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Social disorganization, marriage, and reported crime: A spatial econometrics examination of family formation and criminal offending ☆

Jeremy R. Porter [a,*], Christopher W. Purser [b]

[a] City University of New York – Brooklyn College, 218 Whitehead Hall, 2900 Bedford Ave., Brooklyn, NY 11210, United States
[b] Murray State University, Sociology, Murray, KY 42071, United States

A B S T R A C T

It has long been documented that "marriage matters" for a variety of reasons. Furthermore, there has been considerable debate over the causal relationship between marriage and a number of its associated correlates, most often related to social processes of health behaviors, criminal involvement, and achievement. While most research associated with marriage and crime is concerned with the individual, little is understood concerning the ecological effect of marriage rates. Using data from the U.S. Census Bureau and the F.B.I.'s Uniform Crime Reporting Program (UCR), this study tests such relationships through the implementation of spatially-centered analytic approaches concerning the potential independent effects of marriage rates within a social disorganization context. It is important to understand such aggregate level effects in the face of the existing literature, which relies heavily on relational associations and is subject to ecological fallacy. Analytic techniques incorporate Exploratory Spatial Data Analysis (ESDA) and spatial regression.

Introduction

It has long been documented that "marriage matters" for a variety of reasons. Among these, it has been reported that marriage positively contributes to the health and well-being of both children (Goldman, 1993; Huebner, 2005; Lewis & Butterfield, 2007; Lo & Zhong, 2006; Manzoli, Villari, Pirone & Boccia, 2007; Maume, Ousey & Beaver, 2005; Pearlstein, 2005; Ross & Mirowsky, 2002; Sampson, Laub & Wimer, 2006; Schwartz, 2006). There has also been considerable research done in understanding the relationship between marriage and decreased criminal activity (Huebner, 2005; Lo & Zhong, 2006; Schwartz, 2006; Wilcox et al., 2005).

At the individual level, recent changes in the dynamics of the family structure in the U.S. and marriage patterns in general have made clear the importance of understanding this critical relationship. Despite some evidence to the contrary, Americans still report that they want to be married and believe that being married is an indicator of a "good life" (Huston & Melz, 2004; Waite & Lehrer, 2003). The empirical evidence appears to support this notion. According to the CDC Report, *Marital Status and Health: United States, 1999-2002*, married adults appear to be healthier than their counterparts. Moreover, he findings indicate that married adults are less likely than other adults to be in fair or poor health, are less likely to be limited in various activities, including work and other activities of daily life, and are less likely to smoke, drink heavily or be physically inactive (CDC, 2004). In light of these findings, it is not surprising that married individuals are also expected to live longer lives than their unmarried counterparts.

Not only has marriage been correlated with better health and increased life expectancy, it has also been linked to a reduction in crime at both the individual and community level. Sampson et al. (2006) report, "Being married is associated with a significant reduction in crime compared to non-married states for the same man." The marriage state is beneficial for children as well. A review of recent research on family structure and delinquency found that teens in both solo and remarried homes are at a higher risk for delinquency. The same report found that married parents appear to reduce crime and delinquency at both the individual and aggregate level (iMAPP, 2005). Furthermore, Sampson (1987) hypothesizes that, "A population of married couples tends to stabilize other interpersonal relationships and foster attachment to conventional others, lowering the number of law violations." Furthermore, this relationship is not tested in a formal manner within an ecological framework and therefore is purely relational to this point.

The current study tests this relationship in an attempt to contribute a better understanding of potential contextual level effects of marriage rates on community level rates of reported criminal offending. To date, most inferences researchers make about the community level effect of high marriage rates on rates of criminal offending are based on individual relationships or other relational associations, which do not directly test the independent effects of marriage within an accepted theoretical framework. This aforementioned aggregate level relationship is explicitly examined within the ecological framework of social disorganization.

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* Corresponding author. 218 Whitehead Hall, CUNY – Brooklyn College, 2900 Bedford Ave., Brooklyn, NY 11210, United States. Tel.: +1 646 670 1542.
E-mail address: jeremy.reed.porter@gmail.com (J.R. Porter).

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This theoretical framework takes aim at understanding community level effects of indicators of social disruption; most pertinent to this study is family disruption, on local patterns of reported offending. Within this framework, this analysis will examine the social causation hypothesis by testing the effect of marriage rates on levels of criminal offending within the given ecological context. Specifically, social causation posits that the effects of positively viewed social markers result in lower levels of criminal offending (Ross & Mirowsky, 1995).

Crime and marriage

For the purpose of the current study, this analysis has focused on the criminal offending component of the marriage/well-being literature. Like health and longevity, crime is something that affects most everyone at the individual and societal level. As a result, a significant amount of research has been done on the determinants of crime and a plethora of variables have been linked to it. There is a consistent association between marriage and lower crime rates, which has been found in numerous quantitative and qualitative studies. Indeed, research demonstrates that marriage has emerged as central to the understanding of changes in offending over the life course, and much of the literature suggests that married adults are less likely to commit crimes than their unmarried counterparts (Huebner, 2005; Lo & Zhong, 2006; Sampson et al., 2006).

Wooldredge and Thistlewaite (2003) found that married males were less likely to commit assault and Lester (1994) found an inverse correlation between "domestic integration" (marriage) and both homicide rates and murder rates. This association is not limited to men. It has long been recognized that crime rates are higher for males than for females. "Women are rewarded for their ability to establish and maintain relationships and to accept family obligations" (Steffensmeier & Allan, 1996, p.476). This may provide further support for the crime reducing effects of family, particularly marriage. Similarly, Lo and Zhong (2006) found, "that intimate connection with a spouse deterred deviance among men and, even more readily among women" (p. 326). There are other factors that encourage women to steer away from a life of crime such as feminine stereotypes (including domestication) and greater child-rearing responsibilities, but this fact lends further support to the idea that marriage and family may be deterrents to a life of crime.

Research has also identified robust community-level family structure effects on crime and delinquency (Schwartz, 2006). Wilcox et al. (2005) found murder and robbery rates to be strongly and negatively associated with the health of marriage in urban communities. In other words, low rates of marriage were usually accompanied by high rates of murder and robbery. This was true for both African American and White adults and juveniles. Similarly, results from Wooldredge and Thistlewaite (2003) suggest that neighborhoods with fewer married adults were more likely to witness higher rates of assault.

Many individual level theories have been put forth in an attempt to explain the relationship between crime and marriage, including the implementation of the marriage as protection hypothesis, and the social bonding theoretical framework. Research shows that strong social ties are formed through primary relationships like marriage (Sampson et al., 2006). According to this line of research, n areas where the majority of people are married compared to single or divorced, residents have a sense of obligation to one another, discouraging deviance and encouraging the development of relationships with other conventional people, lowering the amount of crime in the area (Lo & Zhong, 2006). Directly related to this individual-level understanding of the effects of marriage on well-being, ecological theories of well-being have been used to explain the effects of many social indicators on indicators of community level well-being. Furthermore, as in the case of health, previous research has shown these aggregate level effects to be extremely important in explaining patterns of reported criminal offending and pathways to many undesired neighborhood characteristics (Sampson & Groves, 1989; Sampson & Laub, 1993).

Moving from the individual to the aggregate

A well accepted and possible explanation, at the individual level, for the relationship between the above variables using the marriage as protection hypothesis is accounted for in the framework of age-graded life-course, which takes a more direct approach in explaining variations in social processes, especially criminal offending, the latter views this relationship as being natural in relation to cultural milestones within the life-course. Most important in this current piece is the milestone of marriage, which directly leads to a desistance of unhealthy and criminal behaviors.

Life-course criminology is derived from the broader social control framework. The idea behind life-course criminology is that the informal controls that are most salient in inhibiting criminal behavior vary as the individual progresses through the life course. In other words, as individuals age there is an increase in informal social bonds (e.g. career, education, family), which ostensibly leads to crime desistance.

Life-course criminology focuses on two constituent elements: trajectories and transitions (Sampson & Laub, 1992). The former refers to a pathway, or long-term patterns, over the life span, such as parenthood, marriage, and criminal behavior. The latter essentially refers to abrupt, specific (e.g. first marriage) life events that are embedded within broader trajectories and evolve over a shorter time span. Additionally, given the fact that many of these transitions occur at certain ages, Sampson and Laub (1992) refer to their theory of crime-desistance as age-graded theory. From the perspective of age-graded theory, many of life's transitions, or turning points, are paramount in crime desistance, and additionally account for the age/crime relationship. Specifically, when an individual experiences a conventional turning point (e.g. parenthood), the proclivity to engage in criminal behavior quickly diminishes due to the increased responsibility (a function of the strengthening of the informal bond).

Consequently, Sampson and Laub's (1992) conjecture is that these turning points or transitions can affect broader trajectories. To put it succinctly, key turning points can reroute even criminal trajectories into a more conventional direction. Therefore, criminogenic childhood trajectories (delinquent peer association, dysfunctional home life) can be diverted by these turning points witnessed in early adulthood. In other words, adult experiences can account for adult variations in behavior, independent of childhood experiences. It warrants mentioning that researchers identify marriage as being among the most consequential turning point in desistance from crime *for individual criminals* (Sampson & Laub, 1992; Sampson et al., 2006). This study augments research in this area by examining key aspects of age-graded theory at the *aggregate* level (i.e. marriage rates).

While previous research in the social sciences has shown that many individual level demographic variables, such as education, gender, age, income, race, etc., have a significant effect on both structural and demographic variables when aggregated to the community level, it is important to build upon these individual level theories in order to incorporate a more meaningful ecological understanding to the subject at hand. In fact, while both social bonding theory and age-graded life-course theories hint at the fact that those communities with higher rates of marriage would be better off, they neglect to understand the role of community and the interconnected facets that may act in differing manners. One such framework, which directly ties these interconnected facets to one another, is social disorganization theory.

Social disorganization

Developed in the 1920s, ecological theories of neighborhood disorder were some of the earliest attempts to link aggregate community factors to indicators of "well-being" (Paulsen and Robinson,

2004). Most often these early theories were interested in ecological theories of crime and included some noteworthy contributors, including the "Chicago School of Human Ecology", which later developed social disorganization theory and a number of approaches to the examination of neighborhood arrangement and its effect of social order. Social Disorganization is concerned with the prediction of well-being based on community characteristics concerned with socioeconomic status, racial/ethnic heterogeneity, residential stability, and urbanization (Bursik & Grasmik, 1993; Farrington et al., 1993; Sampson & Groves, 1989).

The roots of social disorganization theory originated with scholars at the University of Chicago, but it was not until 1958 that the concept of social disorganization was defined. "Thomas and Znaniecki defined social disorganization as a 'decrease of the influence of existing social rules of behavior upon individual members of the group'" (Paulsen & Robinson, 2004, p. 54). Modern social disorganization theory is built on the ideas of Park and Burgess' concentric zone theory (1925) and, more famously, Shaw and McKay's cultural transmission theory (1942). More recently, Veysey and Messner (1999) gave an explanation of social disorganization within communities. They suggest "that social disorganization operates 'through the processes of value and norm conflicts, cultural change and cultural vacuums and the weakening of primary relationships. This, in turn, is believed to reduce internal and external social control, which then frees individuals to engage in deviant behavior'" (Paulsen & Robinson, 2004, p.61). Therefore, according to Veysey and Messner, there are specific characteristics of the community that inhibit the ability to exhibit social control over its members, including racial heterogeneity, SES, single-parent households, etc. (Paulsen and Robinson, 2004).

Social disorganization theory attributes variations in crime to a breakdown in the basic social institutions within a community; such as family, school, church, etc, and a breakdown of the relationships and networks between people within the community. As a result, social disorganization theorists indicated that delinquent traditions emerged in some communities and were culturally transmitted from one generation to the next. When social disorganization is present in a community, there are fewer positive influences (i.e., community organizations, adult supervision) and more negative influences leading to a greater likelihood of associations with deviant peers from which to learn deviant behavior. These associations contribute to the perpetuation and spread of social disorganization (Paulsen and Robinson, 2004).

A community high in "collective efficacy" is thought to be the direct opposite of one high in social disorganization and, unlike the latter, the former knows how to maintain order and is organized to fight crime not perpetuate it (Paulsen and Robinson, 2004, p.61). Sampson et al. (1997) developed the term collective efficacy and suggested that, in order to have it, a community must first have social capital, which they referred to as having many positive informal networks to rely on.

Community level factors suggested to contribute to social disorganization include structural characteristics such as high population density, high levels of transience, high poverty, and physical decay (Paulsen and Robinson, 2004). The *theory of dangerous places* suggests that "factors in the physical environment lead to moral cynicism among residents, to increased opportunities and motivation for crime and interfere with the ability of residents to control the behavior of those who occupy the space" (Paulsen & Robinson, 2004, p.64). Other related factors include SES, residential instability, racial heterogeneity, etc.

> *"SES affects both organizational participation and supervision of peer groups. Poor communities lack money and resources, and therefore, have fewer organizational opportunities for youth and adults. In addition, poverty is believed to undermine formal and informal social controls, thus affecting the community's ability to monitor youth. Urbanization is negatively related to friendship networks and reduced organizational participation. Ethnic heterogeneity reduces community consensus and increases distrust among community members. Communities then become fragmented along ethnic lines, which impedes communication and, therefore, effective supervision of youths. Family disruption directly affects community members' ability to supervise teenage peer groups. Finally, residential mobility is predicted to disrupt friendship networks" (Paulsen & Robinson, 2004, p.66).*

In building on individual level theories of marriage and its effect on social processes, the following analysis is grounded in the social disorganization framework and aims to test the social causation hypothesis at the aggregate level using the levels of reported criminal offending. This hypothesis is grounded in the ecological literature, which suggests the relationships that are developed through the creation and maintenance of family will directly lead to lower levels of offending.

Methodology

Data and measures

Data for this project were obtained from various sources all pertaining to 2000 data at the county level for the contiguous forty-eight states. Data concerning the dependent variable, the community's crime rate, was obtained from the F.B.I.'s Uniform Crime Reports (UCR).[1] The independent variables in the study were obtained from a number of sources, again all pertaining to the contiguous forty-eight state region of the U.S. The U.S. Census Bureau's Summary Files (sf3 and sf4) from the 2000 decennial census provided data on the four components of the social disorganization framework. Ultimately, the effect of the county level marriage rate will be examined independently and in conjunction with the components of the social disorganization framework and pertinent controls.

Concerning the first component of the theoretical framework, the urbanization of the community, the total population size, population density, and the percent of the county population classified as urban were included in the analysis. Next as measures of racial/ethnic heterogeneity, the percent Black and the spatial segregation of the county are included in the analyses. Measures of socioeconomic status include the median household income, the percent of the population with a Bachelor's degree, the percent below poverty, the unemployment rate, and the percent of housing units that were owner- occupied. The final component of the framework, familial disruption, is accounted for by introducing measures for percent of all households that were single female-headed and the percent divorced. Next, control variables found to be important in assessing the well-being of a community will include percent of the population under the age of eighteen, the sex-ratio, and geographic indicators of metro and regional status.

Furthermore, all cartographic boundary files used in conjunction with the Exploratory Spatial Data Analysis (ESDA) and the final spatial regression models were also obtained from the U.S. Census Bureau's TIGER file system for counties in the contiguous lower forty-eight states.

Analytic techniques

This project examined the above data in two phases: first, a descriptive and exploratory examination of individual variables; and secondly, an explanatory approach predicting offending levels using the appropriate regression techniques and grounded in the social disorganization framework, while taking special care to address the social causation hypothesis. Phase one involved the simple description of the data in terms of distribution and in terms of possible spatial clustering via Exploratory Spatial Data Analysis (ESDA). Here methods of ESDA are used in order to test for potential spatial clustering, which when not controlled for, often causes inaccurate inferences and biased results concerning independent variable coefficients (Voss et al. 2006). The use of ESDA methods has increased recently, spurred by the continued development of techniques and software, and

are becoming essential to a continued understanding of biases and unreliability in statistics produced in the presence of spatial autocorrelation (Anselin, 1988, 1990, 1995, 1999, 2000, 2001a, 2001b, 2002, 2003; deGraf et al., 2001; Voss et al., 2006; Semaan et al., 2007). The indicator of spatial autocorrelation employed here is the Moran's I statistic, which is similar to a zero-order correlation as a positive coefficient indicates places close together are statistically more alike and a negative coefficient indicates that places close together tend to be dissimilar to one another.[2] The general Moran's I is specified as:

$$I = \left(\frac{1}{s2}\right)\frac{\sum_{i=1}^{N}\sum_{j=1}^{N}\omega_{ij}(Yi-\overline{Y})(Yj-\overline{Y})}{\sum_{i=1}^{N}\sum_{j=1}^{N}\omega_{ij}} \qquad \text{where:} \quad s2 = \frac{1}{N}\sum_{i=1}^{N}(Yi-\overline{Y})\wedge 2 \tag{1}$$

In the above equation, the measure of spatial dependence is equal to a measure of variation in the area unit specific rate, in which the overall mean rate (s^2) is multiplied by the neighbor weight indicator (ω_{ij}) times the product of each unit (i) minus the overall mean and each neighborhood (j) minus the overall mean then divided again by the weight indicator and summed across all units (i) and across all neighborhoods (j) (Waller & Gotway, 2004). The statistic is very similar to Pearson's Correlation Coefficient in that it measures an association between *N* observed values associated with two random variables, *Xi* and *Yi* (Waller & Gotway, 2004). In this case the only difference is replacing the *Xi* variable with the *Yj* neighborhood variable and introducing the weight matrix (ω_{ij}).[3]

This equation produces a statistic in which each unit's (i) interaction with another is taken into account, and when neighboring units (indicated by a 1 as the ω_{ij}, as opposed to a zero for non-neighboring units) are statistically significant and similar, the Moran's I statistic is positive, meaning areas of closer proximity tend to be more alike than those far apart (Waller & Gotway, 2004). In this instance you would have spatial clustering. In order to place a significance value on the observed Moran's I statistic, a permutations-based test will be implemented to test the null hypothesis: "No spatial association" or "spatial randomness". The test employs a permutations-based approach to test the global index on randomly assigned locations in order to approximate the distribution of the global index under the null assumption (Waller & Gotway, 2004). This examination will implement a 999 permutations test with a reject region equal to a 0.05 significance level.

So that statistically significant independent clusters of contiguous "zones" among counties can be identified, Anselin's Local Indicator of Spatial Association (LISA) statistic (1995) was implemented. This approach is based upon the global Moran's I coefficient decomposed into a "local" level, which is the county in this study. This local examination repeats the spatial clustering procedure for each neighborhood, which is equivalent to the reproduction of the procedure *i* times (once for each county accompanied by all of its identified neighbors (Waller & Gotway, 2004). This procedure ultimately produces a categorical outcome based on the relationship of county *i* to the remainder of the counties within the j^{th} neighborhood, producing a result that indicates positive spatial clustering (county is significantly like neighbors), negative spatial clustering (county is significantly unlike neighbors), or spatial random distribution (county is not significantly like or unlike its neighbors) (Anselin, 1995). For the purpose of this article, the general LISA statistic will be employed. It is specified as:

$$I_i = \sum_{j=1}^{N}\omega_{ij}(Y_i-\overline{Y})(Y_j-\overline{Y}) \tag{2}$$

From this equation one can see that the random variable (LISA) *Ii* is equal to the weight indicator multiplied by the product of the local unit value (Y_i) minus the global mean ($\overline{Y}$), and the neighborhood average value of the same variable (Y_j) minus the global mean ($\overline{Y}$). Simply put, the LISA value for a given location is equal to the relationship between the two variables of interest (correlation) multiplied by the weight indicator matrix (one if considered a neighbor, zero if otherwise).

Phase two involved the specification of a series of nested regression models.[4] Based on the findings from the ESDA in the descriptive analysis, the explanatory analysis will identify the appropriate technique to control for the existence or absence of spatial autocorrelation. In the event of obvious spatial autocorrelation, as expected via the literature review, spatial dependence diagnostics will be examined in Geoda[5] in order to select the appropriate spatially weighted model. The initial model will test the isolated effect of marriage on the social well-being indicator within the social causation framework. Next, a series of additive models will be examined controlling for each of the four components of social disorganization (racial heterogeneity, family disruption, socio-economic status, and urbanization) in rotating stepwise fashion.

The spatial dependence diagnostics test used in this analysis will be concerned with a particular type of spatial effect, spatial dependence. The two primary causes of spatial dependence are error and substance (Anselin, 1995; Messner et al., 1999). When spatial dependence is determined to be error-based it means that the autocorrelation among the variables is among the regression residuals and suggests that in fact there may be other explanatory variables, which have not been included in the model. In this case, the spatial weight is applied to the error term in the regression equation. Furthermore, when the spatial dependence is determined to be related to substance, it suggests that the autocorrelation exists in the dependent variable itself. Unlike the error case, this time the spatial weight is applied to the dependent variable.

Results

The results from phase one of the analyses suggest that there is, in fact, a significant degree of spatial autocorrelation in the county-level-offending variable. The results can be seen in Fig. 1. From the figure, it is evident that the levels of reported criminal offending of counties across the U.S. is far from random; in fact, the scatterplot presented in Fig. 1 illustrates a significant degree of spatial autocorrelation as evidenced by the positive slope, indicating that levels of development are in fact spatial clustered. The positive slope shows that as well-being rises at the local i^{th} county, so to does the extralocal well-being of the surrounding j^{th} neighborhood. Furthermore, the positive Moran's I statistic of 0.2993, illustrates a strong spatial relationship that must be taken into account in subsequent portions of the analysis in order to avoid inflated standard errors and unreliable coefficient estimates (Anselin, 1995).

Once these clusters are mapped, using the LISA statistic with significance levels less than 0.05, it becomes evident where these spatial clusters exist geographically. From the top panel of Fig. 2, one can see that high levels of criminal offending exist in pockets in the Southeast, Southwest, and Northwest (as well as sporadically across the Midwest and Northeast). These patterns are indicative of the non-random relationship identified by the Moran's I [Fig. 1] (Anselin, 1995).

The identification of significant clusters were based on a Queen's contiguity matrix and a .05 significance level using a randomization procedure of 999 permutations.[6] Given these parameters, significant clusters were saved and mapped in Fig. 2 where communities exhibited a High-High relationship or a Low-Low relationship. The H-H relationship was then labeled as communities experiencing a statistically significant high crime rate and the L-L communities just the opposite. These Local clusters are for descriptive purposes only

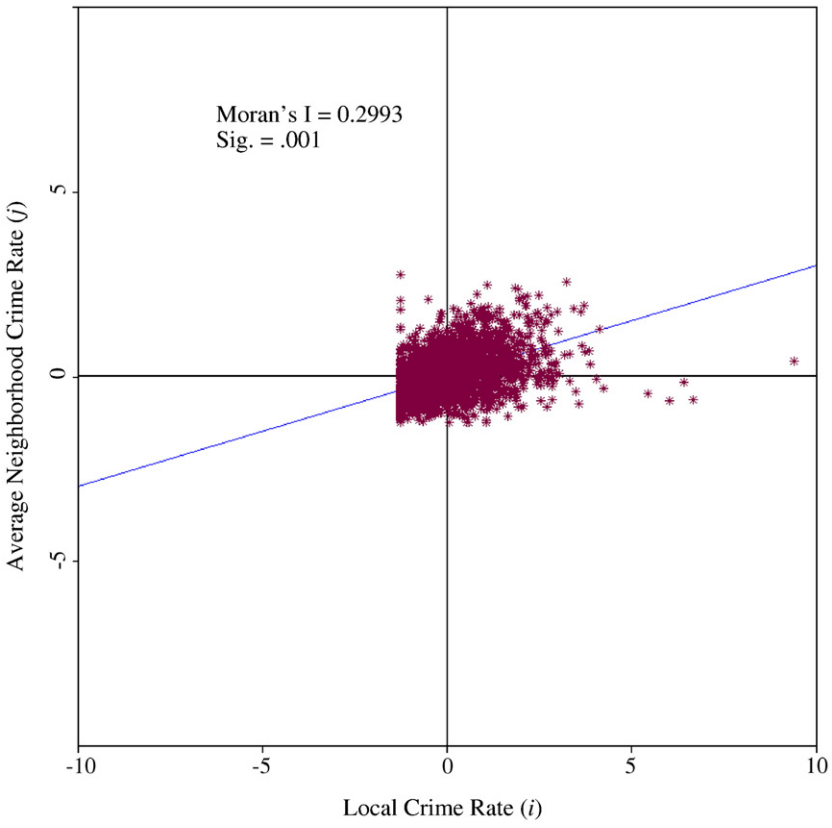

Fig. 1. Moran's scatterplot examining spatial relationship of social well-being to average neighborhood levels.

and it is the statistically significant positive Moran's I that is the basis for the spatial regression technique, which provides the bulk of the substantive analysis.

Based on the significant spatial autocorrelation, the descriptive statistics of the variables of primary interest are first examined by region and in aggregate form at the national level in Table 1. The results show, as expected based on the LISA, there are variations by regions in each of the variables. At the national level, the U.S. average crime rate per 1,000 is 39.2; the average percent married for individuals over the age of eighteen is 75.9percent. Each of the regional- specific statistics follows as expected, based on the results of the ESDA illustrated in Fig. 1, with the South and West having the highest rates of reported crime at 45 and 46 per 100,000, respectively.

Following the results of the ESDA, phase two implements spatial regression models in order to better understand and explain the aggregate level effects of marriage on local levels of offending, while controlling for the non-random spatial variation in the social well-being indicator. This dependence on space can be further tested in exploratory OLS regression models specified to test for such relationships via a set of spatial diagnostics.

In order to test for the model specification to control for the identified existence of spatial autocorrelation, OLS models were initially run employing an adjacency weight matrix. These preliminary models returned a series of coefficients, via the Lagrange Multiplier Tests, which identify whether the spatial autocorrelation is due to spatial lag or error.[7] For each model all coefficients were significant, with the dominant spatial process being a spatial error. Based on the results, each regression model was re-specified in order to introduce the appropriate spatial weight into the equation.[8] Introducing a weight for spatial error into a model entails the correcting for non-random error term correlation by adding the spatial weight to the right-hand side of the equation; also known as a Simultaneous Autoregressive Model (SAR) (Cressie, 1993). The standardized coefficient estimates reported from this point forward were obtained from the following model specification:

$$Y_{ij} = x_{ij}\beta + \varepsilon_{ij} \quad \text{where}: \quad \varepsilon_{ij} = \lambda\omega\varepsilon + \upsilon \tag{3}$$

From the model one can see that the SAR model consists of a basic regression model, with the only weighting taking place in the error term (ε_{ij}). Here the correlated error terms are controlled through the introduction of a spatially weighted adjacency vector ($\lambda\omega\varepsilon$) and an added vector of independently and identically distributed (iid) errors (υ). This spatial weight, along with the introduction of the uncorrelated error terms, allows for the regression coefficients to be estimated without violating the assumptions inherent in spatially correlated data (Cressie, 1993).

Model 1, which tests the isolated effect of the local marriage rate on the level of offending, reports that an increase in the rate of marriage negatively affects the local levels of reported criminal offending of the county by 24.49 standardized units. This initial finding is promising and points to a strong aggregate level relationship in bivariate form while controlling for spatial clustering.[9]

Next, Models 2 – 6l test the effects of marriage while controlling for the components of the social disorganization framework, one at a time in Models 2 – 5 and in full form with all controls in Model 6. First, Model 2 introduces the indicators of the urbanization component of the framework to the previous model. The results show that, while the introduction of these controls decreases the standardized effect, the community marriage rate remains a significant predictor. Furthermore, since standardized *Beta's* are being presented here, it is appropriate to point out the effect of marriage is larger in magnitude when compared to the urbanization indicators as a group, except for the percent of the population classified as urban. All three indicators proved to be significantly related to the response variable, significantly increasing the rate of offending in the community.

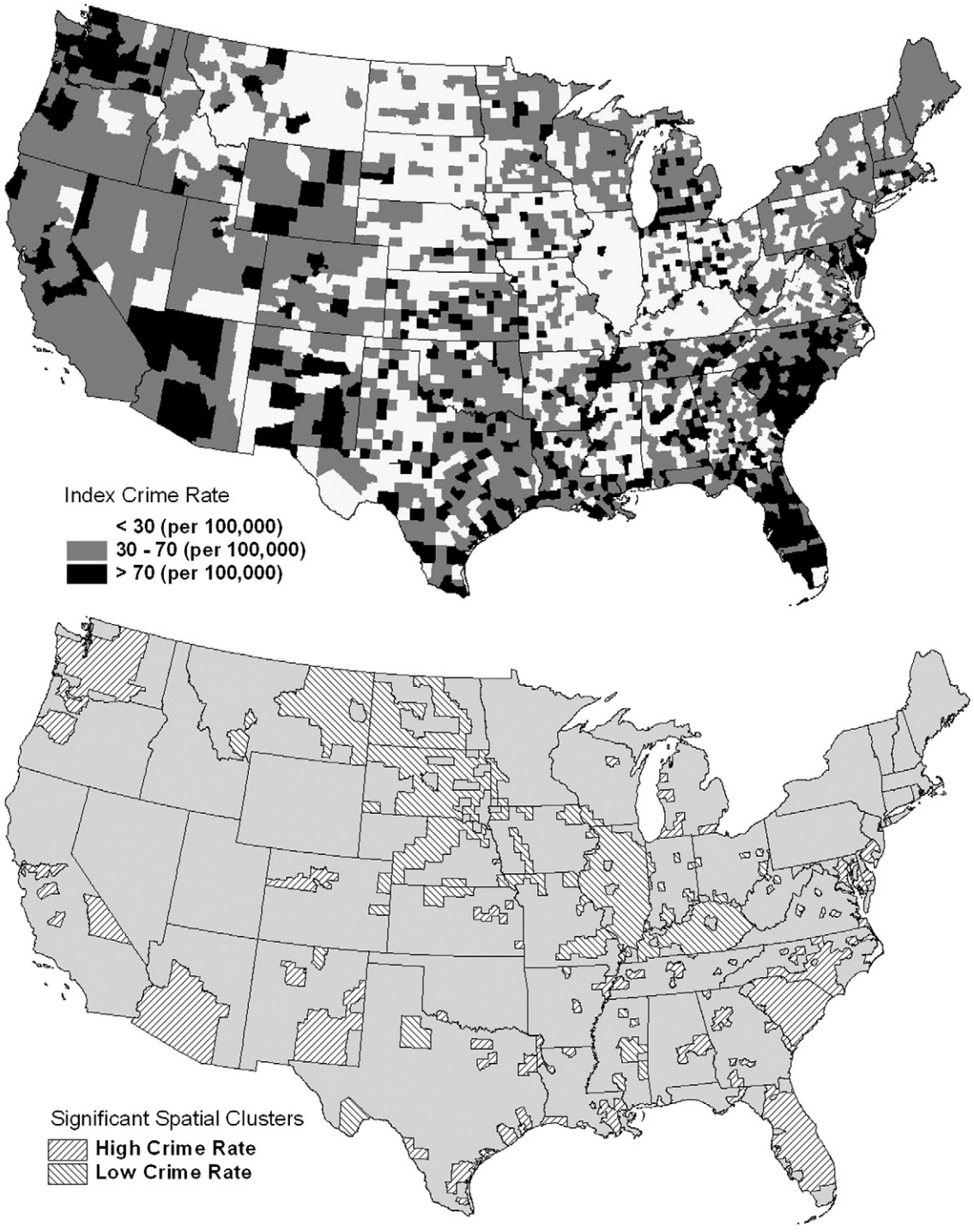

Fig. 2. Spatial variation of index crime rate and significant spatial clusters, U.S.

Likewise, in Model 3, the indicators of the racial/ethnic heterogeneity component are introduced and again the marriage rate remains significant, decreasing the levels of criminal offending in the local community by 20.45 standard units. In this case, the marriage rate of the local community proved to be the strongest indicator of levels of offending in the model, given the magnitude of the standardized coefficient. In relation to the indicators, increases in the percent Black and county segregation were significantly related to increases in the levels of offending.

Next, Model 4 introduces the items aimed to measure the socioeconomic status of the community and the third component in the social disorganization framework. From the results one can see that when controlling for the socioeconomic indicators of the county, increases in the marriage rate continue to provide evidence of a positive effect on the aggregate levels of offending. Along with the marriage rate, increases in the percent with a bachelor's degree, increases in the percent unemployed, decreases in the percent in poverty, and decreases in the percent housing owner occupied all negatively affect the local levels of offending by increasing the rates. While most would see these indicators as inherently linked to well-being, the real story here is the ability of the marriage rate to remain significant in the face of indicators that are often measured as the sole indicators of well-being, especially at aggregate levels. It is important to note at this point that all models included tests for colinearity

Table 1
Descriptive statistics of dependent and primary independent variables

	Min.	Max.	Mean	Median	Std. Dev.	Skewdness	Kurtosis
Northeast Region							
Crime Rate	0.0	247.1	39.9	36.7	23.0	3.758	29.843
Percent Married	57.7	80.9	73.9	74.5	3.3	-1.604	5.210
Midwest Region							
Crime Rate	0.0	239.2	28.5	23.4	27.2	1.772	6.948
Percent Married	51.9	85.5	76.3	77.0	3.7	-1.925	6.543
South Region							
Crime Rate	0.0	208.9	45.0	39.7	33.3	0.854	0.707
Percent Married	48.8	93.9	75.9	76.7	4.4	-1.228	3.437
West Region							
Crime Rate	0.0	332.3	46.2	44.5	29.5	2.357	20.535
Percent Married	59.6	85.2	76.0	76.6	4.0	-0.920	1.400
U.S. Average							
Crime Rate	0.0	332.2	39.2	35.0	31.2	1.341	4.655
Percent Married	48.8	93.9	75.9	76.6	4.1	-1.340	3.865

Data Sources: National Center for Health Statistics (NCHS), FBI's Uniform Crime Reports (UCR), and U.S. Census Bureau.

among the predictor variables, all of which provided no support for the existence of multicollinearity.

The last of the individual component models, Model 5, introduces the indicators of familial disruption along with the local marriage rate. This model is especially interesting due to the fact that when one thinks of the four components of social disorganization; one would tend to think of marriage as most closely being associated with the familial disruption grouping. Furthermore, even when controlling for other measures of family disruption in the community, increases in the marriage rate prove to significantly decrease the level of offending in the county. Interestingly, the magnitude of the standardized coefficient for the marriage rate is lower than the other component models, lending credence to its apparent association to the component and its independent ability to explain rates of reported criminal offending in the face of those controls. Also in the model, increases in the percent divorced increase rates of offending at the aggregate level.

The final model in Table 2 is the full model, including all components of the social disorganization framework along with controls proposed to be related to levels of marriage at the community level. Most important here is that given all of the components of the social disorganization framework and the marriage related controls, the effect of the marriage rate remains significant and negative in relation to its affect on county levels of offending. While the controls explain away a good deal of variation, they are ultimately unable to account for the strong and consistent effect of the local marriage rate on local levels of crime. Along with the marriage rate, increases in the median household income and the percent in poverty both significantly decrease the local levels of criminal offending, while all other significant relationships are associated with an increase in the rate of offending.

Lastly, as can be expected based on the ESDA, the strongest predictor in the model is the average neighbor's crime rate (lambda). The inclusion of the average neighbors score inflates the R-Square, making the role of space evident in comparison to a simple OLS model (not shown). This inclusion is necessary based on the LISA results and allows for more accurate inferences about the variable specific slopes than a regular OLS model (Voss et al., 2006). Furthermore, the full model slightly reduced the standardized spatial effect from a starting point of 26.85 in the isolated bivariate model (Model 1) to 23.82 in the full model (Model 6). This decrease provides further evidence that the social disorganization framework and the selected components are extremely important in accounting for some of the initial spatial variation; however, it remains the case that these measures were ultimately unable to explain away any amount of spatial association that should be considered efficient given the number of explanatory variables included in the models.

Discussion and conclusions

It is evident from the findings that, yes, marriage matters at the community level as the community's marriage rate is a significant predictor of the community's rate of criminal offending. Furthermore,

Table 2
Standardized spatial regression results predicting the crime rate via a social disorganization framework

	Isolated Marriage Effect		Individual Component Models - Social Disorganization Theory^								Fully Integrated SD Model & Controls	
Independent Variables	Model 1		Model SD2		Model SD3		Model SD4		Model SD5		Model SD6	
Marriage Rate	-24.49	***	-11.69	***	-20.45	***	-22.03	***	-20.14	***	-8.75	***
Population Size	--		3.91	***	--		--		--		3.85	***
Population Density	--		6.61	***	--		--		--		6.15	***
Percent of Population Urban	--		25.69	***	--		--		--		20.01	***
Percent Black	--		--		2.75	**	--		--		3.81	***
Residential Segregation	--		--		9.68	***	--		--		2.67	**
Median HH Income	--		--		--		1.76		--		-6.14	***
Percent BA Degree	--		--		--		2.14	*	--		3.96	***
Percent Poverty	--		--		--		-6.01	***	--		-6.41	***
Percent Unemployed	--		--		--		3.75	***	--		3.26	**
Percent Housing Own-Occ	--		--		--		-3.64	***	--		2.48	*
Percent Female-Head HH	--		--		--		--		1.95		-0.86	
Percent Divorced	--		--		--		--		3.93	***	4.74	***
Sex Ratio (male to female)	--		--		--		--		--		-0.15	
Percent Under 18	--		--		--		--		--		2.87	**
South (dummy)	--		--		--		--		--		5.73	***
Metro (dummy)	--		--		--		--		--		3.73	***
Spatial Weight (ϵ)	26.85	***	27.87	***	27.58	***	27.55	***	26.19	***	23.82	***
Constant	28.55***		19.27***		22.39***		22.54***		20.14***		9.93***	
R-Square	0.335		0.469		0.357		0.372		0.544		0.513	
AIC	29146.51		28462.00		29054.61		28986.01		29127.41		28342.70	

*** P-value<.001; ** P-value<.01; * P-value<.05.
^ SD2 - Urbanization, SD3 - Racial Heterogeneity, SD4 - Socioeconomic Status, SD5 - Family Disruption.
ϵ = Spatial Error Model (Simultaneous Autoregressive Model).

the use of these spatial techniques allows for the controlling of autocorrelation, which can, when not controlled for, yield inaccurate results of both direction and magnitude (Voss et al., 2006). On that point, it is important to note that not only does marriage matter at the aggregate level, but also that space matters in relation to the identified relationship.

Our results lend support to the idea that marriage rates at the community level create a low level of social disorganization based on their dynamic relationships and interrelationships between and within families in a community. From the literature review, one can recall that simply having social relationships can significantly improve a number of individual and community level outcomes (Lewis & Butterfield, 2007; Lo & Zhong, 2006; Ross & Mirowsky, 2002; Sampson et al., 2006). Again, these conclusions are supported based on the findings that communities with low levels of social disorganization have decreased crime rates and higher overall social well-being. This is much in the same way that social bonding and age-graded life course theory point to marriage as instrumental in the individual level desistance from criminal offending (Sampson & Laub, 1992). The results also provide confirmatory support for the utility of theoretical integration when attempting to account for behavior as multifaceted as crime.

While an aggregate indicator of criminal offending has been implemented here, the findings are still consistent with much of the previous literature. The use of such a measure coupled with the use of ESDA and spatial regression techniques have allowed for a more complete and accurate understanding of the effect of marriage at the community level on the involvement and desistence of criminal behaviors. The effect of the marriage rate was found to significantly improve the rates of offending of the community even while controlling for a number of substantive demographic variables. This is important in the creation of policy and the understanding of social issues pertaining to marriage. In recent times, social scientists have seen that the family structure has changed dramatically and the current trajectory hints at its continued evolution. With this in mind, the current study hopes to add to the existing understanding of the effect of marriage on social well-being indicators while calling for further research on the role that the change in family structure will play on the future well-being of both individuals and their greater communities.

In closing, it should be briefly noted that this analysis has been conducted using the software program Geoda and the LISA statistic as the indicator of significant spatial clustering. There are a number of alternative measures of cluster identification (i.e. hotspots) as well as many other viable software packages with the sophistication to provide such analysis. In fact, many of this software packages were developed solely for this purpose. These include Geosurveillance, R, SaTScan, Cancer Atlas Viewer, CrimeStat, among others. It is important to note that the results of the identification of significant clusters do change *within* and *between* software packages given the randomization procedures and algorithms associated with the given analysis. In any case, each provides a measure of spatial dependence that should be taken into consideration in any subsequent explanatory modeling while also being noted as a potential limitation given the method chosen in the analysis.

Appendix A

	Regression Diagnostics					
	Model1	Model2	Model3	Model4	Model5	Model6
Spatial Dependence						
LM (lag)	784***	707***	720***	702***	698***	466***
Robust LM (lag)	21***	1.9	1.8	41***	17*	3.1
LM (error)	977***	984***	954***	945***	878***	558***
Robust LM (error)	214***	279***	274***	283***	197***	98***

Notes

1. It is widely known that the UCR has some issues with missing data. This analysis takes a Heckman's two-stage correction approach in the imputation of missing data. This approach in a parametric imputation procedure which incorporates pertinent characteristics of the missing data unit based on a given regression approach.

2. The most common case is that of positive autocorrelation in which the local unit's (i) value on a variable of interest is significantly, and positively, correlated with the average neighborhood (j) value. Less frequently, negative autocorrelation refers to an instance when a local unit's (i) value pertaining to a specific variable is significantly in opposition to the neighborhood's (j) average value.

3. The LISA statistic was used in order to identify spatially significant clusters of high and low crime across the US. It must be noted that there are a number of spatially-centered approaches for identifying statistically significant clusters of crime (and other social phenomena for that matter). The LISA was employed here given the software used to perform the analysis (Geoda). This software was used for both the ESDA (i.e. the tests of significant spatial clustering) and the subsequent explanatory modeling (i.e. the spatially weighted regression models).

4. Due to higher than sought after correlations between a few of the independent variables with the social disorganization framework, colinearity diagnostics were examined in conjunction with the coefficient estimates in order to ensure that the models did not violate the linear regression assumption. On that point, all models exhibited high levels of non-orthogonality, indicating no colinearity.

5. Geoda is an open source software package, developed by Luc Anselin, specifically designed for the analysis of data through a series of techniques for the identification and controlling of spatially correlated data.

6. Initially part of the exploratory approach taken by the authors was to test both distance and different contiguity matrices. The most robust application was in reference to the Queen's matrix at one level of hierarchy. A k-nearest neighbors approach (ranging from 3 to 10 neighbors) was tested as well as a Rook and Queen matrix at both first and second order hierarchy. The results show that the method ultimately employed in the article had the highest Moran's I coefficient, indicating the most robust identification process concerning significant spatial clusters of reported criminal offending.

7. The results of the LM tests are presented in an appendix at the end of the manuscript.

8. Ultimately, the type of spatial autocorrelation identified involved correlating error terms within local neighborhoods. In regards to the analysis, this means that a traditional OLS approach violates the assumption of uncorrelated error terms.

9. There may a multiple comparison problem, given the fact that inference of local spatial autocorrelation statistics is usually complicated by the fact that these local statistics are correlated when the neighborhood sets of two regions contain common elements. Given that these are population data with no need to meet probability based assumptions, this potential issue is not taken into account here. However, in such a case the Bonferroni and Sidak approximations may be appropriate for comparative purposes.

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