high factor loadings: percent below poverty (.862), percent unemployed (.756), and median household income (-.900).

The percentage of school-district residents that are white was included. This index allows for a more complete measure of the predominance of one racial group. Percent white was measured as percent non-white; it is a measure of diversity that takes into account the size of the population in each group” (Blau, 1977, p. 78). This index allows for a more complete measure of the predominance of one racial group. Percent white was measured as percent non-white; it is a measure of diversity that takes into account the size of the population in each group. The aggregated mean level of substance use among student respondents was also controlled for by calculating a mean score for all forms of substance use besides methamphetamine.

DATA COLLECTION AND METHOD

Data collection for the MAOD study was conducted in 17 school districts in the northwest United States. The participating schools were selected using a two-stage probability-based area probability sample. The first stage involved selecting school districts, with a probability of selection proportional to the number of students in the district. The second stage involved selecting schools, with a probability of selection proportional to the size of the school within the district. Once selected, the MAOD used a two-stage probability-based area probability sample. The first stage involved selecting school districts, with a probability of selection proportional to the number of students in the district. The second stage involved selecting schools, with a probability of selection proportional to the size of the school within the district. Once selected, the MAOD study included only those present on the day the survey was administered; thus absentees and students who had dropped out of school were not included. As a result, the rates of methamphetamine use may slightly underestimate actual use rates since absentees and dropouts are likely to have higher rates of drug use (e.g., Chavez, Edwards, & Oetting, 1989; Johnston, O’Malley, & Bachman, 1987). Also, it has been found that the accuracy of reporting is influenced by the setting in which the questionnaire is given. Fendrich and Johnson (2001) reported that underreporting is more likely when surveys are administered at home rather than at school. It is important to consider these methodological differences when comparing the results of studies within this area of research. The MAOD study used an anonymous, in-school questionnaire across several different types of schools which allowed for more reliable data in comparison to other data collection methods.
Community Characteristics and Methamphetamine Use

1985; Warner & Pierce, 1993) and the present study followed this standard. Ethnic heterogeneity was operationalized as “one minus the sum of the squared fractions of the population in each group” (Blau, 1977, p. 78). This index allows for a more precise measure of the racial-ethnic mix within a school-district than a measure such as percent non-white; it is a measure of diversity that takes into account the size and number of different groups. Whereas percent white, for example, is included as a measure of the predominance of one racial group. Percent white was measured by simply calculating the percentage of school-district residents that were white. Low economic status was measured using a principal component analysis. The percent of the population below the poverty line, the percent of the population that is unemployed and median household income are the three measures which were included. The eigen value for the factor analysis is 2.125 and 70.82 percent of the variance is explained. All three variables have high factor loadings: percent below poverty (.862), percent unemployed (.756), and median household income (-.900).

Following Sampson and Groves (1989), family disruption was measured by summing z-scores of two related variables: 1) the proportion of divorced or separated adults and 2) the percentage of households with single parents with children. The zero-order correlation for these two variables was 0.803.

The percent of residents in each school district that live within rural areas was provided by the U.S. Census. Preliminary analyses revealed a bimodal distribution that departed significantly from the normal. Seventeen percent of school districts in the sample contained no residents living in rural areas while 29% were 100% rural; the remainder (54% of the districts) had some percent of its population living in rural areas. The remainder fell in between the two extremes. Given this, we categorized the school districts as urban, suburban, or rural. The dummy variables, rural, urban, and suburban were calculated from the percent of the residents of the school districts that live within rural areas. School districts whose rural population was 10% or less were coded as urban, school districts whose rural population was between 10% and 90% were coded as suburban, and school districts whose rural population was 90% or above were coded as rural.

Control Variables

The population size and the percent aged 18 to 24 were controlled based on findings from extant research (Land, McCall, & Cohen, 1990; Parker, 2001). The aggregated mean level of substance use among student respondents was also controlled for by calculating a mean score for all forms of substance use besides methamphetamine. To control for the potential effect of students’ age on lifetime use of methamphetamine and because the age distribution of students varied across districts, we included a set of controls for grade level (our best available proxy for age). We control for the proportion of surveyed students who were in the 8th grade...
(.356 or 35.6%) and the proportion in the 10th grade (.358) relative to the proportion in the 12th grade (.277) (omitted category).  

A regional dummy variable was created by coding each school district within the southwest region of Michigan as “one” and the remaining school districts as “zero” because methamphetamine is more prevalent within the southwest region of Michigan (MDCH, 2003). The southwest region consists of nine counties, and if the school district was located primarily within at least one of the nine counties then it was recorded as “one.”

Analytic strategy

To examine the distributions of the variables in our analyses, we reviewed descriptive statistics and determined if skewness and kurtosis statistics were significant (see Table 1). In this sample of school districts, the average percentage of methamphetamine users was about 9.2 percent. There were two school districts that reported zero methamphetamine use, while in one school district, 28.7% of students reported using methamphetamine in their lifetime. The distribution for methamphetamine use was significantly and positively skewed ($z = skew/se = 1.608/0.171 = 9.4$) and significantly clustered around the mean ($z = kurt/se = 4.93/0.341 = 14.46$). Logging the percentage of methamphetamine users did not make the distribution normal, rendering ordinary least squares regression inappropriate. Therefore, we turned to our alternate measure, the count of methamphetamine users. The average number of users across school districts was 41.6 students ($SD = 55.7$), while also not normally distributed, the count can be used without transformation in negative binomial Poisson regression.

The distributions for total population and percent aged 18-24 significantly departed from the normal (skewness = 3.55 and 6.24, respectively) and were clustered around their respective means (kurtosis = 15.96 and 59.06). Therefore, log transformations were performed in an effort to create more normal distributions. The distribution for the logged population was normal, while the distribution for the logged aged 18-24 more closely approached normality, as the skewness (1.34) and kurtosis (7.57) were reduced. These log transformations allowed for more efficient interpretations of the coefficients. Percent white was negatively skewed and so it was reflected prior to logging and then re-reflected. The transformed distribution nicely approximated a normal distribution.

The average percent of the school district population that lived in rural areas was 50 ($SD = 41$), but the distribution was bimodal with 0% and 100% the most frequent values. As noted above, we used percent rural to create dummy variables representing rural, suburban, and urban communities. Thirty-four percent ($n=68$) of the school districts were categorized as rural, 38.1% ($n=77$) were suburban and 28.2% ($n=55$) were located within southwest Michigan.

The over dispersion in the percent of methamphetamine users resulted in the violation of many of the assumptions of ordinary least squares (OLS), thus resulting in biased estimates. Fortunately, researchers have shown that negative binomial regression can account for these violations and provide interpretable coefficients (Gardner, Mulvey, & Shaw, 1995; Long, 1997; Osgood, 2000). Accordingly, this analysis utilized negative binomial regression available in the software program STATA. Although the coefficients are interpreted in terms of percentage change in the rate, rather than the count, of methamphetamine users (Osgood, 2000), the analysis made possible an indication of the rate, rather than the count.
The proportion of students who reported ever using methamphetamine in the 12th grade was 28.7% (SD = 35.6%), and the proportion in the 10th grade (35.8%) relative to the proportion in the 12th grade (27.7%) (omitted category).

A regional dummy variable was created by coding each school district within the southwest region of Michigan as "one" and the remaining school districts as "zero" because methamphetamine is more prevalent within the southwest region of Michigan (MDCH, 2003). The southwest region consists of nine counties, and if the school district was located primarily within at least one of the nine counties then it was recorded as "one."

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Using the negative binomial regression Model, we regressed the number of methamphetamine users on the exogenous indicators of social disorganization and type of community (i.e. dummies for rural and suburban, while urban is the reference category) controlling for logged population and percent young. Subsequently, we included a control for location in the southwest region of Michigan given knowledge about the pattern of methamphetamine use in the state. Finally, we include a control for average frequency of self-reported substance use because bivariate analyses suggest it is correlated with methamphetamine use and several independent variables. We run this series of analyses two times, first including ethnic heterogeneity, then substituting logged percent white for ethnic heterogeneity.

In order to identify any cases that may be multivariate outliers and thus may have substantial effects on the regression results, a variety of distance measures were examined. Also, influence statistics were calculated to measure the impact of individual cases on the regression results and it was determined that no individual case had a large enough impact on the regression results to exclude them from the analysis. A White’s test indicated that heteroskedasticity was not a significant problem. Diagnostic tests for multicollinearity were also performed to examine the extent to which estimates of the coefficients were reliable. Such tests suggest that multicollinearity may be problematic according to some standards as variance inflation factors exceeded 2.5 for several variables: family disruption (3.24), low economic status (2.82), rural (3.94) and log population (2.79) (Allison, 1999). However, none of the variance proportions were even close to the cutoff of .90 for two or more coefficients (Hair, Anderson, Tatham, & Black, 1998). Finally, because these variables are conceptually different, multicollinearity is common in ecological studies, and precedent sets 4.0 as the critical VIF, so we opted to retain all variables (e.g., Parker, Stults, & Rice, 2005).

**RESULTS**

Negative binomial Poisson regression results are presented in Tables 2 and 3. Results suggest that variation in methamphetamine use across school districts is associated with several social structural factors. As seen in Model 1, low economic status, residential instability, and ethnic heterogeneity are significantly associated with methamphetamine use, controlling for population variables and community type indicators. The coefficients for both low economic status and residential instability are positive and in the direction expected by the hypotheses. Post-estimation procedures show that a standard deviation increase in low economic status translates into an 11.6% increase in the expected rate of methamphetamine users, and a standard deviation increase in residential instability translates into a 9.8% increase in the rate of methamphetamine users. Ethnic heterogeneity, however, is negatively associated with methamphetamine use, suggesting that communities with greater diversity have lower rates of methamphetamine use.

To explore further, we substituted logged percent white for ethnic heterogeneity. As evident in Table 3,
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Results

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To explore the unexpected finding regarding ethnic heterogeneity further, we substituted logged percent white for ethnic heterogeneity. As evident in Table 3,
logged percent white is significantly associated with the dependent variables net the other variables in the Model; a standard deviation increase in logged percent white is associated with a 10.9% increase in the rate of methamphetamine users. The substitution of percent white for ethnic heterogeneity has no significant impact on any other coefficients in the Models.

Compared to location in urban school districts, suburban districts and rural districts have significantly more methamphetamine use. Model 1 in Table 3 suggests that compared to location in urban communities, school districts located in suburban communities have a 21.9% and those in rural communities have a 20.1% higher rate of users. Model 2 adds a control for location in the southwest region of Michigan; the coefficient was positive and significant. Thus school districts located in the southwest region of Michigan had significantly more methamphetamine users compared to districts across the rest of the state. Being a school district in the southwest region compared to other regions increases the expected rate of methamphetamine users by 52.9%. These differences in urban and suburban districts and rural districts compared to those in the southwest region of Michigan did not change the pattern of significance of the remaining structural variables. That is, even controlling for the community type variables, the negative association with low economic status, the positive association with logged percent white, and the negative association with ethnic heterogeneity remained significant with the addition of overall substance use. Only the coefficient for residential instability drops below standard significance levels. Yet, post-estimation techniques indicated that the effects of these variables are slightly reduced when substance use was introduced into the Model. Each standard deviation increase in logged percent white translated into an 8.7% increase (compared to 15.5% in Model 2) in expected mean rate of methamphetamine use, each standard deviation increase in low economic status had an expected 28.1% increase in rate of methamphetamine use, and each standard deviation increase in substance use had an expected 28.2% increase in rate of methamphetamine use.

### Table 3: Negative Binomial Regression of Methamphetamine Use Count on Independent and Control Variables (with Percent White Population)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$b$ (SE)</td>
<td>$b$ (SE)</td>
<td>$b$ (SE)</td>
</tr>
<tr>
<td>Low economic status</td>
<td>0.10**</td>
<td>0.12**</td>
<td>0.09**</td>
</tr>
<tr>
<td>Residential instability</td>
<td>0.01**</td>
<td>0.01**</td>
<td>0.01</td>
</tr>
<tr>
<td>Log percent white</td>
<td>0.11**</td>
<td>0.15**</td>
<td>0.09**</td>
</tr>
<tr>
<td>Family disruption</td>
<td>0.03</td>
<td>0.02</td>
<td>0.05**</td>
</tr>
<tr>
<td>Log age 18-24</td>
<td>-0.28*</td>
<td>-0.23*</td>
<td>-0.14</td>
</tr>
<tr>
<td>Log population</td>
<td>0.06</td>
<td>0.08*</td>
<td>0.06</td>
</tr>
<tr>
<td>Suburban</td>
<td>0.20**</td>
<td>0.08</td>
<td>0.06</td>
</tr>
<tr>
<td>Rural</td>
<td>0.13**</td>
<td>0.08</td>
<td>0.12</td>
</tr>
<tr>
<td>Proportion 8th grade</td>
<td>-0.06</td>
<td>-0.08</td>
<td>-0.05</td>
</tr>
<tr>
<td>Proportion 10th grade</td>
<td>-0.17</td>
<td>-0.23*</td>
<td>-0.19*</td>
</tr>
<tr>
<td>SW Michigan</td>
<td>0.42**</td>
<td>0.37**</td>
<td>1.13</td>
</tr>
<tr>
<td>Avg life substance use</td>
<td>1.36**</td>
<td>1.20</td>
<td>28.2</td>
</tr>
</tbody>
</table>

** $p \leq 0.01$

* $p \leq 0.05$

1 The percent change in the expected count of methamphetamine users for a standard deviation increase in the independent variable. For dummy variables (suburban, rural, and SW Michigan), we present the percent change in the expected count of users for a unit change (i.e., suburban versus urban, rural versus urban, and SW versus non-SW).
Community Characteristics and Methamphetamine Use

Compared to urban school districts, suburban districts and rural districts have significantly more methamphetamine use. Model 1 in Table 3 suggests that compared to location in urban communities, school districts located in suburban communities have a 21.9% and those in rural communities have a 20.1% higher rate of users. Model 2 adds a control for location in the southwest region of Michigan; the coefficient was positive and significant. Thus school districts located in the southwest region of Michigan had significantly more methamphetamine users compared to districts across the rest of the state. Being a school district in the southwest region compared to other regions increases the expected rate of methamphetamine users by 52.9%. The inclusion of this variable, however, reduced the difference between urban and suburban districts to zero. None of the urban districts were located in the southwest region, while this region contained 17% of suburban and 10% of rural districts. Importantly, the inclusion of the community type variables, did not change the pattern of significance of the remaining structural variables. That is, even controlling for degree of rurality, economic status, residential instability, and racial composition significantly impact methamphetamine use. In supplemental analyses (available upon request from the authors), we found no evidence of differential effects of the structural variables by community type.

In Model 3, substance use was included as a control to conduct a more robust test of the multivariate relationships. It was expected that a high level of overall substance use would increase the rate of methamphetamine users and that overall substance use would be associated with several of the structural variables in a manner similar to methamphetamine use. By adding substance use as a control variable in Model 3 we isolated the effects of structural variables on methamphetamine use by controlling for any relationships between structural variables and overall substance use. Other than location in the southwest, the association between methamphetamine use and overall substance use was the largest in the Model (each standard deviation increase in substance use translated into a 28.2% increase in expected mean rate of methamphetamine use). Importantly, however, the positive associations with low economic status, logged percent white, location in the southwest region, and the negative association with ethnic heterogeneity remained significant with the addition of overall substance use. Only the coefficient for residential instability drops below standard significance levels. Yet, post-estimation techniques indicated that the effects of these variables are slightly reduced when substance use was introduced into the Model. Each standard deviation increase in logged percent white translated into an 8.7% increase (compared to 15.5% in Model 2) in expected mean rate of methamphetamine use, each standard deviation increase in low economic status
translated into a 9.5% increase (compared to 13.5% in Model 2) in methamphetamine use, and being a school district in the southwest region of Michigan increased the rate of methamphetamine users by 45.6% (compared to 52.9% in Model 2). The reductions in these multivariate associations suggest that, as expected, some of the impact of the structural variables on methamphetamine use are indirect through impact on the use of other illicit substances. Interestingly, the coefficient for family disruption reaches standard levels of significance with substance use in the equation (each standard deviation increase in family disruption translated into a 9.7% increase in methamphetamine use rates).

In terms of our control variables, we found that logged population size was not significantly associated with the count of methamphetamine users until we controlled for southwest location. Logged percent of youth in the population is negatively associated with methamphetamine use in two out of three Models. The age distribution of the surveyed students across districts was influential in these Models. Specifically, compared to districts that surveyed a larger proportion of 12th grade students, districts with a larger proportion of 10th grade students had significantly lower rates of methamphetamine use. The coefficient for proportion in grade 10 is significant in Models 2 and 3. Importantly, the inclusion of this proxy for sample age distribution did not alter the partial regression coefficients of the key theoretically independent variables (equation available upon request from the authors).

In this analysis we expected school districts with low economic status, ethnic heterogeneity, a high level of family disruption, and residential instability would experience more community-level methamphetamine use. In addition, school districts in the southwest region and rural areas were expected to have more methamphetamine use. Results show that methamphetamine use is positively and significantly associated with low economic status and location in the southwest Michigan region. Unexpectedly, ethnic heterogeneity is negatively associated with methamphetamine use, while logged percent white is positively associated with it. Independent of the effects of control variables and substance use, these structural variables had substantial influence on methamphetamine use. The influences of family disruption and residential instability are not as clear. It is possible that residential instability indirectly affects methamphetamine use through overall substance use while the effect of family disruption may have been suppressed until substance use was held constant. While suburban districts appear to have higher levels of methamphetamine use than urban communities, this difference disappeared when location in the southwest region of Michigan was introduced. There was no difference between urban and rural communities nor between suburban and rural (as seen in analyses not presented).

**COMMUNITY CHARACTERISTICS AND METHAMPHETAMINE USE**

**DISCUSSION**

In an effort to add to the understanding of methamphetamine use, the current study offered the first macro-level study that focused particularly on variation in methamphetamine use across communities. Characteristics of mobile, predominantly white (and less racially diverse) communities had more methamphetamine users compared to other communities. The latter finding is supportive of expectations based on prior micro-level research and preliminary reports that lower economic status and limited economic opportunities are associated with methamphetamine use rates (MDCH, 2003).

There were also results that were in contrast to expectations that should be elaborated on other contexts. Specifically, the positive correlation of non-white is one of the strongest macro-level predictors of higher levels of crime (Pratt & Cullen, 2005). However, it is supportive of reports that methamphetamine use is primarily seen among white persons. The pattern of results in the current study may not be interpreted as failing to support the hypothesis that diversity impedes social disorganization. However, it is supportive of reports that methamphetamine use is primarily seen among white persons. The pattern of results in the current study may be interpreted as failing to support the hypothesis that diversity impedes social disorganization.

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DISCUSSION

In an effort to add to the understanding of methamphetamine use, the current study offered the first macro-level study that focused particularly on variation in methamphetamine use across communities. Social disorganization theory served as a theoretical starting point for this study and additional hypotheses were included within the analysis. The results clearly show that social structural variables influence variation in methamphetamine use across communities.

From this evidence, we conclude that community characteristics are relevant for the study of the social influences of methamphetamine use. Characteristics of communities, especially economic status, residential instability, racial composition, and community type, influence the amount of methamphetamine use. Poor, highly mobile, predominantly white (and less racially diverse) communities had more methamphetamine users compared to other communities. The latter finding is supportive of expectations based on prior micro-level research and preliminary reports that have suggested that methamphetamine use is largely a phenomenon of white communities that have few economic opportunities. Nonetheless, we cannot know the racial makeup of methamphetamine using students from this aggregate level analysis. We only know that the count of users is higher in predominantly white communities and lower in racially diverse communities.

It is reasonable to expect that these results generalize to other states, but research on other communities is needed. Within Michigan, geographic location further influenced prevalence of methamphetamine use. Communities in the southwest region of Michigan had significantly more adolescent methamphetamine use than those in other parts of the state. This finding coincides with the high level of methamphetamine-related arrests of adults in this region. The high prevalence of methamphetamine use in this area is likely related to its accessibility since there are many reports of a high prevalence of production laboratories in this region (MDCH, 2003).

There were also results that were in contrast to expectations that should be elaborated. The negative association between ethnic heterogeneity and methamphetamine use and the positive association with percent white is in contrast to social disorganization theory and criminological research which finds that percent non-white is one of the strongest macro-level predictors of higher levels of crime (Pratt & Cullen, 2005). However, it is supportive of reports that methamphetamine use is primarily seen among white persons. The pattern of results in the current study is that the greater the percent of white residents the higher the methamphetamine use while the greater the diversity of the community the lower the use. These results may be interpreted as failing to support the hypothesis that diversity impedes social organization, communication, social support, and social control. In other words,
racial composition seems to matter, but for reasons other than an indirect effect on social disorganization because racial heterogeneity not homogeneity is posited to impede organization. Nevertheless controlling for percent white (and other variables in the Model), the level of economic status and percent white, and perhaps most of the effect of residential instability on the count of methamphetamine users are indirect. These findings are supportive of social disorganization theory, although further research is needed to include indicators of social disorganization itself and examine the extent to which economic status, racial composition, and residential instability directly or indirectly matter (and whether the underlying mechanisms better reflect social disorganization theory or the economic disadvantage hypothesis (see Pratt & Cullen, 2005).

There were no significant differences between rural areas and suburban or urban areas once we controlled for location in southwest Michigan. But without this special control, location in both suburban and rural communities increases school districts counts of users and in the case of suburbs, significantly so. We found that economic status, residential instability, and racial composition impact methamphetamine use independent of community type, and no interactions are evident between structural factors and community type in our sample of school districts. The impact of community type of access to methamphetamine and to the number of users deserves further research. Alternative operationalizations of community type need to be specified. How rural does a community have to be to experience increased risk of methamphetamine use? What characteristics of suburban communities, other than those explored here, increase their risk of methamphetamine use over urban areas?

As the first step in macro-level analyses of methamphetamine use, results indicate that like other illicit substances, variation in use relates not just to characteristics of individuals but of places too. The next step should be, as recommended by Kubrin and Weitzer (2003), to identify and introduce measures of collective efficacy, informal controls, social ties and social capital. Specifically, it is unknown whether these potentially mediating factors change the effects of racial composition (especially a lack of diversity and predominance of white persons), residential instability, or low economic status. Theory states that structural constraints can weaken neighborhood social control and that collective efficacy can mediate the effects of structural constraints. Both structural constraints and collective efficacy influence community delinquency and disorder (Sampson, Raudenbush & Earls, 1997; Sampson & Raudenbush, 1999).

The ability of a community to gain resources to help control delinquency may also affect its level of methamphetamine use. Measures of formal (and informal) social control such as the number of police officers per capita or availability of mental health services or differences in policing strategies, for example.Also, there were no significant differences between rural areas and suburban or urban areas. Therefore, evidence presented here coincides with past research that indicates that policies through ‘get-tough’ initiatives will struggle due to the social structural influences of low economic status, residential instability, and racial composition impact methamphetamine use. Our results suggest that economic status, residential instability, and racial composition impact methamphetamine use independent of community type, and no interactions are evident between structural factors and community type in our sample of school districts. The impact of community type of access to methamphetamine and to the number of users deserves further research. Alternative operationalizations of community type need to be specified.

As a short-term attempt to address the impact of low economic status on methamphetamine-related offenses (see Hope, 1995). Attempts to improve collective efficacy within low income communities through community building programs may also prove to be a useful strategy toward reducing methamphetamine use. As Bursik & Grasmick (1993) point out, communities experience these problems. As Bursik & Grasmick (1993) point out, communities experience these problems. As Bursik & Grasmick (1993) point out, communities experience these problems. As Bursik & Grasmick (1993) point out, communities experience these problems. As Bursik & Grasmick (1993) point out, communities experience these problems. As Bursik & Grasmick (1993) point out, communities experience these problems. As Bursik & Grasmick (1993) point out, communities experience these problems.
This study was conducted to explore the relationship between community characteristics and methamphetamine use among students. The research findings indicate that economic status, racial composition, and residential instability have a significant impact on methamphetamine use. Specifically, communities with lower economic status and higher racial diversity experienced a greater increase in methamphetamine use compared to those with higher economic status and lower racial diversity.

The study used self-report data from various school districts across the United States to examine the relationship between economic status, racial composition, and methamphetamine use. The results showed that communities with lower economic status had a higher rate of methamphetamine use compared to those with higher economic status. Furthermore, communities with higher racial diversity had a greater increase in methamphetamine use compared to those with lower racial diversity.

The study also found that residential instability, such as high rates of home ownership, was associated with a higher rate of methamphetamine use. This suggests that unstable living conditions may contribute to increased methamphetamine use.

The findings of this study are important for policy makers and community leaders who are working to reduce the use of methamphetamine. The results suggest that interventions aimed at improving economic status, reducing racial diversity, and increasing residential stability may be effective in reducing methamphetamine use.

Future research could utilize more qualitative methodological approaches to better understand the characteristics of communities that experience methamphetamine-related issues. Additionally, a longitudinal analysis could provide a more thorough understanding of the factors that influence methamphetamine use over time.

Overall, this study sheds light on the complex relationship between community characteristics and methamphetamine use. Further research is needed to explore the underlying mechanisms that link these factors and to develop effective strategies to reduce methamphetamine use in communities.
examination by assessing changes in the structural influences of methamphetamine use. In addition, it may be useful to consider examining changes in economic and occupational structure, as transitions between agricultural, manufacturing and service-sector economies will substantially affect a community’s social structure. Finally, we recommend attention be paid to links between patterns of adult and juvenile methamphetamine use. Although formally beyond the scope of the current study, the prevalence of methamphetamine use in southwestern Michigan suggests a relationship between access, adult usage patterns, and adolescent use.

As the prevalence of methamphetamine use continues to remain a public concern, we must attempt to examine its structural influences rather than simply focus on individual-level risk factors. This analysis indicated that there are structural influences upon methamphetamine use. Future attempts to reduce methamphetamine-related problems should consider these influences, as well as individual-level factors.

Notes

1. It is possible that using lifetime use to calculate the primary measure of methamphetamine use rates may result in inaccurate measures because part of the respondents had moved across school districts since the time of use. While acknowledging the possibility of this measurement problem, calculating the percentage of lifetime methamphetamine users was unlikely to be greatly affected by the problem and was capable of providing an accurate measure.

2. While considering these issues, the effects of inaccurate reporting were minimized by two data editing procedures. First, in order to help ensure the reliability of the methamphetamine use measure, a check for inconsistent reporting was performed. This procedure is important when using self-report data as it allows the researcher to be confident that there is internal consistency within the data file as variables need to be in agreement with one another (Granquist & Kovar, 1997). The check for inconsistent reporting consisted of marking cases as “missing” if the respondent reported use in the last 30 days but no lifetime use. Second, the measures of methamphetamine use were created to include all levels of users. This minimized the effects of inaccurate reporting among users as it counted all levels of use as equal. While this procedure does not account for variation among users, this variation was not a concern as the measure was used to calculate the percentage of all methamphetamine users within a school district regardless of their frequency of use.

3. The six categories within the index include the number of people with Hispanic backgrounds, nonhispanic whites, nonhispanic blacks, nonhispanic Asians and Pacific Islanders, nonhispanic American Indians, and nonhispanic people of other races. It is important to note that persons with Hispanic backgrounds are included in all five categories of race since Hispanic indicates an ethnic background rather than inclusion in a racial group. In other words, an individual could be included in both the Hispanic ethnic and black racial categories.

4. Areas are considered rural or urban according to the following definitions provided by the U.S. Census. Urban: All territory, population and housing units in urban areas. Rural: Territory, population and housing units not classified as urban. Rural classification cuts across other hierarchies and can be in metropolitan or non-metropolitan areas. Metropolitan: A central place and adjacent densely settled census blocks that together have a total population of at least 2,500 people of other races. It is important to note that persons with Hispanic

5. A similar measure was used by Peters, Oetting & Edwards (1992) for urban clusters, or at least 50,000 for urbanized areas. Urban classification cuts across other hierarchies and can be in metropolitan or non-metropolitan areas. Rural: Territory, population and housing units not classified as urban. Rural classification cuts across other hierarchies and can be in metropolitan or non-metropolitan areas. Metropolitan: A central place and adjacent densely settled census blocks that together have a total population of at least 2,500 people of other races. It is important to note that persons with Hispanic

6. Forms of substance use include marijuana, alcohol, LSD, cocaine, ecstasy, crystal-meth, barbiturates, tranquilizers, heroin, inhalants, other narcotics, psychedelics, crack-cocaine, amphetamines, rohypnol, GHB, ketamine, and steroids. The scale used to measure these forms of drug use was the same

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backgrounds are included in all five categories of race since Hispanic indicates an ethnic background rather than inclusion in a racial group. In others words, an individual could be included in both the Hispanic ethnic category and the black racial category.

4. Areas are considered rural or urban according to the following definitions provided by the U.S. Census. Urban: All territory, population and housing units in urban areas, which include urbanized areas and urban clusters. An urban area generally consists of a large central place and adjacent densely settled census blocks that together have a total population of at least 2,500 for urban clusters, or at least 50,000 for urbanized areas. Urban classification cuts across other hierarchies and can be in metropolitan or non-metropolitan areas. Rural: Territory, population and housing units not classified as urban. Rural classification cuts across other hierarchies and can be in metropolitan or non-metropolitan areas (U.S. Census, 2006).

5. A similar measure was used by Peters, Oetting & Edwards (1992). There is a potential weakness of this measure due to the somewhat arbitrary cutoff points for distinguishing between the three types. However, Models were run with cutoffs at different points (i.e. school districts with 95% rural population were considered rural) and results did not significantly change.

6. Forms of substance use include marijuana, alcohol, LSD, cocaine, ecstasy, psychedelics, crack-cocaine, amphetamines, rohypnol, GHB, ketamine, crystal-meth, barbiturates, tranquilizers, heroin, inhalants, other narcotics, and steroids. The scale used to measure these forms of drug use was the same as that used for methamphetamine use (mentioned above). An aggregated mean was calculated for each school district.

7. As suggested by one the anonymous reviewers, we control for number of students in each grade level. This was based on the assumption that the statistical control patterns of reported methamphetamine use merely reflect the variations in the age of the sample rather than social context.

8. We include product terms for region and the major structural variables and also estimated separate equations for the three community types; sample size was too small in these equations to be reliable and no product terms reached levels of significance.

Acknowledgements

We would like to thank several people, along with the anonymous reviewers, for their helpful assistance. Greg Howard, David Hartmann, Jane Spencer, William Post, Tom Van Vale, Ronald Akers, and Chris Gibson all deserve sincere acknowledgement for their contribution to this paper.
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