

## **Factors Associated with Sex Offender Concentrations in Minnesota Neighborhoods**

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## **Research Summary**

Communities across the United States have become increasingly concerned over the presence of sex offenders in their neighborhoods. The purpose of this research is to examine the factors that are associated with the concentration of sex offenders throughout the state of Minnesota, a large geographic area with few residency restrictions. This research also examines multiple categories of sex offenders subject to varying levels of community notification, allowing for an assessment of what, if any, effect community notification has on the residential patterns of sex offenders. Concentrated disadvantage, concentrated affluence, and housing affordability are all significant factors in explaining the concentration of multiple categories of sex offenders. Concentrated affluence relative to poverty is the most consistent predictor of sex offender concentration, revealing that more affluent communities ward off sex offender residents, regardless of community notification requirements.

## **Introduction**

Sexual offenders living outside confinement often incite concern and fear in communities across the United States. This anxiety likely stems from high-profile cases of sexual violence and murder (Levenson & Cotter, 2005; Socia & Stamatel, 2010), as well as misinformed public attitudes and beliefs about the nature of sexual offending (Levenson, Brannon, Fortney, & Baker, 2007). Public anxiety over the perceived risk of recidivism among convicted sexual offenders has triggered the development of several federal, state, and local laws, including more punitive sentencing for sexual offenders, state and national sexual offender registries, public notification requirements, and restrictions barring sexual offenders from living in certain areas (Cohen & Jeglic, 2007).

Much like the rest of the United States, Minnesota's legislative treatment toward sexual offenders has become increasingly punitive over the past decade, particularly after the high-profile murder of Dru Sjodin in 2003 by a violent sexual offender released from a Minnesota state prison. Since Sjodin's murder, use of Minnesota's civil commitment procedures for sexual offenders has skyrocketed, along with the addition of lengthier prison sentences and periods of supervision attached to sexual offenses (Yunker, Starr, & Roskopf, 2011). A small, but increasing, number of Minnesota cities are imposing residency restrictions that effectively ban the highest risk sexual offenders from living within city limits, whereas other city and county leaders are publicly questioning why their communities house so many high-risk sexual offenders (Stahl & Rao, 2013).

Recent scholarship has examined the residential patterns of registered sexual offenders in limited geographic areas (Socia, 2013a, 2013b, 2014), as well as large geographic areas that have several residency restrictions (Hipp, Turner, & Jannetta, 2010; Socia et al., 2014). The present study examines the distribution of multiple categories of sexual offenders throughout the state of Minnesota, a large geographic area with very few residency restrictions for sex offenders. Although Minnesota lacks residency restrictions in most areas, certain categories of sex offenders are subject to varying degrees of public notification. By examining these separate categories of sex offenders together and separately, we also measure the degree to which public notification affects the residency patterns of sex offenders. Using

geographic information systems (GIS) software, we linked the addresses of approximately 10,000 sex offenders to demographic and economic data from the U.S. Census Bureau's American Communities Survey.

In the following sections, we first review prior literature on offenders and ex-prisoners in communities, theoretical perspectives on the distributions of offenders in communities, and a description of sex offenders in Minnesota. These sections are followed by a description of the data and measures used in this study and the results of the analyses. This article concludes with a discussion of the implications of the findings.

### **Former Prisoners and Sexual Offenders in Communities**

Existing research has shown that many aspects of crime are neither evenly nor randomly distributed across neighborhoods, including aggregate crime rates (Sampson & Groves, 1989; Shaw & McKay, 1942; Morenoff, Sampson, & Raudenbush, 2001), individual offending (Anderson, 2002; Oberwittler, 2004), individual victimization (Miethe & McDowall, 1993; Sampson & Lauritsen, 1990), and even recidivism (Kubrin & Stewart, 2006; Mears, Wang, Hay, & Bales, 2008; Stahler et al., 2013). Certain demographic and economic characteristics can explain the distribution of such phenomena. Overall, areas with increased levels of economic disadvantage, residential instability, and racial and ethnic heterogeneity, among other factors, tend to have higher rates of all types of criminal activity.

Just as criminal activity is not randomly distributed, neither are former prisoners and parolees. A growing body of research has focused on the communities that prisoners come from and return to (e.g., Clear, 2002; Clear, Rose, & Ryder, 2001; Kirk, 2009; Kubrin & Stewart, 2006; Massoglia, Firebaugh, & Warner, 2013; Mears et al., 2008; Rose & Clear, 1998; Stahler et al., 2013). The Urban Institute's multistate longitudinal study of newly released prisoners, the Returning Home series, found that many prisoners are returning to a small number of neighborhoods marked by multiple indicators of concentrated disadvantage (Baer et al., 2006). More than half of the recently released inmates that Visser and Farrell (2005) followed in Chicago were concentrated in just 7 of the city's 77 neighborhoods. These neighborhoods had above average rates of poverty and disrupted households and below-average rates of

high school graduation compared with the rest of the city's neighborhoods. In Maryland, Visher, La Vigne, and Travis (2004) found that almost 60% of state prisoners return to the city of Baltimore. Of the majority of prisoners who returned to Baltimore, more than one third resided in 6 of the city's 55 neighborhoods. These 6 neighborhoods had higher levels of unemployment, poverty, and disrupted households compared with the rest of the city.

An abundance of research has demonstrated that former prisoners often encounter barriers to stable housing (Metraux, Roman, & Cho, 2007; Roman & Travis, 2004) and tend to return to the same or similar disadvantaged neighborhoods they came from (Clear, 2007; La Vigne, Kachnowski, Travis, Naser, & Visher, 2003; Lynch & Sabol, 2001; Massoglia, Firebaugh, & Warner, 2013; Visher et al., 2004). Additional research has shown that community reentry can be even more difficult for sex offenders compared with all other types of offenders (Bonnar-Kidd, 2010; Farkas & Miller, 2007; Hipp et al., 2010; Levenson, 2008; Socia et al., 2014). That is, much like all convicted felons and former prisoners, sex offenders may be restricted from private or public housing, and they face the same economic limitations that prevent them from renting or purchasing properties. On top of these common reentry hurdles, sex offenders in some states and municipalities face residency restrictions and registration requirements, and are subject to community notification. Their sentences or supervision conditions may also restrict them from living with minors, which could, in effect, preclude them from living with many family members or friends as many returning prisoners often do (Baer et al., 2006).

Confirming that sex offenders may face more limited and disadvantaged living situations upon release from prison, Hipp and colleagues (2010) found that, compared with all other types of offenders included in their sample, sex offenders released from California state prisons moved into neighborhoods with higher levels of disadvantage and residential instability. Moreover, the sex offenders in Hipp et al.'s sample continued to move into more disadvantaged neighborhoods on subsequent moves, indicating a propensity for downward residential mobility among sex offenders. Socia (2014) found disproportionate concentrations of sex offenders in upstate New York communities with higher levels of concentrated

disadvantage (i.e., poverty, unemployment, female-headed households, higher proportions of Black residents), available housing, and affordable housing.

Existing research shows that sex offender concentration does not lead to increased victimization of children, although it has been found to be associated with higher rates of sexual offending against adult victims (Socia, 2013b; Tewksbury, Mustaine, & Covington, 2010). Despite evidence that residency restrictions for high-risk sex offenders do little to prevent new sex offenses and may ultimately cause more harm than good (Durling, 2006; Duwe, Donnay, & Tewksbury, 2008; Levenson, 2008; Tewksbury, 2007; Walker, 2007; Zandbergen & Hart, 2006), an increasing number of communities are imposing such restrictions and developing innovative ways to limit sex offender residency (Lovett, 2012, 2013). In Minnesota, Level 3 sex offenders are the only category of sex offenders targeted by the few existing city ordinances that ban offenders from living in most places within city limits. Level 3 sex offenders are individuals convicted of sexual offenses that have passed through the Minnesota state prison system and have been deemed as the highest risk to reoffend. Of the nearly 300 Level 3 sex offenders who lived outside confinement in the summer of 2013, more than 40% resided in the city of Minneapolis. Of those Level 3 offenders who resided in Minneapolis, more than half lived in just 5 of the city's 116 census tracts.

The risk of victimization by a sex offender living in close proximity may be minimal (Duwe et al., 2008; Harris & Hanson, 2004), but the presence of sex offenders in neighborhoods has measurable effects on communities. Although broad community notifications informing residents about the presence of high-risk sex offenders may be useful for reducing recidivism (Duwe & Donnay, 2008), there is evidence that these community notifications may also increase fear among residents (Beck & Travis, 2004; Caputo & Brodsky, 2004; Kernsmith, Craun, & Foster, 2009; Pope, 2008; Zevitz, 2003, 2004). Furthermore, community awareness of resident sex offenders can also have an appreciable effect on home values. Studies of housing prices in Ohio (Larsen, Lowrey, & Coleman, 2003), North Carolina (Linden & Rockoff, 2008), and Florida (Pope, 2008) have provided evidence that the presence of registered sex offenders subject to community notification can reduce the values of nearby homes. In addition to the

perceived risk of victimization, community residents have tangible incentives to keep sex offenders out of their neighborhoods.

### **Social Disorganization and Offender Housing Patterns**

Social disorganization theory is a common theoretical backdrop to ecological studies of crime-related phenomena, including the present study. Elements of social disorganization theory have evolved since its inception at the Chicago School (Shaw & McKay, 1942), but many of the primary structural indicators of social disorganization have remained constant. Poverty, high residential turnover, and racial and ethnic heterogeneity can create disorder in neighborhoods, and in effect, increase criminal activity.

Since the 1980s, a large body of research has articulated the neighborhood mechanisms that work between ecological characteristics and neighborhood crime, including the breakdown of local peer networks, informal social control, and collective efficacy (e.g., Bellair, 1997; Morenoff et al., 2001; Sampson & Groves, 1989; Sampson, Raudenbush, & Earls, 1997; see Kubrin & Weitzer, 2003). Faced with poverty and given the short tenure of many households, residents in socially disorganized neighborhoods tend to interact less with one another, which erodes the collective ability of the neighborhood to provide informal surveillance and social control. Residents of socially disorganized areas have a limited investment in their neighborhoods and are either unwilling or unable to respond to local issues, including criminal activity.

Studies focusing on the residential patterns of all offenders and sex offenders in particular have also relied on social disorganization framework to guide research and explain findings (e.g., Clear et al., 2001; Hipp et al., 2010; Kubrin & Stewart, 2006; Mears et al., 2008; Socia, 2013a, 2014). Indeed, common measures of social disorganization have been salient factors in research similar to the present study (Socia, 2013a, 2014). Socia (2014) found that a neighborhood-level increase in concentrated disadvantage, housing availability, and housing affordability were all significantly associated with an increase in higher-than-expected rates of registered sex offenders in New York State. In addition to the lure of more affordable rental rates and housing availability, it appears that sex offenders are bound to more socially disorganized neighborhoods either by choice or by default (Hipp et al., 2010). Anecdotal

evidence from around the country has demonstrated that organized local residents can push out and ward off sex offender residents (Lovett, 2012, 2013; Stahl & Rao, 2013).

One factor that may have been overlooked in previous studies of sex offender housing patterns is the insulating effects of concentrated affluence and the deleterious effects of extreme poverty in the complete absence of wealth (Chiricos, Barrick, Bales, & Bontrager, 2007; Kubrin & Stewart, 2006; Massey, 1996, 2001; Morenoff et al., 2001; Sampson, Morenoff, & Gannon-Rowley, 2002). The harmful effects of coexisting indicators of disadvantage (e.g., unemployment, disrupted households) are intuitive and well-documented, but multiple studies have also shown that both extremes of income segregation (i.e., wealth relative to poverty and vice versa) can have unique effects on the same social phenomena (Morenoff et al., 2001). Brooks-Gunn, Duncan, Klebanov, and Sealand (1993) found that the presence of affluent neighbors, and not neighborhood-level poverty and joblessness, had a significant effect on individual-level childhood development. Sampson, Morenoff, and Earls's (1999) multilevel analysis of Chicago neighborhoods revealed that concentrated affluence, more than poverty, consistently and significantly influenced outcomes such as informal surveillance of neighborhood children and willingness to engage in reciprocal relationships with other neighborhood residents (e.g., willingness to do favors for one another, frequency of get-togethers with neighbors).

Levels of economic inequality and income segregation have been increasing over the past few decades (Reardon & Bischoff, 2011). As affluent communities become more isolated from less affluent communities, resources also become more concentrated in certain areas, which can affect several community-level outcomes. Given the evidence provided by Sampson et al. (1999), that concentrations of income levels influence the willingness of neighborhood residents to intervene in the affairs of the neighborhood, it seems plausible that very wealthy neighborhoods could exert passive or active informal social control that prevents sex offenders from taking up residence in those neighborhoods. Conversely, the limited liability of residents in neighborhoods marked by extreme poverty in the complete or near absence of wealth may leave them unable or unwilling to deflect sex offender residents. Moreover, the relative anonymity that is provided by poor neighborhoods that lack collective efficacy and informal

social control may be appealing to sex offenders, particularly the conspicuous highrisk sex offenders subjected to community-wide notification. Thus, in addition to common indicators of social disorganization and neighborhood disadvantage, the present study also uses a measure that captures the range of socioeconomic statuses that may exist in one community.

### **Sex Offenders in Minnesota**

Although many sexual assaults are never reported to the police, recent data from 2008- 2012 indicate there are, on average, a little more than 2,000 sex offenses reported to the police each year in Minnesota. In 2012, 829 of the 2,060 reported sexual assaults (40%) resulted in an arrest (Minnesota Bureau of Criminal Apprehension, 2013). Sentencing data from the same year show that 544 offenders were convicted and sentenced for a felony-level criminal sexual conduct (CSC) offense (Minnesota Sentencing Guidelines Commission, 2013).

Although a felony is the most serious offense level in both Minnesota and the United States, about 40% of those convicted of a CSC offense in Minnesota are sentenced directly to prison. The remaining 60% convicted of a CSC offense are sentenced to probation involving community supervision and/or are required to serve time (no greater than 365 days) in a local county jail. Of the sex offenders who are not sentenced directly to prison, the vast majority are sentenced to local confinement (Minnesota Sentencing Guidelines Commission, 2013). Offenders who violate their conditions of probation, however, are subject to having their supervision revoked and their prison sentence executed, resulting in admission to prison.

Since 1991, Minnesota has required convicted sex offenders to register their addresses with the Minnesota Bureau of Criminal Apprehension (BCA). Minnesota's predatory offender registration (POR) law has been amended several times over the last few decades, primarily to widen its scope and increase the penalties for noncompliant offenders. Three years after the POR law was enacted in Minnesota, Congress passed the Jacob Wetterling Act, which required sex offenders in all states to register identifying information with law enforcement agents. Two years later, as part of Megan's Law, the Wetterling Act was amended to allow for public dissemination of some registry information.

When Megan's Law was passed in 1996, states were required to develop procedures to inform communities where sex offenders will be living. Yet, because states were given a lot of discretion in applying the law, community notification has varied widely across the United States. At one end of the spectrum are states that have different levels of community notification that vary according to sexual recidivism risk. That is, the higher the sex offender's risk to reoffend sexually, the greater the degree of notification. At the other end of the spectrum are states that make information publicly available, often via the Internet, on all sex offenders regardless of risk.

In Minnesota, which implemented the Community Notification Act on January 1, 1997, community notification applies only to offenders released from prison who are subject to POR. The degree to which the community gets notified depends on the risk level assigned to offenders prior to their release from prison by an End of Confinement Review Committee (ECRC), which is comprised of the prison warden or treatment facility head where the offender is confined, a law enforcement officer, a sex offender treatment professional, a prison caseworker, and a victim services professional. In assigning risk levels, the ECRC considers scores from actuarial risk assessment tools as well as additional factors that ostensibly may either increase or decrease the risk of re-offense (Duwe & Donnay, 2008).

For offenders receiving a Level 1 assignment (i.e., lowest public risk), notification includes victims, witnesses to the crime, law enforcement agencies, and anyone else identified by the prosecutor. For offenders given a Level 2 assignment (i.e., moderate public risk), notification includes those in the Level 1 information release plus schools and day care centers, and other organizations where individuals who may become victims of the offender are regularly found. For offenders assigned a Level 3 (i.e., highest public risk), broad public notification is required. More specifically, law enforcement is responsible for notifying the community where the Level 3 offender will be residing, generally by holding a public meeting in addition to distributing information through the media. Furthermore, following release from prison, the residential vicinities of Level 3 offenders are published on the Minnesota Department of Corrections' (MnDOC) website (Duwe & Donnay, 2008). Historically, approximately 55% of predatory

offenders released from prison receive a Level 1 assignment, 30% receive a Level 2 assignment, and 15% receive a Level 3 assignment.

In an effort to address inconsistencies across states regarding their registration and notification requirements, in 2006, Congress enacted the Sex Offender Registration and Notification Act (SORNA), which is Title I of the Adam Walsh Act (AWA). By introducing a comprehensive set of minimum registration and notification standards for states to follow, SORNA extended the provisions of the Wetterling Act by expanding the list of registerable offenses, requiring states to use a three-tiered classification system based on the convicted sex offense, requiring in-person appearances to verify registration information, and increasing the amount of registration information collected and disseminated. Moreover, SORNA required states to retroactively implement these standards on sex offenders within the criminal justice system by 2009. As of 2012, only 16 states (19 total jurisdictions) had substantially implemented the SORNA requirements, according to the Department of Justice's Sex Offender Sentencing, Monitoring, Apprehending, Registering, and Tracking (SMART) office (U.S. Government Accountability Office, 2013). Results from the 2013 report prepared by the U.S. Government Accountability Office indicate that some of the more common challenges jurisdictions faced in implementing SORNA included conflicts between SORNA and state laws, the costs to implement SORNA, the retroactive application of the standards, the offense-based classification system, and the application of juvenile registration requirements. As one of the nonimplemented jurisdictions, Minnesota's registration and notification practices have not been appreciably altered by the SORNA requirements.

Although a majority of states now have residency restriction laws for convicted sex offenders, Minnesota does not. Still, three cities within the state have passed ordinances limiting where certain sex offenders can live. In 2006, Taylors Falls and Wyoming each enacted ordinances that prohibit sex offenders who have committed a sex offense against a juvenile or been given a Level 3 designation from living within 2,000 feet of child congregation locations such as schools, playgrounds, churches, and bus

stops. In May 2010, another city in Minnesota, Duluth, passed an ordinance that restricts Level 3 offenders from living within 2,000 feet of a church, playground, or day care.

By examining factors that predict where sex offenders live in Minnesota, this study makes three main contributions to the literature. First, previous studies have analyzed concentration for a city, county, or part of a state (Socia, 2013a, 2013b, 2014). We extend research in this area by examining concentration throughout the state of Minnesota. Second, by looking at different legislative categories of sex offenders, we not only account for residency restrictions laws, which previous studies have done, we also look at whether community notification has an impact on sex offender concentration patterns. Last, by adding a measure of concentrated affluence and relative inequality, this study also accounts for the protective mechanisms of concentrated neighborhood wealth, which previous similar studies have overlooked.

## **Data and Method**

### *Sample*

This study uses data from three unique sources. The first dataset consists of street addresses from the BCA's POR as of January 1, 2010. The POR dataset includes all offenders convicted of CSC offenses that were required to register as of that date. The offenders on this list received a range of sentences, including supervision, short-term jail sentences, and lengthier prison sentences. The second dataset, which was provided by MnDOC, is the full list of sexual offenders living in the community who have passed through Minnesota state prisons and have been assigned a risk level (1, 2, or 3) based on risk of re-offense, also as of January 1, 2010. Although the POR and MnDOC datasets were pulled from different sources, the MnDOC dataset could be considered a subset of the POR dataset as it includes POR offenders who have served state prison sentences. The third dataset includes economic, demographic, and basic household information at the census tract level from the U.S. Census Bureau's 2010 American Communities Survey (5-year estimates).

The original POR dataset included 16,904 offender addresses, and the original MnDOC dataset included 6,348 offender addresses. Because we are only interested in the community placements of sex offenders living outside confinement, we removed addresses for federal, state, and local prisons, as well

as secure treatment hospitals. Removing these addresses accounted for a little more than half of the removals from each dataset. Most of the other addresses removed from each dataset were for addresses outside Minnesota or the United States (several for deported sex offenders). A small number of addresses were removed because they did not appear to be valid and could not be geocoded, which accounted for about 3% of deleted cases. We also removed a small number of cases for individuals no longer required to register, as well as deceased sex offenders who still appeared on the lists. Removing all of these addresses left us with a total of 9,894 POR addresses and 3,362 MnDOC addresses. Of the MnDOC addresses, about 70% were Level 1 sex offenders, 25% were Level 2 sex offenders, and the remaining 5% were Level 3 sex offenders.

During the time period that these data were collected from (January 2010), two rural cities (Taylors Falls and Wyoming) had city ordinances that effectively barred Level 3 sex offenders from living within city limits. The 5 census tracts that cover these two cities are not included in the present sample, leaving a total of 1,329 tracts that cover the rest of Minnesota. No other cities in Minnesota had any sex offender residency restrictions at the time of data collection.

### *Dependent Measures*

There are three dependent variables in this study, and all three are at the census tract level. The first two outcomes are counts of the number of (a) POR offenders and (b) Level 1 and Level 2 sex offenders combined. The third dependent variable is a dichotomous measure of whether or not there was a Level 3 sex offender residing in the census tract. These variables were constructed by first geocoding the addresses of offenders in the POR and MnDOC datasets, and then collecting a sum of the three types of sex offenders living within the bounds of each census tract using ArcGIS. Unlike the POR and Level 1 and Level 2 sex offender dependent measures, the Level 3-only measure was transformed into a dichotomous variable. The majority of neighborhoods used in this research (1,211) did not have any Level 3 sex offenders, whereas a majority of the remaining 118 neighborhoods had only 1 Level 3 sex offender.

The first dependent variable, the POR count, thus provides the broadest measure of sex offender populations. Of the 9,894 POR offenders included in the data, 6,516 did not have an assigned risk level, which means they had not been to prison since the criminal conviction that initiated their registration. This measure subsumes the offenders included in the second (Level 1 and Level 2 sex offenders) and third (Level 3 offenders) dependent variables.

Given that only those sex offenders with an assigned risk level are subject to varying degrees of public notification, using these three measures of sex offender concentration enables us to broadly assess whether or not community notification influences where sex offenders live. Community notification may exacerbate the processes that push sex offenders into poorer and more socially disorganized areas, especially for Level 3 sex offenders who are subject to wide public notification.

#### *Independent Measures*

Using data from the U.S. Census, this research formulated multiple independent measures of economic disadvantage and social disorganization, as well as other measures that have been previously linked to sex offender housing patterns (e.g., Hipp et al., 2010; Socia, 2013a, 2013b, 2014) and community-level crime (e.g., Morenoff et al., 2001; Sampson & Groves, 1989; Sampson et al., 1997).

*Concentrated Disadvantage* is a factor score comprised of the following neighborhood-level measures: (a) percentage of households with children under 18 years old headed by single females, (b) percentage of households living under the poverty line, (c) percentage of unemployed persons, (d) percentage of households receiving public assistance, (e) percentage of residents who do not have at least a high school or general education development (GED) diploma, and (f) the percentage of residents who are not White. These measures together loaded strongly on a single factor (eigenvalue = 4.879) with factor loadings ranging between 0.75 and 0.95. In line with previous research on housing patterns of ex-prisoners and sex offenders, we expect that an increase in concentrated disadvantage would be associated with an increase in the rate of POR and Level 1 and Level 2 sex offenders, as well as the presence of at least one Level 3 sex offender in a census tract (Hipp et al., 2010; Socia, 2014).

*The Index of Concentrated Extremes (ICE)* is based on the following formula (Massey, 2001): 
$$([\text{number of affluent families}] - [\text{number of poor families}] / \text{total number of families})$$
. For the purposes of the present study, affluent families are ones that make US\$75,000 per year or more, and poor families are ones that live below the poverty line according the U.S. Census. The ICE measure ranges from -1 (when all of the families in a census tract are poor) to +1 (when all of the families in a census tract are affluent). A score of 0 indicates that there are equal numbers of affluent and poor families living in the census tract. Because the ICE measure has previously been negatively associated with other undesirable outcomes, such as neighborhood-level homicide rates (Morenoff et al., 2001) and individual-level recidivism (Kubrin & Stewart, 2006), we expect that an increase in the ICE measure (indicative of more affluence) would correspond to decreased rates of sex offenders. Not only does it seem plausible that sex offenders would be priced out of more affluent neighborhoods, but past research has demonstrated that wealthier neighborhoods are often insulated from undesirable outcomes (Sampson et al., 2002).

*Residential Instability* is a factor score based on the percentage of owner-occupied homes in a census tract along with the percentage of residents who have occupied the same homes for 5 years or more (Socia, 2014). This score was then reverse-coded for ease of interpretability, so that positive values are indicative of more instability and negative values of less instability. Residential turnover is a common indicator of social disorganization (e.g., Clear et al., 2001; Kubrin & Weitzer, 2003; Shaw & McKay, 1942) in that residents with less tenure in the neighborhood might be less invested in the interests of the neighborhood and also might be less able to provide informal surveillance and social control. Having a higher percentage of short-term residents in a neighborhood might also impede the ability of the residents to organize against the residency of high-risk sex offenders. We would expect higher levels of residential instability to be associated with increased rates of sex offenders and an increase in the likelihood of having at least one Level 3 sex offender in a neighborhood.

*Housing Affordability* is the same measure described by Socia (2014). This measure is the percent difference between the U.S. Census's reported median gross rents in a census tract and the U.S. Department of Housing and Urban Development's (HUD; 2010) fair market rates for two bedroom

apartments in the corresponding county. This measure was then reverse-coded so that negative values indicate that HUD rates are lower than median gross rents reported by the Census, and housing is therefore less affordable in that neighborhood. Conversely, positive values are indicative of more affordability. Because convicted felons and former prisoners are often saddled with economic limitations, we would expect higher levels of affordability to be associated with higher rates of sex offenders. A positive relationship would also be consistent with prior research (Socia, 2014).

*Housing Availability* is the sum of the percentage of housing units for sale and for rent in a census tract. Landlords in markets with very low vacancy rates can be more selective when choosing tenants. Thus, we would expect a positive relationship between housing availability and sex offender concentration because sex offenders, who already face difficulties in securing housing, would be less likely to end up in areas with fewer housing vacancies. This relationship would also be in line with previous research (Socia, 2014).

*Population Density* was calculated by dividing the total population of the census tract by the size of the tract in square miles. Given that ex-prisoners and felons in general tend to gravitate toward more urban and densely populated areas (La Vigne et al., 2003; Roman & Travis, 2004; Visher et al., 2004), we expect a positive relationship between this measure and sex offender concentration.

Identical to the measure used by Socia (2013a, 2014), Ethnic Heterogeneity is a factor score that combines the percentage of residents who are foreign-born and the percentage of residents who are Hispanic. Neighborhood race is included in the aforementioned concentrated disadvantage measure (percentage of residents who are not White/non-Hispanic). In 2010, about 84% of Minnesota residents were White and non-Hispanic, and the next largest race group was non-Hispanic Black and African Americans (5%). Neighborhood racial composition and ethnic heterogeneity are mainstays of social disorganization theory, in that neighborhoods with higher concentrations of minority race groups and higher levels of ethnic heterogeneity tend to have looser peer networks and fewer informal social controls, which can increase neighborhood crime (Hipp et al., 2010; Jones-Webb & Wall, 2008; Kubrin & Weitzer, 2003). Thus, we would expect increased levels of ethnic heterogeneity to be associated with increased

rates of sex offenders. However, Socia (2013a, 2014) found that ethnic heterogeneity was negatively associated with clusters and concentrations of sex offenders, so we might alternatively find a negative relationship.

Preliminary analyses revealed evidence of spatial autocorrelation. In an effort to control for any spillover effects from contiguous neighborhoods, spatial weights were constructed for each of the three outcome measures. These weights are comprised of averages of the three outcome measures among contiguous census tracts for each neighborhood.

### *Analytic Strategy*

To analyze the factors that explain the rate and number of different categories of sex offenders living within neighborhoods, we first examine correlations between each of the outcome measures and the neighborhood characteristics. These correlations are then followed by multivariate analyses predicting the three outcomes.

For the models predicting counts of POR and Level 1 and Level 2 sex offenders combined, we used Poisson regression with instrumental variables. The population size of each census tract was included as an exposure term. The instrumental variable approach was necessary given the inclusion of spatial lag controls. That is, the spatial weights were correlated with the error terms in the corresponding estimation models. By including instrumental variables in our models, we corrected for this violation of the exogeneity assumption, which is an approach that has precedence in prior research (Anselin & Kelejian, 1997; Socia, 2014). To predict the presence of any Level 3 sex offenders in census tracts—a binary outcome—similar probit models with instrumental variables were used. The instrumental variables used were spatial weights for concentrated disadvantage or ICE, housing affordability, and housing availability.<sup>1</sup> To account for the fact that census tracts nested within counties are more similar to one

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<sup>1</sup> Preliminary regression analyses revealed that lagged measures of concentrated disadvantage or Index of Concentrated Extremes (ICE; depending on the primary measures used in the analyses), housing affordability, and housing availability were appropriate instruments for the three different spatial lag measures. These measures combined produced  $r^2$  measures of at least .50 for each of the spatial lag controls.

another than census tracts in different counties, the analyses included robust standard errors based on the county that each tract was nested within.

For each of the outcome variables, we present four models. The concentrated disadvantage and ICE measures are highly correlated ( $r = -.76$ ,  $p$  value  $< .01$ ), and preliminary analyses revealed that including these two measures in the same model would result in multicollinearity. Thus, we performed separate analyses including each of these measures. We also display the results of analyses with and without the spatial lag controls to show what, if any, differences result from controlling for spatial autocorrelation.

## **Results**

### *Descriptive Statistics and Correlations*

Table 1 displays the means, standard deviations, and bivariate correlations for each of the measures included in the analyses.<sup>2</sup> Census tracts in Minnesota had an average of 7.4 POR offenders and 2.4 Level 1 and Level 2 sex offenders. Nearly 9% of census tracts had at least one Level 3 sex offender. The measures of concentrated disadvantage, residential instability, and ethnic heterogeneity were all factor scores, so they averaged at 0 with standard deviations of 1. Because positive values are indicative of more wealth relative to poverty, the average ICE value of 0.27 suggests that neighborhoods in Minnesota skewed more toward affluence. The mean housing affordability value was  $-0.02$ , suggesting lower levels of housing affordability on average across the state. The average vacancy rate across Minnesota neighborhoods was about 8%, and neighborhoods had an average of 25 residents per square mile. An average of about 14% of neighborhood residents were a race other than White or Caucasian.

### *Multivariate Analyses—POR Offenders*

The Incident Rate Ratios (IRRs) from the four models predicting the number of POR offenders are displayed in Table 2. First, referencing Models 1 and 2, concentrated disadvantage had a positive and

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<sup>2</sup> Besides examining correlations, other tests of multicollinearity were performed to ensure that the coefficients used in the models were not overly redundant and problematic for the analyses. Regular linear regressions for the logged predatory offender registration (POR) offender and Level 1 and Level 2 sex offender rates were performed to obtain tolerance and variance inflation factor (VIF) values. The tolerance values ranged from 0.250 to 0.950, whereas the VIF values ranged from 1.005 to 3.995.

**Table 1. Correlations, Means, and Standard Deviations of Sex Offenders in Minnesota Census Tracts and Covariates (*N* = 1,329)**

	1	2	3	4	5	6	7	8	9	10
1. POR Count	1.00									
2. Level 1 & Level 2 Count	0.81**	1.00								
3. Level 3 Dichotomous	0.33**	0.36**	1.00							
4. Concentrated Disadvantage	0.46**	0.51**	0.26**	1.00						
5. ICE	-0.45**	-0.45**	-0.20**	-0.76**	1.00					
6. Residential Instability	0.28**	0.33**	0.16**	0.59**	-0.60**	1.00				
7. Housing Affordability	0.22**	0.21**	0.06*	0.31**	-0.49**	0.28**	1.00			
8. Housing Availability	0.15**	0.14**	0.09**	0.13**	-0.12**	0.06*	0.06*	1.00		
9. Population Density	0.16**	0.27**	0.17*	0.46**	-0.31*	0.62**	0.11**	0.03	1.00	
10. Ethnic Heterogeneity	0.20**	0.25**	0.10**	0.58**	-0.36**	0.51**	0.14**	0.07*	0.54**	1.00
<i>M</i>	7.40	2.38	8.9%	0.00	0.27	0.00	-0.02	7.9%	25.4	0.00
<i>SD</i>	6.32	2.97	0.28	1.00	0.24	1.00	0.29	8.42	33.1	1.00

Note. POR = Predatory Offender Registration; ICE = Index of Concentrated Extremes  
\**p*-value < 0.05. \*\**p*-value < 0.01.

significant effect on the number of POR offenders. Before controlling for spatial autocorrelation, the incident rate of POR offenders in neighborhoods increases by 62% for every 1-unit increase in the level of concentrated disadvantage. Including the spatial lag control reduced the size of concentrated disadvantage's effect by about 22%, but the effect remained positive and significant. Residential instability had a modest positive, yet significant, effect on the incident rate of POR offenders, and this effect increased in size after controlling for spatial lag.

Consistent with expectations and similar research (Socia, 2014), more affordable housing and increased levels of housing availability were both significantly associated with increased rates of POR offenders (Table 2, Models 1 and 2). A 1-unit increase in housing affordability was associated with an 88% increase in the incident rate of POR offenders, and an increase in housing availability increased the incident rate of POR offenders by 1%. These relationships were reduced only slightly in size but remained significant after controlling for spatial autocorrelation. Areas with cheaper rents and more available units also have higher rates of POR offenders.

Contrary to expectations, population density and ethnic heterogeneity were both negatively associated with rates of POR offenders. Prior to controlling for spatial autocorrelation, population density was very slightly, negatively, and not significantly associated with the rate of POR offenders, but this relationship increased in size and became significant once spatial autocorrelation was controlled for. Similar to what Socia (2014) found predicting distributions of registered sex offenders, an increase in ethnic heterogeneity resulted in a decrease in the incident rate of POR offenders ( $-11\%$ ,  $p < .001$ ), but the magnitude of this relationship was reduced in size after controlling for spatial lag.

Referencing Models 3 and 4 in Table 2, we observe that a 1-unit increase in ICE is associated with a nearly 91% decrease in the incident rate of POR offenders. This effect is reduced to an 81% decrease when the spatial autocorrelation control is added (Model 4), but remains statistically significant.

Including ICE in the models rather than concentrated disadvantage appears to change the relationship between residential instability and the rate of POR offenders. This effect is not statistically significant and very close to zero in Models 3 and 4. Housing affordability is positive and significant in Models 3 and 4 as it was in Models 1 and 2, but it is smaller in size in models that include ICE compared with models that include concentrated disadvantage. Also different in Models 3 and 4 compared with Models 1 and 2, the effect of ethnic heterogeneity on the incident rate of POR offenders living in neighborhoods is very close to zero and is not significant. The other relationships between neighborhood characteristics and the incident rate of POR offenders are the same or very similar in Models 3 and 4 compared with Models 1 and 2.

#### *Multivariate Analyses—Level 1 and Level 2 Sex Offenders*

Table 3 displays the results of analyses predicting the rate of Level 1 and Level 2 sex offenders both with and without the control for spatial autocorrelation and with measures of concentrated disadvantage and ICE. Comparing the results in Table 2 with the results in Table 3, we observe that concentrated disadvantage and ICE maintain similar relationships with the outcomes. Two notable differences are that housing availability and ethnic heterogeneity are only significant in one model (Model 1), and are both very close to zero and nonsignificant in the other three models. Overall, comparing the results in Tables 2

**Table 2. Incident Rate Ratios from Poisson Regression Models Predicting POR Offender Counts in Census Tracts (N = 1,329)**

	1	2	3	4
Concentrated Disadvantage	1.622*** (0.056)	1.265** (0.076)		
ICE			0.093*** (0.162)	0.193*** (0.225)
Residential Instability	1.064* (0.029)	1.106** (0.030)	0.973 (0.045)	1.012 (0.051)
Housing Affordability	1.878*** (0.100)	1.804*** (0.093)	1.269* (0.100)	1.360*** (0.014)
Housing Availability	1.010*** (0.003)	1.007** (0.002)	1.010* (0.004)	1.006* (0.001)
Population Density	0.998 (0.001)	0.996** (0.001)	1.000 (0.001)	0.997* (0.001)
Ethnic Heterogeneity	0.891*** (0.289)	0.953* (0.027)	0.983 (0.032)	0.996 (0.030)
Spatial Lag		1.326*** (0.027)		1.233** (0.002)
Constant	0.002*** (0.066)	0.001*** (0.068)	0.003*** (0.056)	0.002*** (0.192)

Note. Standard errors clustered by county. Census tract population totals included as exposure terms in all models. POR = Predatory Offender Registration; ICE = Index of Concentrated Extremes  
 \*p-value < 0.05. \*\*p-value < 0.01. \*\*\*p-value < 0.001

**Table 3. Incidence Rate Ratios from Poisson Regression Models Predicting Level 1 & 2 Sex Offender Counts in Census Tracts (N = 1,329)**

	1	2	3	4
Concentrated Disadvantage	1.802*** (0.102)	1.269** (0.077)		
ICE			0.059*** (0.244)	0.170*** (0.273)
Residential Instability	1.101 (0.152)	1.128** (0.039)	1.023 (0.064)	1.022 (0.051)
Housing Affordability	2.406*** (0.239)	2.525*** (0.180)	1.493 (0.216)	1.818*** (0.175)
Housing Availability	1.012* (0.001)	1.001 (0.004)	1.009 (0.005)	1.003 (0.006)
Population Density	1.000 (0.003)	0.995*** (0.001)	1.002 (0.003)	0.996 (0.002)
Ethnic Heterogeneity	0.876*** (0.039)	0.977 (0.052)	0.994 (0.047)	1.022 (0.053)
Spatial Lag		2.394*** (0.209)		2.246*** (0.203)
Constant	0.001*** (0.103)	<0.001*** (0.104)	0.001*** (0.107)	0.001*** (0.137)

Note. Standard errors clustered by county. Census tract population totals included as exposure terms in all models. ICE = Index of Concentrated Extremes  
 \*p-value < 0.05. \*\*p-value < 0.01. \*\*\*p-value < 0.001

and 3 (particularly the models that control for spatial lag) shows that the more conspicuous sex offenders who have passed through prison, but are not subject to wide community notification (i.e., community meetings, media announcements; Table 3), have similar housing patterns to all of the sex offenders combined (Table 2).

#### *Multivariate Analyses—Level 3 Sex Offenders*

The results of the probit models<sup>3</sup> predicting the presence of any Level 3 sex offenders in neighborhoods both with and without spatial lag controls and with concentrated disadvantage and ICE are displayed in Table 4. Models 1 and 2 show that concentrated disadvantage significantly increases the predicted probability of whether or not a Level 3 sex offender resides in a neighborhood. However, once we control for the presence of Level 3 sex offenders in contiguous neighborhoods, the size of this effect is more than cut in half, and it is no longer significant. Residential instability and housing affordability both positively increase the predicted probability of neighborhoods having at least one Level 3 sex offender resident in Model 2, but neither of these effects is significant. Housing availability significantly increases the predictive probability of the presence of Level 3 sex offenders in Model 1, but this effect is halved and reduced to nonsignificance once the spatial lag measure is added. An increase in population density significantly increases the predicted probability of Level 3 sex offender residents, but this effect reverses in direction and turns nonsignificant once spatial autocorrelation is controlled for.

Increased levels of ethnic heterogeneity decrease the predicted probability of the presence of Level 3 sex offenders (Model 1), but this effect is cut in half and turns nonsignificant once the spatial lag control is added (Model 2). This pattern is similar to the results displayed in the same models in Tables 2 and 3.

Turning to Models 3 and 4 in Table 4, ICE appears to be a more consistent predictor of whether or not a Level 3 sex offender resides in a neighborhood compared with concentrated disadvantage. An increase in ICE significantly lowers the predicted probability of having a Level 3 sex offender resident,

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<sup>3</sup> Negative binomial models predicting count measures of Level 3 sex offenders in neighborhoods were also conducted and produced similar outcomes compared with the results displayed in Table 4, in terms of significance and direction of the effects.

**Table 4. Probit Regression Models Predicting Binary Presence of Level 3 Sex Offenders in Census Tracts ( $N = 1,329$ )**

	1	2	3	4
Concentrated Disadvantage	0.325*** (0.030)	0.148 (0.115)		
ICE			-1.386*** (0.206)	-0.991* (0.465)
Residential Instability	0.018 (0.047)	0.024 (0.055)	-0.027 (0.055)	-0.013 (0.061)
Housing Affordability	-0.032 (0.194)	0.036 (0.184)	-0.204 (0.222)	-0.116 (0.242)
Housing Availability	0.011** (0.004)	0.005 (0.005)	0.013* (0.006)	0.008 (0.007)
Population Density	0.004** (0.001)	-0.004 (0.003)	0.005** (0.001)	-0.002 (0.004)
Ethnic Heterogeneity	-0.154*** (0.037)	-0.059 (0.040)	-0.052 (0.028)	-0.020 (0.039)
Spatial Lag		1.810 (1.020)		1.346 (1.029)
Constant	-1.634*** (0.078)	-1.515*** (0.106)	-1.308*** (0.081)	-1.347*** (0.084)

Note. Standard errors clustered by county. ICE = Index of Concentrated Extremes

\*p-value < 0.05. \*\*p-value < 0.01. \*\*\*p-value < 0.001

and this effect decreases only slightly but remains significant when controlling for spatial lag (coefficient =  $-0.930$ ,  $p < .05$  in Model 4). Unlike Models 1 and 2 in Table 4, an increase in the percentage of nonWhite residents is positively and significantly associated with an increase in the predicted probability of Level 3 sex offender residents, even after controlling for spatial lag. Besides the effect of neighborhood race, Models 3 and 4 are very similar to Models 1 and 2 in Table 4 in terms of the size, direction, and significance of coefficients.<sup>4</sup>

## Discussion and Conclusion

The purpose of this research was to examine the factors that are associated with the concentration of sex offenders in a large geographic area with few residency restrictions. By examining multiple categories of sex offenders subject to varying levels of public notification, we were also able to assess what, if any,

<sup>4</sup> Just more than half of all census tracts (53%) in Minnesota and all residents (54%) are located within the seven-county Minneapolis–St. Paul metropolitan area. A little less than half of all POR offenders (46%) and Level 1, Level 2, and Level 3 sex offenders (49%) included in this study resided in this seven-county area as well. Given that so many of the state’s residents and sex offenders are located in this one region, supplemental analyses that included only the 703 census tracts included in the seven-county metropolitan were conducted. The results of these analyses followed a nearly identical pattern to the models displayed in Tables 2, 3, and 4. Omitting the large swath of rural Minnesota and smaller metropolitan areas (e.g., the Rochester area, the Duluth area) did not greatly alter the results of these analyses, besides slightly reducing the effect sizes of some of the coefficients.

effect community notification has on the housing patterns of sex offenders. Moreover, we extended the literature on the housing patterns of offenders and sex offenders in particular by accounting for extreme poverty and affluence.

When comparing the concentrations of POR and Level 1 and Level 2 sex offenders alone, we found few differences in the factors associated with these outcomes. Concentrated disadvantage, ICE, and housing affordability were all consistently significantly associated with the outcomes across different models with and without controls for spatial lag. Both concentrations of POR offenders and Level 1 and Level 2 sex offenders increased in the presence of concentrated disadvantage and more affordable housing, whereas these incident rates of sex offender residents decreased as levels of concentrated affluence increased. Most of these findings are consistent with similar research (Socia, 2014).

Comparing the rate of Level 3 sex offenders versus POR and Level 1 and Level 2 sex offenders combined is more difficult given the low number of Level 3 sex offenders distributed across the state, as well as the different analytical technique used to examine this outcome. Comparing only the direction and significance of the coefficients, ICE is the only measure consistently associated with all three outcomes both with and without the spatial lag controls. Taken together, regardless of how conspicuous these offenders were in the community, they are all less likely to be found in more affluent areas.

Our results indicate that concentrated disadvantage helps explain why certain neighborhoods are more likely to have a higher population of convicted sex offenders. However, it does not tell the whole story because concentrated disadvantage may not fully account for the potential protective effects of affluent neighborhoods (Morenoff et al., 2001). ICE was a strong and consistent predictor of sex offender concentration or presence in all of the models, which highlights the importance of including indicators of extreme wealth as well as indicators of extreme poverty in community-level research (Kubrin & Stewart, 2006; Morenoff et al., 2001). Just as sex offenders may be pushed into communities marked by poverty and other indicators of social disorganization, the other tail end of the economic distribution is insulated from the presence of all levels of sex offenders. Even after controlling for the affordability and

availability of housing, an increase in the level of affluence relative to poverty is associated with a decrease in all categories of sex offenders, regardless of the presence of community notification.

Why do extreme levels of wealth and poverty exert such a strong influence on where convicted sex offenders live? When neighborhoods are more affluent, they typically have more social capital and greater access to social and institutional resources. Moreover, neighborhood affluence is positively associated with collective efficacy (Maimon & Browning, 2012), which increases the capacity for informal social control. The presence of a convicted sex offender in the community is generally perceived as a threat to public order. Sex offender concentration not only reduces home values, but it also inflames concern for the safety of children. Indeed, protecting children has ostensibly been one of the main reasons for the proliferation of sex offender residency restriction laws across the United States over the last decade. Because affluent neighborhoods are more likely to have social capital and collective efficacy, they possess the resources and means to prevent sex offenders from living in their communities.

Impoverished neighborhoods, however, seldom have adequate access to powerful social, economic, and political institutional resources. Nor do they tend to have the shared expectations for collective action that might result in an organized effort to successfully drive out sex offenders from their communities. Therefore, considering that sex offenders are widely regarded as social pariahs, they gravitate toward the areas that are least able to effectively resist their presence in the community.

Although this research has some strengths, it does come with three major limitations. First, this study is cross-sectional. Thus, we are only able to measure the factors that are associated with the concentration of sex offenders, and not factors that increase the concentration of sex offenders. As Hipp et al. (2010) notes, many neighborhoods across the United States are locked in a “cycle of disadvantage” (p. 559), confounded by poverty, crime, disorder, and the exit and reentry of offenders. It is possible that structural characteristics can increase the concentration of sex offender residents, whereas the presence of sex offenders can further erode certain structural characteristics. Data spanning multiple time points are needed to examine the potential causal relationships between structural characteristics and the concentration of sex offenders. Second, we did not specify the mechanisms that explain the relationship

between ICE and the concentration of sex offenders. It appears that sex offenders are deterred from more affluent neighborhoods, and the price and availability of these markets do not explain this relationship. Future research should attempt to identify the community-level processes that may mediate the link between structural characteristics and the housing patterns of this conspicuous group of offenders, outside residency restriction laws and ordinances. Finally, there are likely many individual-level variables that explain the living patterns of all sex offenders who are not included in this research. For example, the prior criminal histories of these sex offenders or the severity of their offenses could either make it easier or more difficult for them to find housing in less disadvantaged areas.

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