17 Years in Chicago Neighborhoods

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Mapping Crime Trajectories in 801 Chicago Census Tracts from 2001 to 2017

Introduction

Criminologists have established the notion that crime is unevenly distributed in space (so-called crime hot spots). This study attempts to portray the crime pattern of Chicago neighborhoods over the past 17 years. Is crime concentrated in place as was argued by previous studies? Are places with concentrated crime consistently producing crime incidents over time? Is the crime trend identical across census tracts?

Data and Methodology

Data: Individual crime incidents data between 2001 and 2017 are obtained from Chicago Open Data Portal, which basically represents the crimes that come to the knowledge of Chicago Police. Crime incidents with valid geographic coordinates are aggregated to 801 census tracts (as per the boundaries defined in 2010) using spatial join method in R.

Group-based Trajectory Analysis: Given the huge number of census tracts in the City of Chicago, we classified the 801 individual crime trend pattern into limited number of groups using group-based trajectory analysis (Nagin, 1999) in R with package *crimCV*.

Geospatial Data Analysis: Geospatial data analyses are conducted using software Geoda and ArcGIS. Local Indicators of Spatial Association (LISA) method (Anselin, 1995) is used for detecting local spatial clustering.

Figure 1.

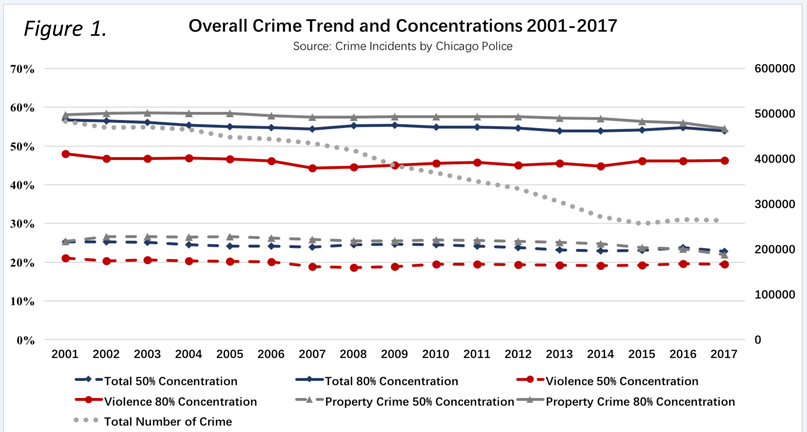


Figure 2.

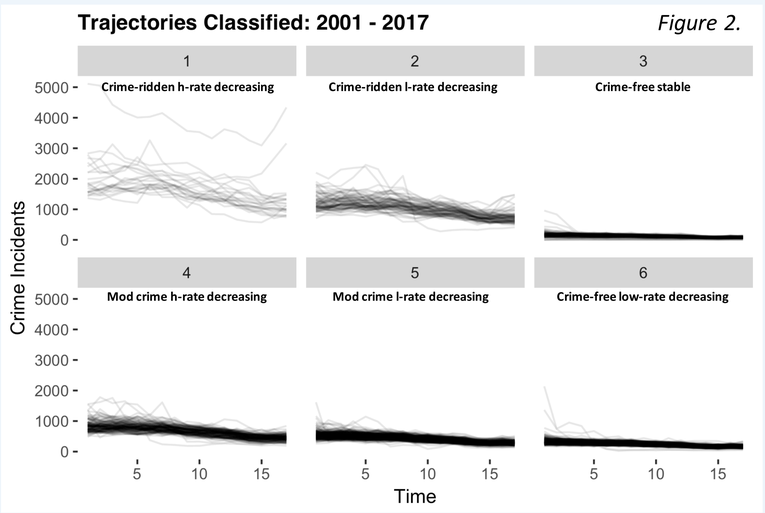
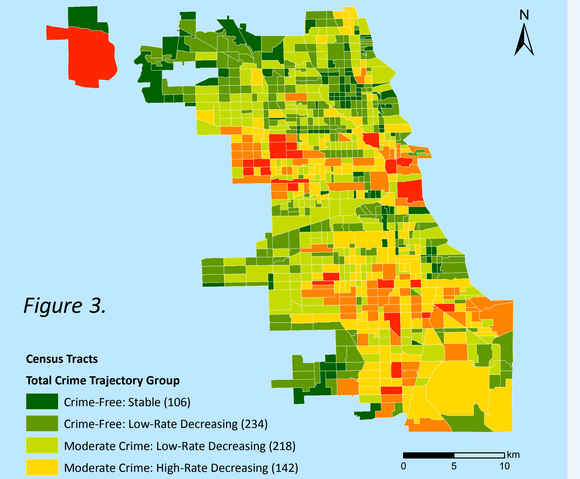


Figure 3.



Group-based Trajectories: Tight Coupling of Crime and Place

Although the proportion of street segments with a specific threshold of crime incidents remains consistent over time, we wonder if the concentrations are place-specific. Namely, are the same 25% (55%) census tracts stably producing 50% (80%) of the crimes? We adopt Group-based Trajectory Analysis developed by Nagin (1999) to classify census tracts' crime trajectories. This model provides a simple descriptive portrait of the trend of crime in our data. Census tracts were reduced into 6 groups based on AIC criterion, each representing a unique crime developmental pattern. *Figure 2.* displays the 6 estimated group trends of crime: 1. Crime-ridden high-rate decreasing traj; 2. Crime-ridden low-rate decreasing traj; 3. Crime-free stable; 4. Moderate crime high-rate decreasing traj; 5. Moderate crime low-rate decreasing traj; 6. Crime-free low-rate decreasing traj. *Figure 3.* shows the spatial distribution of these six raw trajectories.

Spatial Cluster: The six trajectories were then collapsed into three classes: Crime-ridden decreasing (1&2); Moderate crime decreasing (4&5); and Crime-free stable (3&6). *Figure 4.* – *Figure 6.* highlight the spatial clustering of three classes of crime trajectories. Both positive and negative local spatial autocorrelation are shown in all three maps, suggesting considerable heterogeneity in the larger community areas. The most salient message from the figures is that census tracts that are close to each other tends to experience similar crime trajectories (positive LISA). The examples of Austin and Englewood, as well as the northern Chicago, clearly illustrate this. On the other hand, despite that many crime-ridden decreasing census tracts are enclosed by crime-ridden decreasing tracts, there are also census tracts in the same community area free or less bothered by crime. Again, pink areas (negative LISA) in Austin and Englewood clearly supports this finding. It is of special interest for further studies to unveil the underlying mechanisms of such differential developmental paths within the same area.

Findings

Law of Crime Concentration

Criminological studies have established that crime is strongly concentrated in space. For example, Sherman, Gartin, and Buerger (1989) found that 3.5% of the addresses produced 50% of the crime calls in Minneapolis. Wesiburd, Groff, and Yang (2012) found that 80% of the total crime consistently occurs in 20% of the streets in Seattle. In this study, we confirm this notion of Law of Crime Concentration at the census tract level in Chicago. As shown in *Figure 1.*, despite the overall crime decline during the time span, crime is nonetheless highly concentrated. 50% of the total number of crime incidents occurred in approximately 22% - 25% of the census tracts. 80% of the total number of crimes occurred in 53% - 56% of the tracts. Similar conclusion can be drawn with respect to violence (19% and 45%), and property crime (25% and 57%). More interestingly, as Chicago sees a crime decline during 2001– 2017, total crimes (25.2% to 22.9%; 56.7% to 53.9%), violence (21.1% to 19.5%; 47.9% to 46.3%), serious crime (26.0% to 22.7%; 57.8% to 54.6%), and property crime (25.3% to 22.0%; 58.1% to 54.6%) are becoming increasingly concentrated without an exception.

Figure 4.

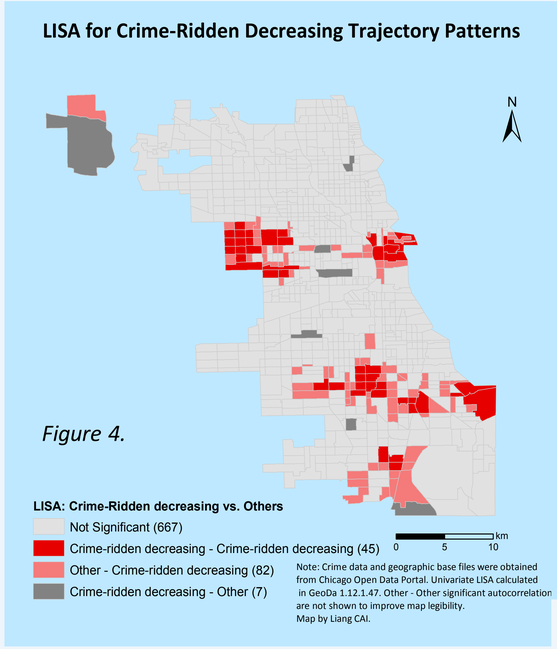


Figure 5.

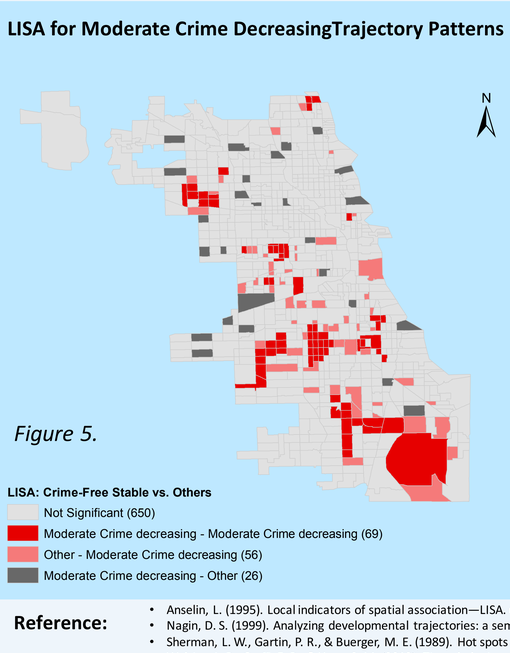
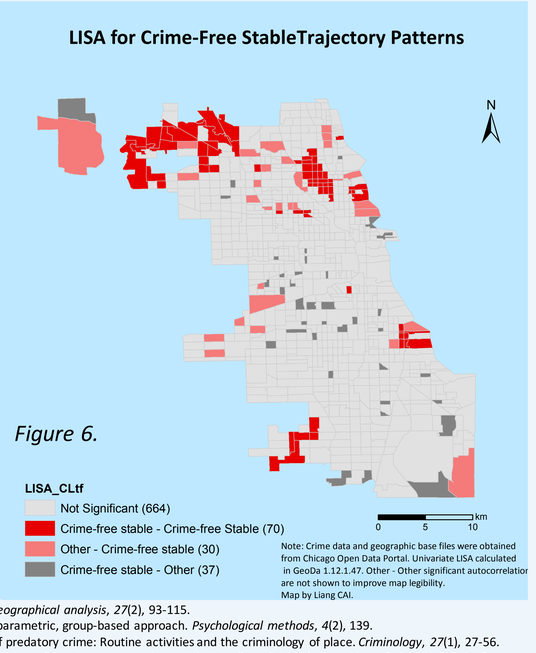


Figure 6.



Reference:

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