[DRAFT – PLEASE DO NOT CITE OR CIRCULATE WITHOUT THE AUTHOR'S PERMISSION]

LIBRARIES FIGHTING CRIME:

SPILLOVER EFFECTS OF PUBLIC INSTITUTIONS

Andy Porter

University of California, Irvine

DRAFT DATE: DECEMBER 2014

ABSTRACT

Public institutions such as libraries, schools, and shelters create crime spillover effects by attracting victims, witnesses and incapacitating criminals. This paper is the first to estimate the causal impact of public institutions on local crime rates. These crime effects are identified by exploiting exogenous variation in the open hours of the Los Angeles Public Library system. To estimate the relevant local impact, I divided Los Angeles by nearest library and utilized administrative crime data from the Los Angeles Police Department. I find increasing operating hours of local public institutions decreases non-gang related aggravated assault rates and car burglary rates nearby. I also find evidence of burglary substitution between car burglary and residential and business burglary, as burglars shift from busier areas near open public institutions and transition to potentially empty homes further away. Public institutions can reduce crime by attracting patrons that act as witnesses against car burglary, and by keeping potential aggravated assault victims or aggressors occupied in a safe environment.

JEL codes: K14, H43

I'd like to thank Marianne Bitler, David Neumark, Linda Cohen, Mike McBride, George Tita, Jan Brueckner, Damon Clark, Joe Altonji, Gordon Dahl, the Los Angeles Police Department, and the many individuals who gave me insightful comments and criticism.

I. Introduction

Brick and mortar public local institutions[1] such as libraries, schools, homeless shelters, and parks are important establishments in communities. When open, these are places where people congregate and spend time. While stated missions of these public institutions might concern literacy, homelessness, and education, among others, these public institutions have crime spillover effects. As crime requires victims as well as perpetrators, any place and time where individuals congregate, crime is affected. Public institutions can affect crime by attracting potential victims, and simultaneously decrease crime by attracting potential witnesses. Public institutions can incapacitate potential criminals who are utilizing the public institution's services indoors. In addition, potential victims may be safer inside the public institution than at risk outside on the street. How crime responds to the opening and closing of public institutions has a broad impact, as these types of institutions are common in all cities.

Institutions can affect crime in three different ways. By creating a free public space, people from all income levels can come and potentially utilize the institution. By spending time within the institution instead of on the street, a person will be at less risk of getting arrested or becoming a victim of a crime. In addition, these institutions provide "eyes upon the street" when people attend. The appearance of visitors is a deterrent to potential criminals, as the person can act as a witness and report the crime to the police and potentially identify them in a lineup. Adversely, institutions also provide a boon to crime in the form of suitable targets for crime. Every time someone new enters the institution or is in the nearby area there is an additional person who can be victimized. These three mechanisms by which institutions can influence

[1] The word "institutions" has many meanings to many economists. In this paper I refer to public institutions as physical locations that are open to the public or a relevant demographic slice of the public, where individuals come to spend time, such as libraries, schools, parks and shelters.

crime also interact in complex ways, making it necessary to consider all simultaneously and their combined impact on different types of crime when determining the crime spillover effects of public institutions.

Testing the causal effects any observational treatment is difficult as exogenous variation in general is rare, including exogenous variation in the availability of public institutions. In this paper I exploit exogenous variation in the opening hours of the Los Angeles Public Library, as the system experienced a dramatic change in hours. During the Great Recession, the Los Angeles Public Library's budget was cut and later partially restored. The cuts varied by the day of the week on which they occurred, the library types to which they were applied, the dates on which they took effect, and the number of hours by which they cut library service. This exogenous variation represents a unique opportunity to empirically test the impact of library hours on crime and uncover how opening and closing public institutions alters the criminal landscape.

Libraries are an ideal institution to test because they are enjoyed by the wealthy and the poor, college graduates and those studying for a general educational development (GED) test. However, the library system is much more important to the disadvantaged (Zickuhr, Rainie, Purcell 2013). Those without internet or computer access can use the library's free internet and computers to apply for jobs, connect with friends and family, read the news, enjoy entertainment, and much more. Those without shelter can find a place to sit and read. Those struggling with illiteracy can attend adult education classes. The library can act as a safe haven, a compelling place to spend time inside the library instead of possible worse alternatives outside on the street. The traditionally disadvantaged use the library more than others, and simultaneously are much more at risk of becoming victimized or arrested (Zickuhr, Rainie, Purcell 2013). This makes libraries an especially salient type of public institution to estimate its impact on crime.

In the following paper I show evidence of the impact of opening and closing public institutions on local crime rates. To accomplish this I utilizes exogenous variation in the open hours of the Los Angeles Public Library system. First, I review the history of the Los Angeles Library during the Great Recession, discuss the three mechanisms by which local institutions can affect crime rates. Next I describe the crime and library data and my unique library map construction. Following this I explain my empirical model, utilizing a difference in differences empirical strategy. Afterwards I present my results and conclusions. I find statistically significant and negative effects of library hours on car burglary and non-gang aggravated assault near libraries, and find evidence that implies substitution from car burglary into residential and business burglary.

II. A History of the Los Angeles Public Library During the Great Recession

The Los Angeles Public Library, first established in 1872, includes 73 libraries, and in encompassed a collection of over six million volumes (American Library Association 2012) which serves 3.8 million residents of Los Angeles. Among public libraries in the United States and according to the American Library Association in 2012, the Los Angeles Public library serves the most residents, has the second most total visits, fourth most holdings (print materials, electronic books, audio and video,) and is twelfth in total circulation[2].

During the Great Recession of 2009, low tax revenues hit California and Los Angeles particularly hard. The city faced a budget shortfall of $212 million during the 2009-2010 fiscal

[2] The New York Public Library is first in holdings, visits, circulation, and 2nd in population served. However, the County of Los Angeles Public Library is a separate entity from the Los Angeles Public Library. The county library is large, albeit smaller than the city library.

year and a $485 million shortfall during the 2010-2011 fiscal year[3]. In response to this, the library's total expenses were cut 15 percent from 2009 through 2011 (California Library Statistics 2012). Most of the impact of these cuts were in total open hours, which fell during this time period by 25 percent. During various dates from 2009 through 2010, library administrators cut Sunday and Monday completely, as well as shortening hours for the rest of the days of the week. Monday service was partially restored in the summer of 2011. During meetings of library administrators, they sought to minimize the impact of the upcoming cuts to service hours to visitors and maximize the salary savings by cutting whole days instead of half days. They reason there are significant fixed costs to opening and closing a library, so cutting a whole day is cheaper than cutting the same amount of hours among multiple days. In addition library administrators were concerned about "confusion" among library patrons as to what times the library was open. They reasoned cutting whole days was easier for patrons to recall.

In response to cuts to the library hours, fewer people visited the library and utilized its services. Initially, library administrators were hopeful patrons would shift their library usage to other, open days of the week[4]. Unfortunately for the library, as hours fell by 25 percent during the 2009 through 2011 period, visits to the Los Angeles Public Library fell by 28 percent as well (California State Library Statistics 2012). Circulation, which is a measure of the number of checked out volumes in the library system also fell by 20 percent. As the 20 percent reduction in circulation is less than both the number of hours and the number of visits percent change, the most devoted library patrons may have decreased the number of visits but partially shifted the days they check out books.

[3] From the City of Los Angeles Budget Summary, 2010-2011 and the minutes of the Board of Library Commissioners, City of Los Angeles, March 25, 2010 and April 15, 2010.
[4] Minutes of the Board of Library Commissioners, City of Los Angeles, July 29, 2010.

Many individuals use the library for the free public computers. Computer use is common in public libraries; a Pew survey found 26% of Americans age 16 and older used the internet, the computers, or free Wi-Fi at a local library (Zickuhr, Rainie, Purcell 2013). In a Pew Research study released in 2013, computer use was found to be a common and expected use of public libraries. The Pew study reported 26% of Americans age 16 and older used the internet at the library through the computers or free Wi-Fi.

The usage of the library's internet-connected computers fell during the same period by 33 percent. This means individuals who used the library's free computers did not, or were not able to, shift their usual computer time onto other days by a greater amount than the hours cut. Since the rates of computers used, circulation, hours and visits are largely in the same ballpark we can conclude the cuts in library hours adversely affected how many individuals were coming to and utilizing the library.

III. How Libraries and Institutions Affect Crime Rates

In this section I describe the three theoretical mechanisms by which libraries and comparable institutions can influence crime rates: the social services, the eyes on the street and the suitable targets mechanisms derived from routine activities theory (Cohen, Felson 1979). Each mechanism offers a compelling theoretical argument for how and why crime should be affected by the presence of open institutions such as libraries. All three mechanisms happen simultaneously and are directly intertwined to the costs and benefits of public institutions. However, as I detail in the results section, different crimes are affected by different mechanisms.

Each of the three mechanisms are related to the rational criminal model. As criminals have been shown to respond to incentives, the rational criminal model developed by Becker is an important tool to understanding criminal behavior and what strategies might mitigate potential crimes. Becker (1968) developed the rational model of crime: depicting a criminal deciding whether to commit a crime given his available opportunities. Researchers have been utilizing the Becker rational criminal model (Sjoquist 1973, Dills 2009, Melkhop 2010) of crime to better understand how to deter criminal behavior. In a simple specification of the model, a criminal decides to commit a crime if the net expected benefits outweigh the reservation wage or opportunity cost. Traditionally, the opportunity cost of committing a crime has been studied in a labor context (Cornwell 1994, Donahue 2001, Gould 2001, Raphael 2001, Rege 2009, Phillips 2012), investigating a weak but significant link between unemployment, wages and crime. In the following section I discuss the opportunity cost of crime in the context of local institutions such as libraries, and the potential choices a victim or criminal might make.

III.1. The Social Services Mechanism

Libraries are popular institutions many different kinds of people enjoy. However, when institutions are cut or removed, low income individuals are the most adversely affected. This is supported by a Pew survey on library usage, which found Blacks, Hispanics and low income individuals are 50 to 100 percent more likely to say library services are “very important” for almost all of library services (Zickuhr, Kathryn; Rainie 2013). Library services include quiet spaces, internet and computers, youth programs, job search assistance, and government services

help[5]. In a library a low income individual can use the free services they may not have access to at home. The time spent inside the library is time not spend in a criminally risky situation.

In addition to utilizing library services more, the poor and blacks suffer disproportionately from crime. The rape, robbery and aggravated assault victimization rate is 169% higher for blacks than whites, the overall arrest rate is 241% higher for blacks than whites and the burglary victimization rate for individuals making less than $7,500 a year is 213% higher than those making more than $75,000 (BJS 2010; FBI 2012; Census 2012). Low income and disadvantaged individuals may also commit more crime due to peer and network effects, an individual may commit more crime if his neighbors are committing crimes (Glaeser et al. 1995, Freeman 1999).

Therefore, the same groups that demand the most library services would be hurt the most should the library hours be cut. These groups will be forced into alternative activities during the day that may be more criminally risky than before. Parents who would have dropped their teenagers off at the library if they could not afford a babysitter will be out of an option. Recently paroled felons who are looking for work and need assistance looking will have to go elsewhere. Students who don't have a quiet space to study and the elderly who don't have a sheltered place to use a computer or read will have less options than before. If these patrons spend more time in bad neighborhoods or out on the street, crime may increase as a result of the cuts to library hours.

The social services mechanism draws on findings from the incapacitation literature, showing the less time a potential criminal has available due to being otherwise busy or incapacitated, the less crimes are committed. Traditionally, this literature has shown increasing

[5] Books and media had the most similar response rate across groups, though Blacks, Hispanics and low income individuals still had the highest "very important" response rate (Zickuhr, Kathryn; Rainie 2013).

prison sentences decreases crime rates (Ehrlich 1972, Levitt 2007). By having individuals stay in prison longer after committing a crime, future crimes are reduced due to the most likely culprits are already in prison. By removing them from the pool of available criminals, law enforcement effectively lowers crime. In non-prison setting, Dahl (2009) found the release of violent movies reduced assaults that same night and weekend. The authors argue this reduction is due to potential violent criminals enjoying violent movies instead of drinking alcohol at nearby bars and committing assault. This mechanism applies to potential victims of crimes as well. By victims self-selecting into a relatively protective place such as a library, they remove themselves from the pool of potential victims. If criminals are incapacitated or victims are in a safe haven, both the supply, the pool of criminals, and the demand, the pool of victims, of crime are reduced resulting in less crimes committed.

Free internet and computers are a strong draw for the library (Zickuhr, Rainie, Purcell 2013). One possible use of the internet is to look for employment. Kuhn and Skuterud find internet job searchers become employed faster during unemployment spells. However, once controlling for individual characteristics the gains from internet searching is eliminated (Kuhn, Skuterud 2004). Stevenson (2008) finds labor search is more efficient since the advent of the internet. Employees who have jobs are more likely to pursue better job opportunities elsewhere, and the unemployed are more likely to find jobs that best suit their skills. In addition to labor, the internet can substantially decrease consumer search costs. Brown (2002) found internet use decreased costs of life-insurance plans due to increased price competition among providers. As individuals are better able to find jobs with internet access, access to libraries may increase the probability of finding a job, therefore increasing the opportunity cost of crime. Individuals can also use the computers to connect with family and loved ones or solely for entertainment

purposes. If the individual is spending time with the computer indoors that person is effectively removed from both the pool of potential victims and potential criminals[6], thereby lowering the number of crimes committed.

III.2. Eyes Upon the Street or Potential Guardians Mechanism

As more individuals gather together there is a greater likelihood someone will see a crime being committed, interfere with the criminal, take photos or call the police. This is known as "eyes upon the street" or "potential guardians" in the routine activities criminology literature (Cohen, Felson 1979). Chang and Jacobson found after marijuana dispensaries were unexpectedly shut down, effectively closing a business, nearby burglaries from vehicles went up substantially and decreased in distances further away from the dispensary (Chang, Jacobson 2014). The authors reason the most likely reason responsible for the crime increase was due to the traffic coming in and out of the dispensary.

If there are many "eyes upon the street" present while a criminal considers committing a crime, he may be discouraged. They become discouraged because the amount of people nearby increase the chance of being caught. Individuals nearby can see the crime committed and become a witness, or potentially break up a crime in progress. If caught, the eventual expected value of punishments (fines, jail time, and future lack of employment) are in the future and will be discounted much more heavily than the probability of apprehension, which occurs in the present

[6] Computer-driven crime such as identify theft and scamming are a large problem worldwide and could be facilitated by a library's free computers and internet. However according to the LAPD incident narratives from 2009 to 2011 the number of reported crimes involving a stolen identity was 15 total, out of almost 300,000. This may be underestimating the true stolen identity total as the data does not list if the victim's identity was stolen, only the narrative.

and thus is not discounted. This suggests for crime reduction and policing purposes, increasing "eyes upon the street" and thereby increasing the perceived chance of getting caught could be more fruitful at preventing crime than other methods such as increasing sentencing. This is supported by research finding the probability of arrest is a much more powerful predictor of reductions in crime than the severity of punishment (Davis 1988, Trumbull 1989). This literature informs us by having an institution open, the visitors that come to the institution will act as de-fact "eyes upon the street" that inhibit criminal activity by the fear they place in criminals of getting caught. The result of this mechanism is that the supply of crime is reduced and the demand side has not changed as crimes are as bad to victims as before. Criminals facing the increased chance of being caught would result in a reduction of the supply of crime, reducing crimes committed.

III.3. Suitable Targets Mechanism

Criminals must weigh the benefits and costs of committing a crime and choose the best course of action for them. An open library provides "suitable targets" because there are more people to choose to victimize when the library is open. Libraries are frequently used by students carrying laptops, smartphones, and other expensive electronic devices. These devices are ideal items to steal and are plentiful inside libraries. Therefore, any open library would have to contend with an increase in criminals that would accompany any open library, each looking to take advantage of other patron's belongings.

The suitable targets available in a library are substantially different than those at a regular business, or as Chang and Jacobson studied, restaurants or dispensaries. Restaurants and

dispensaries do have suitable targets, and these individuals carry phones and cash that are attractive to steal and in the case of dispensaries, marijuana. Given the influx of dispensaries in California, the presences of marijuana might not be as attractive an item to steal at present compared to a laptop[7] or bike at a library. As the pool of potential victims has increased this mechanism results in an increase in the demand of crime, increasing the number of crimes committed.

The social services, eyes upon the street, and suitable targets mechanism portray a complex and deep picture of institutions and how they may affect crime. For instance, all three mechanisms either increase or decrease the number of crimes committed or increase or decrease the price or cost of crime depending on which effect dominates. Every hour a library or comparable institution is open, all three are in play and are difficult to disentangle. In the sections that follow, I detail my data, empirical strategy and results of the Los Angeles Library natural experiment.

IV. Empirical Strategy and Data Description

In the following section I describe the variation in library hours, and sources of possible endogeneity and bias. Following that I describe the crime data and the constructed Los Angeles library map. Finally, I discuss my benchmark difference-in-differences model.

[7] Coffee shops do have a significant number of individuals with laptops, and the author plans to extend this research to test whether coffee shops differ from libraries in their crime reducing effects.

IV.1. Variation in Library Hours and Possible Sources of Bias

As shown in Figure 5, the Los Angeles Public library changed its hours on many occasions during the sample. Not only did the hours change on many different dates, the hours changed on different days of the week, and for different library types. Some libraries were closed due to renovations or haven't opened yet, another source of variation in library hours.

However, cuts the library administrators chose were not randomly assigned. The library administrators faced a choice in deciding what days to cut and how much of each day to cut the hours by. From the public minutes of the Board of Commissioners Library Council meetings, the administrators argued and dealt with this very issue. These reasons are important for the interpretation of my results because the marginal hour cut by the library is not the same as a random hour cut. If the council chose to cut busy days I will be estimating the effect of cutting the busiest days on crime. Similarly, if the council chose the least busy days, I will be estimating the effects of the least busy days on crime. The minutes show the administrators focused on disrupting library visitors the least by cutting the least busy whole days.

The Board of Commissioners gave several reasons for choosing Sunday and Monday to cut. The meeting minutes state cutting whole days is preferable to imposing several half-days because half-days may involve complicated "labor rules and negotiations to break workdays in half[8]" in addition to there being "no way to determine whether two half-days would be more efficient in reaching a number of residents than it would to close for one day" as well as "cause confusion" as to the library's opening hours.

Their minutes also show Sunday closure was chosen to because it provides the "greatest

[8] Minutes of the Board of Library Commissioners, City of Los Angeles, June 10, 2010.

salary savings" and "Sunday is among days with the lowest use[9]". Monday was chosen as "many holidays fall on Monday", reducing the disruption to library traffic by selecting a day of the week that was already going to be closed significantly throughout the year. Cutting whole days as they did saves the library system money if there are significant fixed costs to opening and closing the library on any day. By cutting Monday and Sunday completely, the library saves any maintenance, security and administrative costs of opening the library, while minimizing the impact on library patrons. The minutes show the library administrators cut Sunday and Monday to have the least impact on visitor traffic. Therefore, the library cuts Sunday and Monday, saving significant fixed costs of opening libraries for two whole days while not impacting visitor behavior as much as they would have if they had cut more popular days and other days without as many holidays.

Given the library administrators decided to cut the least busy days and minimize impact to visitors, I conclude my estimates are representative of the least busy day cut instead of a random hour cut. Foot traffic is related to crime levels, with fewer people there is less to steal or victimize and fewer people to do the stealing or victimization, lowering crime. However, there are also fewer "eyes on the street" to deter crime. As a result my coefficients will be representative of the least popular and least open library hours on crime.

IV.1.1. Security Presence at Libraries

One possible source of omitted variable bias could occur if the library system cuts affected the security guards present at various libraries. If the presence of security guards is the

[9] Minutes of the Board of Library Commissioners, City of Los Angeles, March 25, 2010.

major catalyst of any crime changes from library hours, then the security guards at library will have a large effect on outcomes. However, the department responsible for library security, the Office of Public Safety stated none of the current "security officers will be laid off[10]". Since there were no security changes occurred during the sample period, security presence at libraries should not affect the interpretation of my results.

IV.1.2. Temporal Displacement of Library Patrons

Another possible source of bias is the displacement of library patrons. When faced with a closed library day, if patrons decide to skip their usual library visit then my interpretations hold. However, if library patrons respond to cuts by shifting their library attendance to other days, then other days may or may not have an increased criminal presence due to the influx of patrons who would not have otherwise been there. However, annual visits declined by approximately the same percentage as the number of hours cut. From 2009 to 2011 library hours fell by approximately 25 percent, and visits fell by 28 percent (California State Library Statistics 2012). Given visits fell by a similar amount to hours, I conclude most visitors responded to the library cutbacks by visiting the library less.

IV.2. Dividing Los Angeles

To test the hypothesis that providing free and available library affect crime, the distances between each library were calculated. This process allowed me to divide Los Angeles into separate "library zones" where for any given location in Los Angeles I will know which library

[10] Minutes of the Board of Library Commissioners, City of Los Angeles, June 10, 2010.

is the closest library. The closest library is relevant to my analysis under the reasonable assumption that an individual can only travel to one library at one time, and if any library has any effect on him, it will be the closest.

The criminology literature that focuses on how far criminals travel to commit crimes has found most criminals travel fewer than 0.6 to fewer than 1.0 miles on average (Snook 2004, O'Leary 2011). Informed by this literature, I've divided every library-zone into three discrete "library radii-zones", to test the effects of library hours on areas closest to the library, versus far away. Dividing the library-zones by distance to the library allows me to test differential effects of library closures by distance. For instance, the library closures might affect those closest to the library the most versus far away. An inner library radii-zone of 0.6 miles and under "as the crow flies", an outer radii zone of 1.0 – 0.6 miles, and the furthest zone of greater than 1.0 miles away from a library. This means if a crime was committed within a library radii-zone, the crime is associated with the closest library and the radii the crime occurred. For instance, if a crime occurred within 0.6 miles of Library A, the crime will be attributed to Library A, at a radii of 0.6 miles and under. This methodology allows me to test the effects of library hours on crime locally, as the places closest to the libraries should see the largest effects of library hour changes.

Population counts are needed for each library zone to normalize crimes committed by their respective population density. The zones were overlain with census block population data retrieved from the 2010 census. The population of each library zone was calculated by summing the total population of the census blocks residing in the zone. If a census block resided in multiple library areas, that census block's population count was divided amongst the libraries by the percentage of area the census block inhabited in each library zone.

IV.3. Crime Data Description

The crime data is from January 1st 2009 to September 17th, 2011, encompassing all part one crimes committed in Los Angeles city and reported by the Los Angeles Police Department. Part one crimes include all violent crimes such as robbery, assault, and homicide as well as property crimes consisting of burglary and theft (including motor vehicle theft). Due to privacy issues, rape was not recorded in the data.

In total, 298,659 crimes were committed in Los Angeles during this period. Of those, 242,150 were property crimes, and 56,509 were violent crimes. The type of crime committed by library radii-zone is provided in Table 2.A. The data is at the reported incident level, such that date, time, offense and location are recorded. For the Los Angeles city libraries, the data on their locations were recorded from the city libraries website. The locations of each crime were collected by the LAPD. The LAPD reports two dates for a reported crime, end date and beginning date. These dates might not equal each other for a variety of reasons. For instance a case of embezzlement that went on for a few days or longer, a burglary during an extended vacation, or a theft that went unnoticed. Below in Table 2.B I present crime totals for each library radii where the difference between the end date and the beginning date are is equal to one or zero days. Predictably, property crime falls when the dates must be equal to each other, as many property crimes can happen overnight or over a weekend without notice.

Crimes are counted for each library radii-zone on a daily basis. Each observation indicates the radii of the library zone and the library for each day in the sample. Daily crime counts per library radii-zone are reported per 100,000 population.

IV.4. Benchmark Model Specification

Below, I specify the benchmark model.

$$CrimeRate_{it} = \beta_0 + \beta_1 LibHours_{ijt} + \beta_2(radii_{r=0.6} * LibHours_{it}) + \beta_3(radii_{r=1.0} * LibHours_{it}) + X_{it}\Phi + \alpha_i + \delta_t + \varepsilon_{it} \quad (1)$$

The model variables are defined as follows: $CrimeRate_{it}$ represents crimes reported per 100,000 population, per day (t), per library radii-zone (i). The fixed effects captured in the model are α_i, which represents library radii-zone location fixed effects, and daily time fixed effects, δ_t. The variable *LibHours* is the total number of hours per library radii-zone. For each library, the hours applicable to each radii-zone are the same. The variable $radii_{r=0.6}$ and $radii_{r=1.0}$ represents values for the categorical variable radii, for radii-zones of 0.6 miles and under, and between 1.0 miles and 0.6 miles radii. The base radii is greater than 1.0 miles. Therefore, the interpretation of the interaction between LibHours and radii is the difference of the slope of library hours of areas close to the library versus farther than 1.0 miles away. The baseline LibHours therefore represents the slope of library hours for areas further than 1.0 miles away.

The vector X denotes a selection of school day variables. These count how many schools of different types, elementary, middle, high, and continuing education, are open in a particular day t and library radii-zone i. This is further discussed in the robustness section.

IV.5. Argument for Weighted Least Squares

The creation of library radii-zones captures the crime effects of areas close to and far away from each library. One cost of this method is the library radii-zones have non-identical populations. As the population of the areas becomes smaller, the variance of any type of crime rate increases, identifying heteroscedasticity in the data. To address this, in my benchmark model I perform weighted least squares, where the weights used are population. There are two reasons for this. First, the nature of this dataset involves construction of library radii-zones by dividing Los Angeles. A casualty of this method is not all areas are equally sized. Therefore, the census population estimates, an average of the census block estimates, get progressively more imprecise as the area becomes smaller. Secondly, the crime rate is by definition the number of crimes divided by the number of population. Given my population estimates vary significantly by place, the variance of my crime rates increases as the population estimates decrease. See appendix A1 for a figure displaying the inverse relationship between crime rates and population.

In the next section I describe my results, the empirical evidence linking library hours and crime rates.

V. Empirical Evidence of Library Hours Affecting Crime Rates

First, in Figure 6, I show how de-meaned car burglary rates responded to changes in library hours for a subset of the available variation. To illustrate the variation in library hours clearly, the figure only shows branch libraries, without holidays, without any library undergoing renovations during the sample period, for areas within 0.6 of a library by day of the week. As seen in the figure, the cuts on Monday and Wednesday, show corresponding increases in car burglary rates near libraries.

Second, in Table 6.1, I show and discuss my benchmark results. Next, in Table 6.2, I will present results that loosen the reported incident date range, to remove the possibility of imprecise incident dates clouding my results. Third, in Table 7, I show results that disaggregate reported gang crimes and not gang crimes. Tables 8.1 and 8.2 show a series of robustness checks.

As the results in Table 6.1 show, burglary from vehicle and burglary display negative and statistically significant effects at the one and five percent level for my covariates of interest. For burglary from vehicle, I find coefficients of -0.0172 for areas within 0.6 miles, and -0.0162 for areas between 1.0 and 0.6 miles statistically significant at the one percent level. The effects represent a burglary from vehicle crime rate change of -0.83 percent to -0.37 percent on average per one library hour increase. As this coefficient is part of an interaction of radii variables, the interpretation of the -0.83 percent to -0.37 percent is the difference between areas within 1.0 miles from a library from areas greater than 1.0 miles away. However, despite negative and statistically significant coefficients on the interaction between library hours and nearby areas for the overall crime rate, the base coefficient on library hours is positive and statistically significant. This is being driven by positive coefficients from burglary, theft and violent crime. One possible explanation of this is displacement. For instance, as library hours increase, individuals may leave their homes in areas far away from a library, which makes it vulnerable to burglary. Standard errors are clustered at the library level throughout, the largest level of my variation in library hours as recommended by Barrios et al (2010).

Each crime is recorded with two dates, the beginning and end date. These dates represents the interval the crime occurred, or could have possibly occurred in. For some types of property crime, particularly burglary, victims may not notice they have become victims until several days later. This may make my estimates less precise. To address this, a crime subsample

is created where if the end date is more than a day later than the beginning date, the crime is dropped. This results in a loss of almost 24,400 property crimes, the majority of which are burglary and burglary from vehicle. Despite this the results from Table 6.2 are in line with the full sample from Table 6.1. I find negative and statistically significant effects of library hours on nearby areas on burglary from vehicle rates.

VI. How Library Hours Affect Gang and Non-Gang Crime

Gangs are criminal organizations. The choices of these organizations may be made by high-level gang members, and these gang members may not be aware of, or respond to, local changes in library hours. Therefore gang-related crimes may create a level of noise in the violent crime data that would blur any possible effects of library hours on types of violent crime. Any time a crime is catalogued by the LAPD, officers will record relevant *modus operandi* or M.O. codes in the database. One of these codes is "gang-related", meaning any crime where gangs are involved. Predictably, the catalogued gang crimes are almost always violent crimes as property crimes will only be noted as a gang crime if the gang were to leave incriminating gang-related evidence. Violent crimes on the other hand have victims that may be gang members themselves or have heard a gang-related threat. After categorizing violent crime into gang and non-gang related, gang related violent crime represents more than 22 percent of all violent crime.

In Table 7, using gang-related crime as the dependent variable, I find no gang related significant effects from library hours. Two, the effects of library hours on areas nearby libraries are statistically significant and negative for non-gang aggravated assaults. The interpretation of the coefficient is a one hour increase in library hours will decrease the non-gang aggravated assault rate by 0.01 per 100,000 population, which represents a 1.9 percent decrease on average

compared to areas far away from the library. I find no other statistically significant effects for any other non-gang violent crime. This is plausible as gang members may not be personally interested in spending time in a library, therefore contribute noisily to overall aggravated assault effects. By removing the gang related aggravated assaults, I am able to estimate the impact of increased library hours on a more relevant section of the population. In addition roughly 50 percent of aggravated assaults are committed by a friend, relative, or an intimate partner (BJS 2010). These types of heated encounters amongst non-strangers may have been avoided if the victim or perpetrator was not in their residence, such as a library. If the perpetrator wasn't in contact with their potential victim, then there's no possibility for an assault to occur.

VI.1. Controlling for Library-Zone Effects with Base Coefficients

In my benchmark model, I explicitly control for city-wide daily effects, and individual library-radii-zone effects. However, I am unable to control for all possible library-zone-day effects. Examples of these include daily foot-traffic, which would control for the amount of people in a library-zone in a given day, and is directly related to the amount of crime. To account for this, I place more emphasis on the differenced coefficients, which are the interaction coefficients of library hours and 0.6 mile radii and between 1.0 and 0.6 mile radii. The base coefficients themselves capture library-zone-day effects, as they capture variation common to all three radii. Therefore, the most trusted coefficients for making inference must be the interactions, as they have differenced out any effects common to all three radii I am not able to control for.

VII. Robustness

In this section I discuss potential endogeneity bias and confounding variation concerning

the Great Recession and school days, as well as robustness specifications for each of my results.

VII.1.1. The Great Recession and Possible Endogeneity Bias

Library hours were cut across the city at distinct and different dates for most libraries simultaneously[11]. However, one possible source of endogeneity bias is the timing of the cutbacks with the Great Recession. The Great Recession was certainly the catalyst, as budget shortfalls caused by the Great Recession caused the city to issue cuts to the library system. Also, unemployment and other correlates of the Great Recession are also correlated with crime. Because of this, it is initially worrisome that the effects I observe of library hours on crime are actually the effects of the Great Recession and its correlates on crime, if the Great Recession caused the library cuts.

However, while the recession and especially the employment effects on crime plausibly affected Los Angeles's overall crime rate, these effects were felt by the city as a whole, on dates not correlated with the library meeting bureaucracy, not correlated by type of library, and not by day of the week. In addition, several branch libraries were under renovations, had unexpected closures or had a grand opening in late 2009. These libraries experienced zero hours and provide an additional plausible counterfactual. To test this, I regressed Los Angeles weekly gas prices, a plausible correlate of economic activity, on library hours and find absolutely no statistically significant correlation between library hours and weekly gas prices[12]. I conclude the variation in library hours I observe does not suffer from Great Recession related omitted variable bias.

[11] Exceptions to this include the Central and regional libraries, and the libraries not yet opened or under renovations, please see Table 4 and Table 5 for more information.

[12] After controlling for the year and day of the week, I find no correlation between weekly gas prices and library hours. Localized gas prices would be ideal but were unavailable to the author at the time of this draft.

VII.1.2. School Day Confounding Variation

One possible source of confounding variation is school days. If library hours are correlated with school days, and school days are correlated with various crime rate outcomes, then my results may be biased. To address this I have included every school in Los Angeles Unified School District, the largest public school system in California and the 2nd largest in the United States. Every school's geographic location is placed within the appropriate library radii-zone the school is located in. The calendars for each type of school were collected and counted to determine if for each day in my sample, which schools are open by type. Therefore, any confounding school variation by day, by place and by school type is accounted for. A map of Los Angeles with the variation in school placement is displayed in Figure 4. The inclusion of school days into my specifications has no appreciable effect on any of the results.

VII.1.3. Burglary from Vehicle Robustness

In Table 8.1 I present robustness checks for burglary from vehicle. The specifications include varying the location fixed effects from library-radii to library, beginning date, end date, date interval one or zero, and population weights. The only specification that produces different results from my benchmark findings are the un-weighted specifications, where one out of the four specifications is statistically significant at conventional levels.

VII.2. Robustness Specifications: Library Zones

As shown above, my results are robust to changes in day type, fixed effects and many other

specifications. One potential problem these specifications could overlook are artifacts of the map construction. Specifically, it may be the construction of the library-radii-zones themselves that are driving my results, instead of the crime effects. To test this, I conduct two full robustness specifications where the library radii-zones are aggregated together to create library-zones instead of library radii-zones. This way there is only one area per library, instead of three as in the benchmark case. As shown in Table 8.2, I find burglary from vehicle is negative and statistically significant at the five percent level, in comparable magnitudes to my previous estimates. I find no statistically significant effects for any other type of crime, which fits in with the overall effects observed from the previous tables. These tables showed statistically significant effects of library hours by radii, while did not show any significant change overall.

For the second specification, also in Table 8.2, I cut the library-zones into areas with a max radius of one and a half miles. I completed this specification to test against the possibility that the results from the previous specification are being driven by areas very far away from any library, thus unknowingly incorporating omitted variable bias from unobserved far away shocks. After cutting the areas at one and a half miles, I run the same benchmark model as before. My results are consistent with my earlier estimates, as I find statistically significant at the one percent level and negative results from burglary from vehicle and none for each other type of crime. These two robustness specifications show the map construction, at least on the radii level, was not responsible for the observed negative effects library hours had on car burglaries.

VII.3. Effects of Library Hours on High Violent Crime Areas and Not-Low Crime Areas

The areas that should see the most crime reductions from increased library hours should not be the areas with the lowest crime. As crime levels cannot go below zero, effects should

plausibly be observed at areas with significant crime levels. While we might observe effects at areas with low but not zero crime levels, we should observe the largest and most salient effects of library hours on high crime areas. Since violent crime is by far the most dangerous and economically disruptive type of crime, I investigate how library hours affect areas with the highest violent crime rates.

To complete this analysis I utilize the aggregated library zones developed in the previous robustness section to investigate how crime-ridden areas respond to changes in hours. These results are present in Table 9.1, where I interact library hours with a variable indicating if the violent crime rate for the library zone is above the 75th percentile for the whole city. To determine the percentiles, I calculated the violent crime rates for each library zone before the treatment took effect. The pre-treatment levels for all non-renovated library is before the first set of library cuts, December 9th 2009.

The aggravated assault and homicide coefficients on the interaction term between library hours and the 75th percentile violent crime rate are negative and statistically significant at the five percent level for homicide, and at the one percent level for aggravated assault. Additionally, I find a positive and statistically significant at the five percent level coefficient for grand theft person. The coefficient for aggravated result represents a decrease in the aggravated assault rate by 1.2 percent per library hour, for high violent crime areas differenced from average or low violent crime areas. However, given the base library hour variable is positive, though not statistically significant, the overall effect on Los Angeles as a whole maybe small or zero.

The homicide coefficient represents an average decrease of 4.4 percent per library hour for high violent crime areas. The base library hour variable for homicide is also negative, albeit insignificant, indicating library hours do have an overall effect on homicide rates. A plot of the

relationship negative relationship between homicide rates and library hours is shown in Figure 7. What may be occurring is the following combination of the three mechanisms of how institutions affect crime. If the libraries are open, there are more eyes on the street to deflect and identify possible assailants. If more criminally risky individuals use the library, and subsequently are less able to be fought with at home, aggravated assaults should decrease. If aggravated assaults decrease at high crime areas, aggravated assaults go too far and result in homicide should decrease as well.

Despite this, 4.4 percent per hour seems high, even for high crime areas. As a robustness check, I used another indicator variable, areas above the 25th percentile in overall crime rates instead of violent crime rates. This indicator will be interacted with library hours above, using the same library-zone map construction instead of the library-zone-radii construction. I chose to use the 25th percentile[13] to difference the areas that have at least some amount of crime from those that do have low crime rates, and to test whether the earlier homicide result is an artifact of the violent crime rate percentile construction, and not a result of changes to library hours.

As shown in Table 9.2, the coefficient on homicide is negative and significant at the five percent level. The magnitude decreases from the previous specification to a 3.1 percent decrease in homicide rates on average per library hour for areas above the 25th crime rate percentile. While still large, both specifications are consistent with each other.

VII.4. Libraries Increasing Suitable Targets and Potential Displacement of Crime

Additionally in Table 9.2, I find positive and statistically significant at the five percent

[13] To determine the percentile, I only counted areas without renovations or closings, before December 9th 2009, that start of the library hour cuts.

level coefficients for grand theft person and burglary. The grand theft person coefficient is consistent with the suitable targets mechanism described earlier in the paper. As individuals often carry phones and laptops in the library and walking around it, an increase in grand theft person, theft above roughly $1,000, seems plausible. Also, burglary might increase in an unusual way, as individuals who drive to the library may leave their homes or shops unattended. As a result, burglary could increase in areas with enough crime and criminals to take notice, displacing burglary farther away from libraries. However, I put less emphasis on the base coefficients which would describe displacement, as I am unable to control for all library-zone daily variation.

VIII. Conclusions

In this study I estimate how public institutions change the nearby criminal landscape through opening their doors and attracting witnesses, victims and criminals. To identify the impact of public institutions on local crime rates I exploit exogenous variation in public library hours in from 2009 through 2011. I find an increase of library hours lowers car burglary rates near libraries. Given car burglaries happen outdoors or in garages were cars are parked, I find "eye's upon the street" is a good explanation of why increased public institution hours result in lower car burglaries.

I also find evidence of burglary substitution, as burglars faced with increased witnesses near public institutions substitute from car burglary to burglary of the potentially un-inhabited homes of the public institution's patrons. In addition, the burglars far away from the public institutions lose cars to burglarize if the patron uses a car to travel to the institution, but gains an

open and potentially unguarded house or business. The combined burglary rate decreases monotonically in distance to the public institutions as operating hours increase.

I find non-gang related aggravated assaults decrease near libraries compared to areas farther away as a result increasing hours. Individuals using the library as a safe haven might get into fewer arguments and fights, and fewer deadly fights as a result. For non-gang members, the individuals who do not explicitly endorse violence by gang membership, public institutions provide a place to spend time safely as opposed to being out on the street.

In high crime areas, free local safe havens may be in short supply, making the public institution a critical local resource. This may be due to increased eyes upon the street, discouraging potential fights, or because the potential aggressor or victim is at the public institution instead of at home or in the same room as their aggressor. If any significant percentage of these fights turn deadly, then libraries have plausibly prevented a loss of life.

As a result of the cuts to the Los Angeles Public Library between 2009 and 2011, an estimated 42,515 total library hours were cut. If we consider the overall combined effects, this resulted in an estimated 28 additional homicides occurred, as well as 514 additional car burglaries, and 129 non-gang related aggravated assaults near libraries. Homicide is extremely expensive, each occurrence is estimated to cost the city nearly $10 million in 2014 dollars (McCollister et al. 2010). Therefore, the total criminal spillover cost, including the effects of all types of crime, ranges between $230 and $244 million dollars[14] (McCollister et al. 2010). The

[14] Homicide has the largest cost of any type of crime by a significant margin. McColister et al. estimate the total cost of a homicide at $9.9 million 2014 dollars. The next most expensive is aggravated assault at $0.12 million 2014 dollars.

city saved only $21 million in 2014 dollars from cutting the library, resulting in a net spillover loss of $209 to $223 million dollars.

Public institutions are complicated structures, while open, contribute to lowering car burglary, and non-gang aggravated assaults nearby. Public institutions like libraries are already demanded by citizens for the obvious and non-spillover services they provide. This research shows cutting access to libraries, like other local public institutions, have large criminal spillover effects. These spillover effects are important economic and social results that should inform policy makers to not cut public institutions in crime ridden areas, and better still to increase hours.

Bibliography

Barrios, Thomas; Diamond, Rebecca; Imbens, Guido W.; Kolesar, Michal. *Clustering, Spatial Correlations and Randomization Inference*, Journal of the American Statistical Association, 2010

Becker, Gary. *Crime and Punishment: An Economic Approach*, Journal of Political Economy, 1968

Brown, Jeffrey; Goolsbee, Austan. *Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry*, Journal of Political Economy, 2002

Bureau of Justice Statistics. *National Crime Victimization Survey*, 2010

California State Library Statistics. *Public Library Survey Data*, 2012

Chang, Tom; Jacobson, Mireille; *Going to Pot? The Impact of Dispnsary Closures on Crime*, working paper, 2014

Cohen, Lawrence E; Felson, Marcus. *Social Change and Crime Rate Trends: A Routine Activities Approach*. American Sociological Review, 1979

Cornwell, Christopher; Trumbull, William N. *Estimating the economic model of crime with panel data*, Review of Economics and Statistics, 1994

Dahl, Gordon; Della Vigna, Stefano. *Does movie violence increase violent crime?*, Quarterly Journal of Economics, 2009

Davis, Michael L. *Time and Punishment: An Intertemporal Model of Crime*, Journal of Political Economy, 1988

Dills, Angela K.; Miron, Jeffrey A.; Summers, Garrett. *What Do Economists Know About Crime?* National Bureau of Economic Research Working Paper, 2008

Donohue, John J; Levitt, Steven. *The Impact of Legalized Abortion on Crime*, Quarterly Journal of Economics, 2001

Ehrlich, Isaac. *The Deterrent Effect of Criminal Law Enforcement*, The Journal of Legal Studies, 1972

Freeman, Richard B. *"The Economics of Crime*," in Orley Ashenfelter and David Card, eds. *Handbook of Labor Economics*, Vol 3c, North Holland Publishers, 1999

Federal Bureau of Investigation. *Crime in the United States*, 2012

Glaeser, Edward; Sacerdote, Bruce; Sheinkmna, Jose. *Crime and social interactions*, Quarterly Journal of Economics, 1995

Gould, Eric; Weinberg, Bruce; Mustard, David. *Crime rates and local labor market opportunities in the United States: 1979-1997,* The Review of Economics and Statistics, 2002

Levitt, Steven. *Empirical Study of Criminal Punishment*, Handbook of Law and Economics, 2007

Los Angeles Times. *L.A. libraries to expand hours thanks to voters' funding measure,* Los Angeles Times, October 15th 2012

McCollister, Kathryn E.; French, Michael T.; Fang, Hai. *The Cost of Crime to Society: New Crime-Specific Estimates for Policy and Program Evaluation.* Drug and Alcohol Dependence, 2010

Mehlkop, Guido; Graeff, Peter. *Modelling a rational choice theory of criminal action: Subjective expected utilities, norms, and interactions*, Rationality and Society, 2010

Peterson, Ruth D.; Krivo, Lauren J.; *Disadvantage and Neighborhoods Violent Crime: Do Local Institutions Matter?* Journal of Research in Crime and Delinquency, 2000

Phillips, Julie; Land, Kenneth C. *The link between unemployment and crime rate fluctuations: An analysis at the county, state, and national levels,* Social Science Research, 2012

O'Leary, Mike. *Modeling Criminal Distance Decay*, U.S. Department of Housing and Urban Development Office of Policy Development and Research, 2011

Raphael, Stephen; Winter-Ember, Rudolf. *Identifying the effect of unemployment on crime,* Journal of Law and Economics, 2001

Regea, Mari; Skardhamarb,Torbjørn; Telleb, Kjetil; Votrubac; Mark. *The Effect of Plant Closure on Crime*, Discussion Papers from Research Department of Statistics Norway, 2009

Sjoquist, David Lawrence; *Property Crime and Economic Behavior: Some Empirical Results*, American Economic Review, 1973

Snook, Brent. *Individual Differences in Distance Travelled by Serial Burglars*, Journal of Investigative Psychology and Offender Profiling, 2004

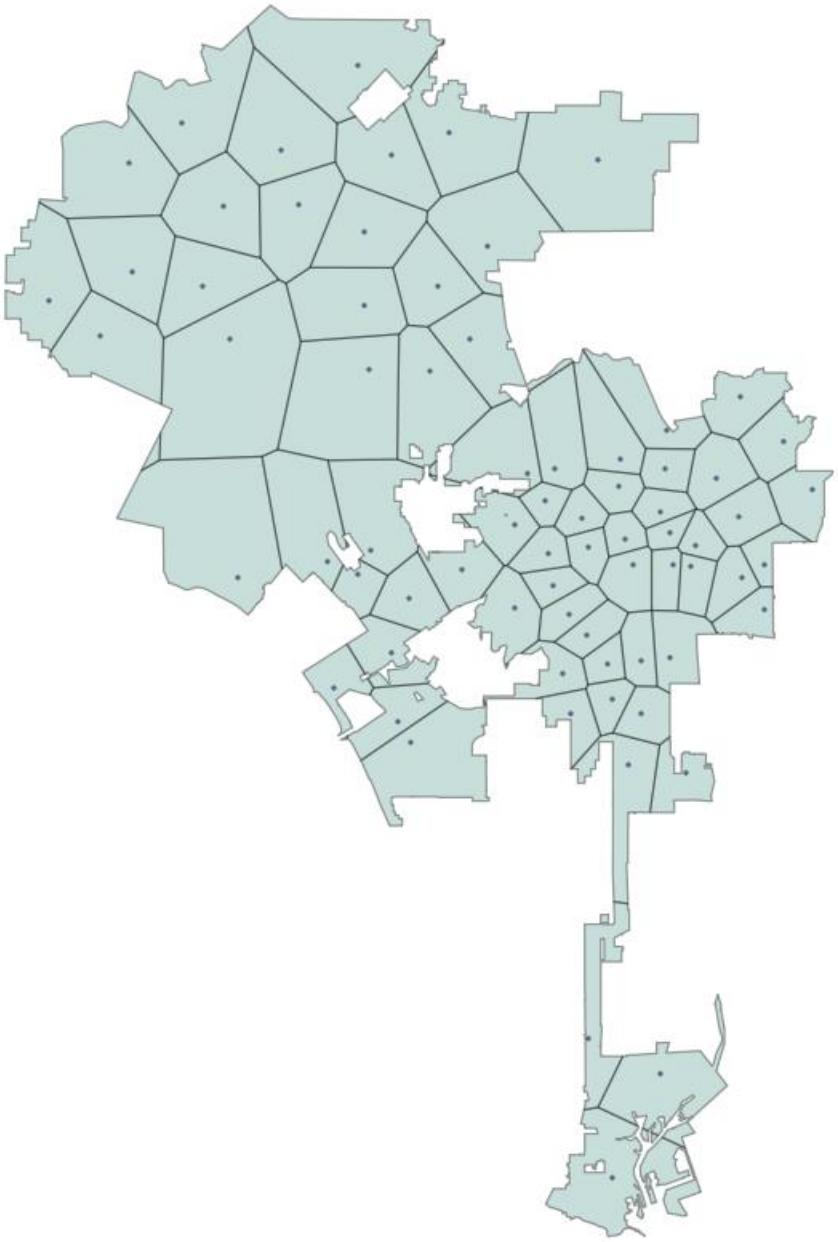
Stevenson, Betsey; *The Internet and Job Search,* NBER Working Paper, 2008

Trumbull, William. *Estimations of the Economic Model of Crime Using Aggregate and Individual Level Data*, Southern Economic Journal, 1989

U.S. Census Bureau, *Census of Population and Housing*, 2012

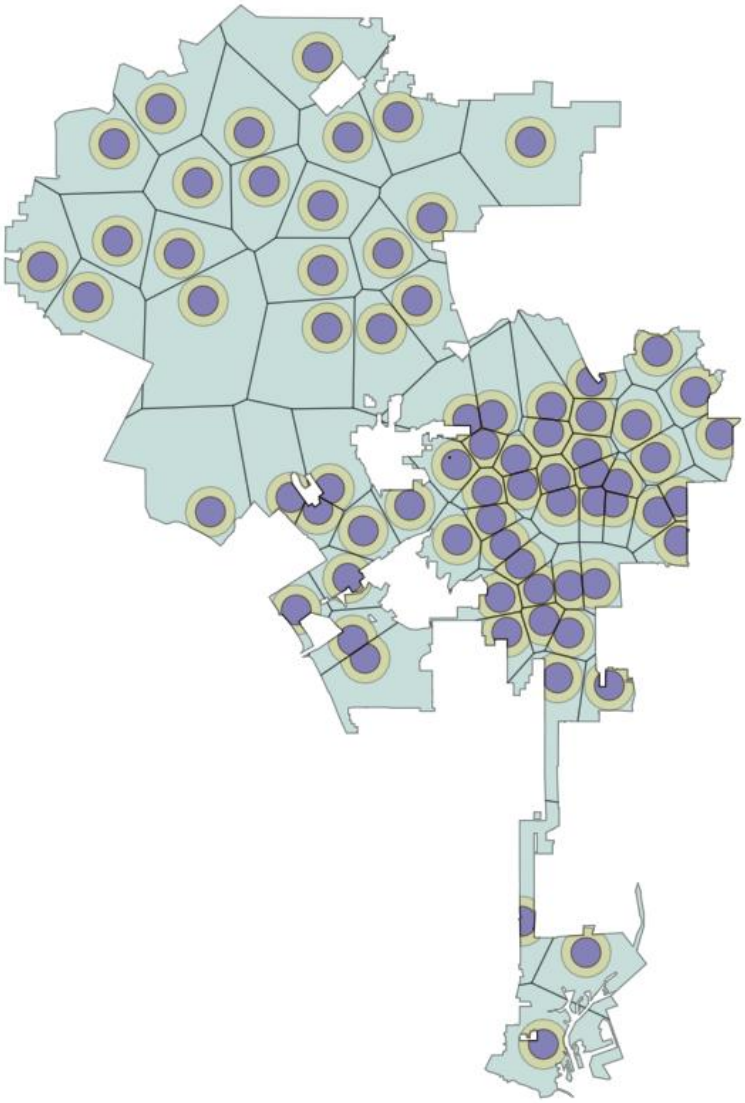
Zickuhr, Kathryn; Rainie, Lee; Purcell, Kristen. *Library Services in the Digital Age, Pew Internet & American Life Project*, Pew Research Center, 2013

Figure 1—Los Angeles libraries and library-zones



Notes. This is a map of Los Angeles divided into library zones. Each dot represents a Los Angeles public library. A library's catchment area is calculated as a voronoi polygon, where each library is responsible for all of the area where it is the closest library "as the crow flies".

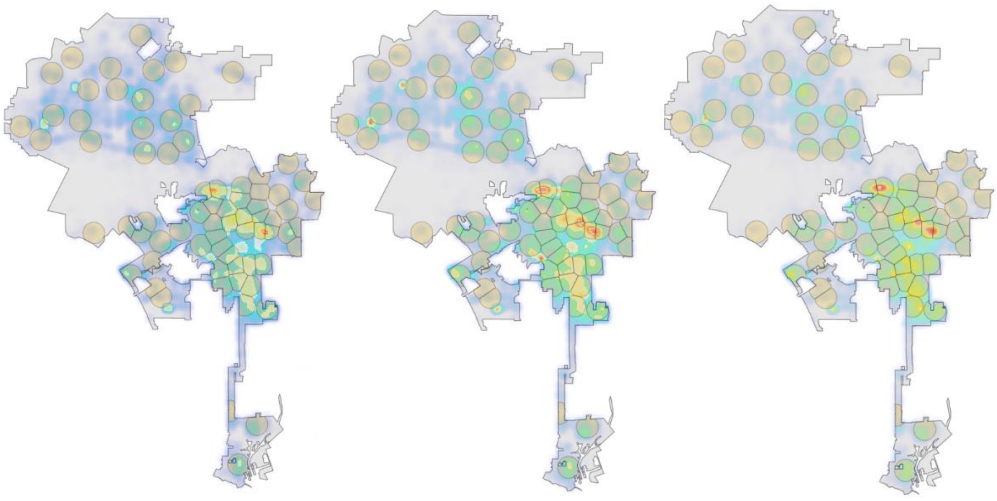
Figure 2—Los Angeles by library radii-zones



Notes. This is a map of Los Angeles divided into library zones. A library's catchment area is calculated as a voronoi polygon, where each library is responsible for all of the area where it is the closest library. Within each library zone, two library radii-zones, 1.0 miles and 0.6 miles are illustrated.

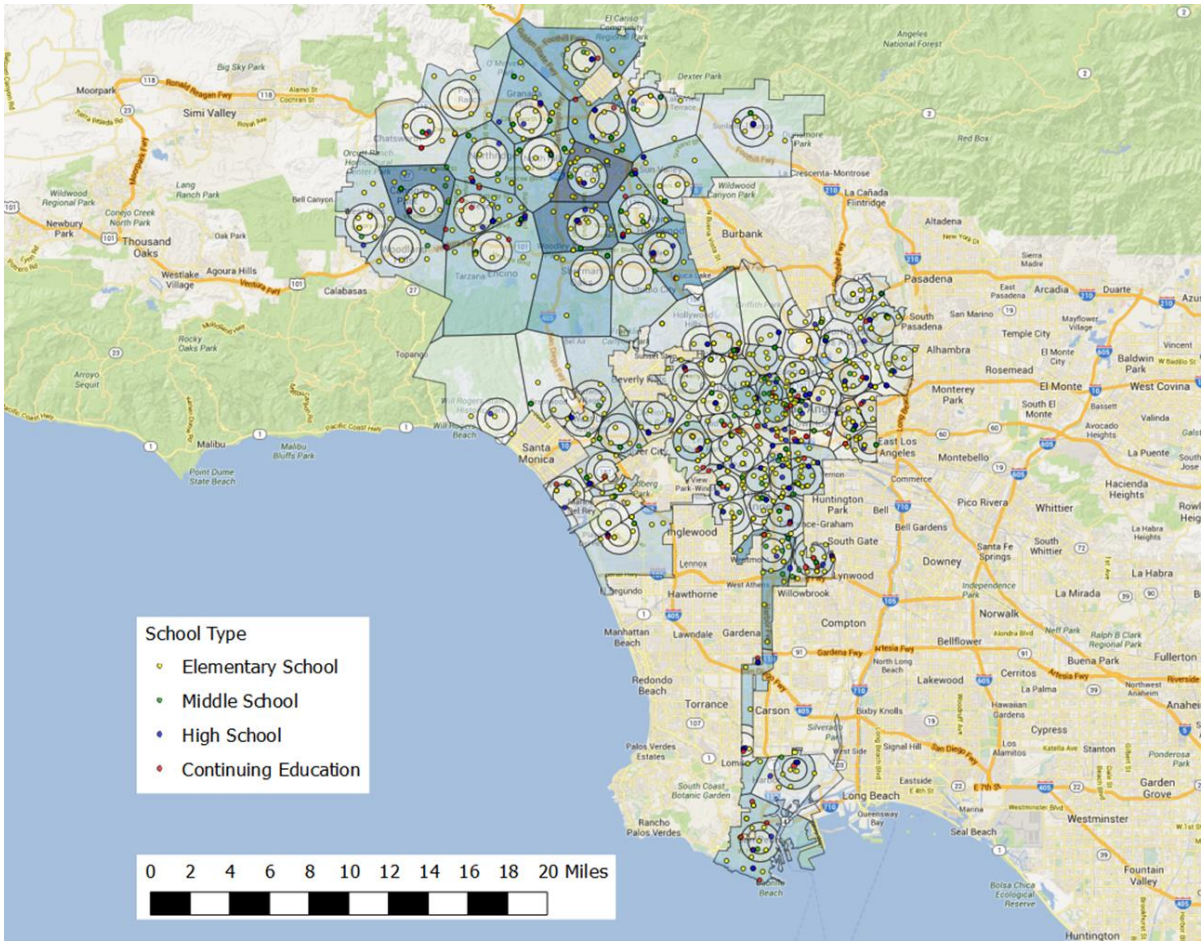
Figure 3—Los Angeles crime heatmaps (2009 – 2011) with 1.0 mile library radii-zones

A.2009 B. 2010 C.2011 (partial)



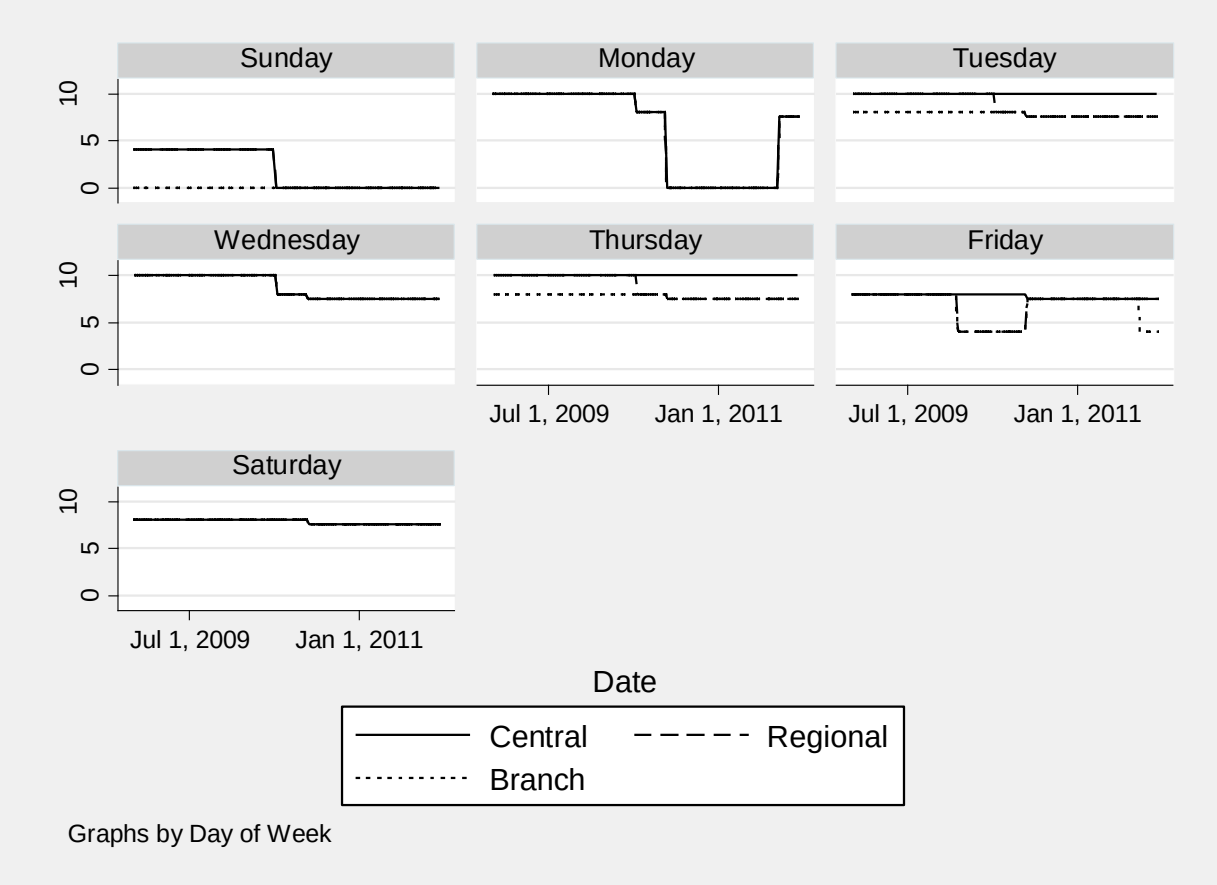
Notes. Each figure is a crime heatmap of Los Angeles for all three years in the sample. 2009, 2010 are complete, while 2011 only extends to September 17th. The heatmap transitions from "cold" colors of blue and green, to "hot" colors of yellow and red. Hotter colors indicate larger crime counts.

Figure 4—Map of Los Angeles and surrounding areas, by Library radii-zones and Los Angeles Unified School Type



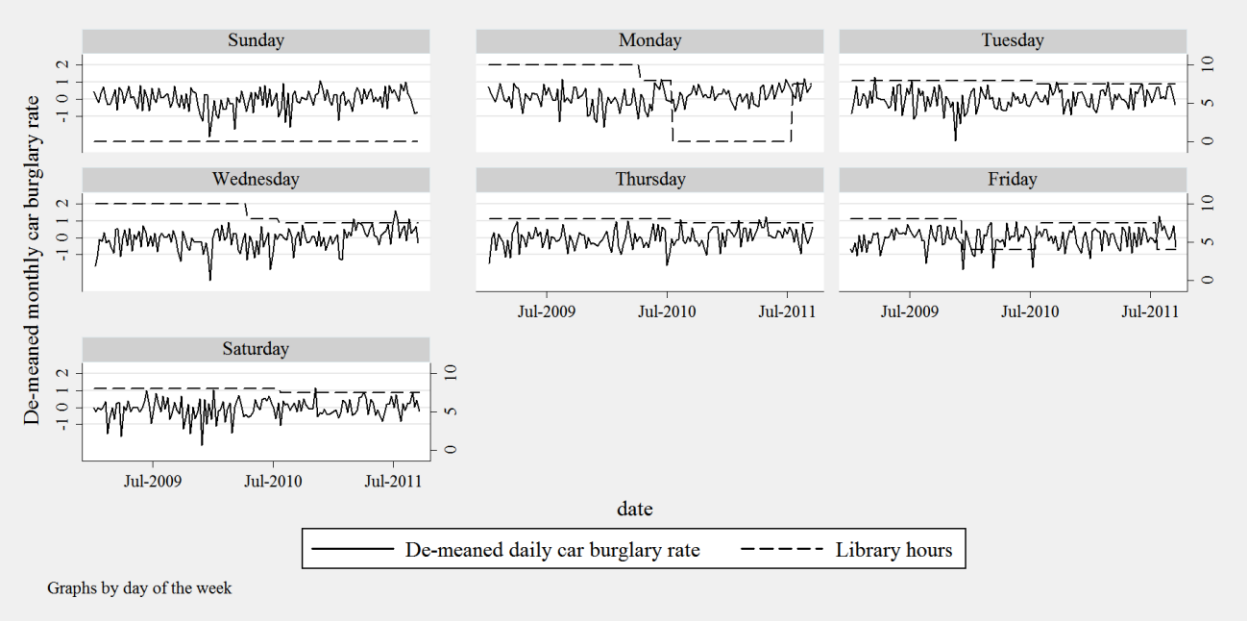
Notes. The above map represents the Los Angeles Public Library radii-zones, overlain over a map of the surrounding Los Angeles County. The dots on the map refer to Elementary Schools, Middle Schools, High Schools, and Continuing Education schools in Los Angeles Unified School district. Darker areas indicate higher levels of population.

Figure 5—Variation in Library Hours by Library Type,
January 2009 – September 2011
By Day of Week, holidays removed



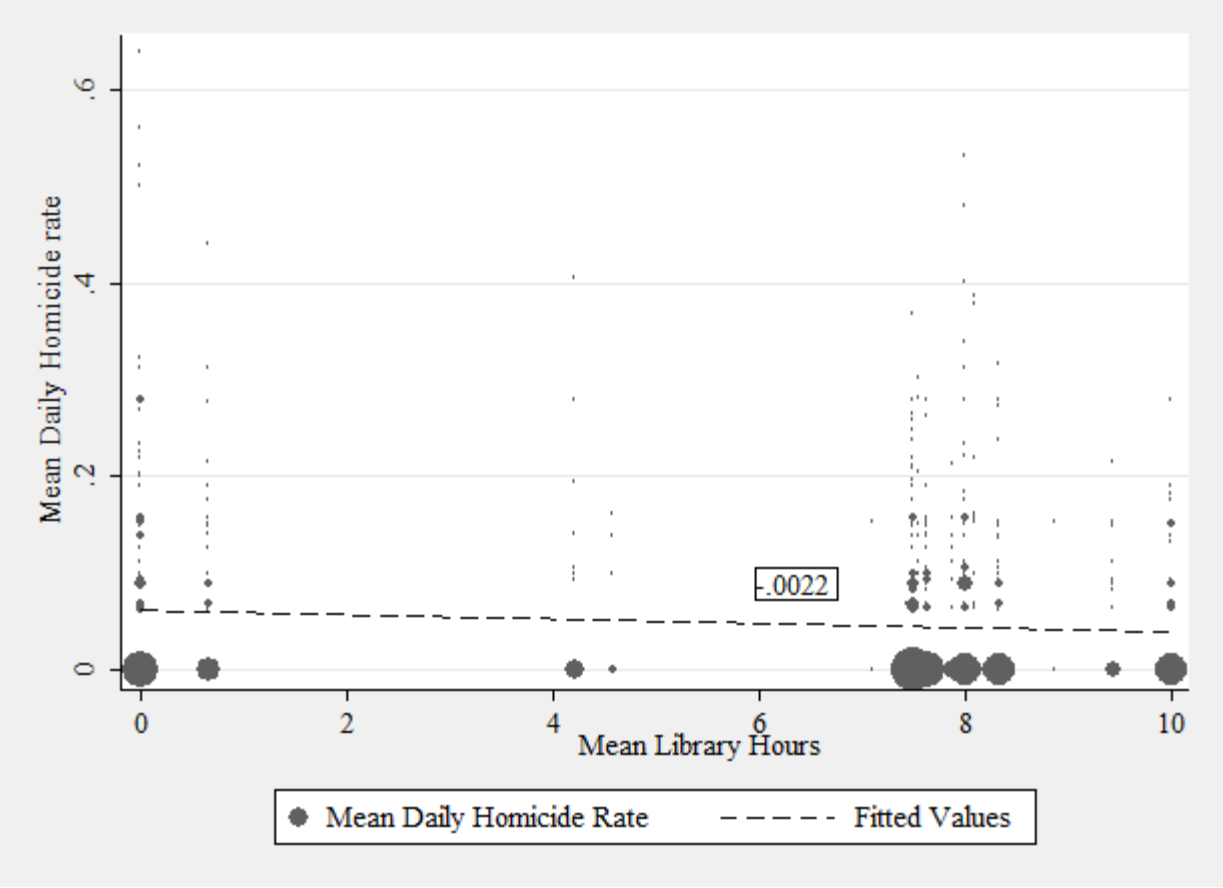
Notes. This figure shows the variation in library hours during the sample period, January 2009 through September 2011, by day of the week and type of library. Library holidays were removed from the figure to cleanly show the intended variation. In the Los Angeles Public Library system there are one central, eight regional, and 64 branch libraries.

Figure 6—De-meaned Car Burglary Rate and Library Hours by Date, by Day of the Week, Areas within 0.6 miles of a library



Notes. This graph shows relationship between daily de-meaned car burglary rates by day of the week, for areas within 0.6 of mile of a library, for branch libraries, without holidays and for only the libraries that didn't undergo renovations or grand openings over the entire sample period. The reason for the restrictions is to clearly show the variation in library hours by date and day of the week, without the visually confusing variation by renovations, holiday and library type. In the figure, on Monday and Wednesday, de-meaned car burglary rates rise when the library hours were cut.

Figure 7—Mean Daily Homicide Rate versus Mean Library Hours,
January 2009 – September 2011



Notes. This graph shows the negative relationship between daily homicide rates for high violent crime areas and library hours. High violent crime areas are those above the 75th percentile of violent crime rates during the pre-treatment period. Marker size denotes how many observations are located at each homicide and library hours coordinate, larger size means more observations. The slope of the fitted line is -.02.

Table 1—Los Angeles Public Library selected demographics

Fiscal year 2010-2011	Visits	Borrowers	Users of Internet Terminals	Total Internet Terminals
Los Angeles Public Library	12,544,074	1,231,764	3,438,705	1,489

Source: California State Library Statistics

Notes. This are descriptive statistics of the Los Angeles library from 2010 to 2011, the fiscal year.

Table 2—Crime totals by date range, radii, type, and gang identifier, January 2009 through September 2011

Radii	Population	Gang and Non-gang			Gang			Non-gang		
		All crime	Property	Violent	All crime	Property	Violent	All crime	Property	Violent
A. Any date range										
0.6 or less	1,172,730	97,375	75,922	21,453	5,197	317	4,880	92,178	75,605	16,573
1.0 - 0.6	1,226,670	91,070	71,721	19,349	4,896	250	4,646	86,174	71,471	14,703
1.0 or greater	1,395,648	110,164	94,461	15,703	3,499	245	3,254	106,665	94,216	12,449
Total	3,795,049	298,609	242,104	56,505	13,592	812	12,780	285,017	241,292	43,725
B. Date range equal to one or zero days										
0.6 or less	1,172,730	90,612	69,190	21,422	5,177	304	4,873	85,435	68,886	16,549
1.0 - 0.6	1,226,670	84,111	64,786	19,325	4,882	240	4,642	79,229	64,546	14,683
1.0 or greater	1,395,648	100,403	84,730	15,673	3,489	237	3,252	96,914	84,493	12,421
Total	3,795,049	275,126	218,706	56,420	13,548	781	12,767	261,578	217,925	43,653

Source: Los Angeles Police Department

Notes. This table reports crime and population totals for each radii of 0.6, 1.0 and 1.0 or greater miles, for property, violent and all crimes, by date range, and by gang identifier Every crime is recorded with a date range over which the crime is alleged to occur. The date range is the difference between the reported beginning date of a crime, and the end date. Table 2.A reports all crimes regardless of the date range. Table 2.B reports only crimes which have a date range of one or zero.

Table 3—Descriptive Statistics by crime type, radii and date range

Radii	Stat	Violent Crime			Property Crime				
		Agg. Assault	Homicide	Robbery	Theft	Grand Theft Auto	Grand Theft Person	Burglary	Burglary from Vehicle
A. Any date range									
0.6 or less	Mean	0.722	0.02	0.877	2.073	0.12	1.222	1.207	2.082
	Std. Dev.	2.689	0.356	2.492	4.473	0.879	3.109	3.364	4.529
1.0 - 0.6	Mean	0.728	0.026	0.832	1.638	0.094	1.214	1.242	1.953
	Std. Dev.	3.079	0.525	2.776	3.94	0.973	3.175	3.288	4.357
1.0 or greater	Mean	0.878	0.02	1.121	2.818	0.142	1.935	1.594	3.143
	Std. Dev.	19.392	0.532	10.068	14.957	2.872	14.435	9.242	18.39
Total	Mean	0.775	0.022	0.942	2.171	0.119	1.453	1.346	2.386
	Std. Dev.	11.343	0.477	6.153	9.241	1.81	8.656	5.952	11.145
B. Date range equal to one or zero days									
0.6 or less	Mean	0.72	0.019	0.876	1.854	0.12	1.129	1.052	1.937
	Std. Dev.	2.687	0.355	2.491	4.211	0.878	2.98	3.143	4.376
1.0 - 0.6	Mean	0.727	0.026	0.832	1.429	0.094	1.115	1.085	1.815
	Std. Dev.	3.077	0.525	2.776	3.666	0.973	3.035	3.05	4.209
1.0 or greater	Mean	0.876	0.02	1.121	2.488	0.142	1.765	1.354	2.95
	Std. Dev.	19.391	0.529	10.068	13.53	2.871	13.539	8.539	17.784
Total	Mean	0.773	0.022	0.941	1.919	0.118	1.332	1.162	2.228
	Std. Dev.	11.342	0.476	6.153	8.4	1.81	8.133	5.507	10.777

Notes. This table presents descriptive statistics by crime type across all radii and possible date range. Because crimes can occur when the victim isn't present, a date range is usually given to police. Therefore, for the purposes of analyzing the effects of daily changes in library hours, a smaller date range is preferable. In the table above, I have segregated the full sample in part A and in part B only included the crimes which could have occurred with one or two days.

Table 4—Los Angeles Library Hours Variation, January 2009 through September 2011

Type	Date Affected	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Central	1/1/2009 - 12/10/2009	1pm-5pm	10am-8pm	10am-8pm	10am-8pm	10am-8pm	10am-6pm	10am-6pm
	12/11/2009 - 4/10/2010	1pm-5pm	10am-8pm	10am-8pm	10am-8pm	10am-8pm	10am-6pm	10am-6pm
	4/11/2010 - 7/18/2010	*CLOSED*	*10am-6pm*	10am-8pm	*10am-6pm*	10am-8pm	10am-6pm	10am-6pm
	7/19/2010 - 7/17/2011	CLOSED	*CLOSED*	10am-8pm	*10am-5:30pm*	10am-8pm	*10am-5:30pm*	*10am-5:30pm*
	7/18/2011 - 10/15/2012	CLOSED	*10am-5:30pm*	10am-8pm	10am-5:30pm	10am-8pm	10am-5:30pm	10am-5:30pm

	Date Affected	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Regional	1/1/2009 - 12/10/2009	1pm-5pm	10am-8pm	10am-8pm	10am-8pm	10am-8pm	10am-6pm	10am-6pm
	12/11/2009 - 4/10/2010	1pm-5pm	10am-8pm	10am-8pm	10am-8pm	10am-8pm	*1:30pm-5:30pm*	10am-6pm
	4/11/2010 - 7/18/2010	*CLOSED*	*10am-6pm*	*12pm-8pm*	*10am-6pm*	*12pm-8pm*	1:30pm-5:30pm	10am-6pm
	7/19/2010 - 7/17/2011	CLOSED	*CLOSED*	*12:30pm-8pm*	*10am-5:30pm*	12:30pm-8pm	*10am-5:30pm*	*10am-5:30pm*
	7/18/2011 - 10/15/2012	CLOSED	*10am-5:30pm*	12:30pm-8pm	10am-5:30pm	12:30pm-8pm	10am-5:30pm	10am-5:30pm

	Date Affected	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Branch*	1/1/2009 - 12/10/2009	CLOSED	10am-8pm	12pm-8pm	10am-8pm	12pm-8pm	10am-6pm	10am-6pm
	12/11/2009 - 4/10/2010	CLOSED	10am-8pm	12pm-8pm	10am-8pm	12pm-8pm	*1:30pm-5:30pm*	10am-6pm
	4/11/2010 - 7/18/2010	CLOSED	*10am-6pm*	12pm-8pm	*10am-6pm*	12pm-8pm	1:30pm-5:30pm	10am-6pm
	7/19/2010 - 7/17/2011	CLOSED	*CLOSED*	*12:30pm-8pm*	*10am-5:30pm*	*12:30pm-8pm*	*10am-5:30pm*	*10am-5:30pm*
	7/18/2011 - 10/15/2012	CLOSED	*10am-5:30pm*	12:30pm-8pm	10am-5:30pm	12:30pm-8pm	*1:30pm-5:30pm*	10am-5:30pm

**The Robertson branch removed eight Saturday hours during the week of April 10th 2011, and replaced them with four Sunday hours*

Notes. This table lists all the changes to the library hours during the sample period. As seen above, there are many changes for each type of library, branch, regional and the Central library. There is one central library, eight regional libraries and 64 branches. The major cuts to library hours occurred on in April, 2010 and July, 2010 when Sunday and Monday service were cut. Monday service was partially restored the following year.

Table 5—Closures and Openings

Library Name	Closed	Open
Angeles Mesa	8/1/2009	9/10/2009
Cahuenga	1/22/2009	1/26/2009
Felipe de Neve	2/7/2009	6/15/2009
John C. Freemont	4/6/2009	5/11/2009
Malabar	5/18/2009	5/18/2009
Silverlake (grand opening)	-	11/17/2009
Vermont Square	7/26/2009	10/13/2009

Notes. This table lists the library branches that closed for repairs, renovations or opening a new library (Silverlake) during the sample period, January 2009 through September 2011. These closures and openings add additional variation and provide a counterfactual as there were no library hours and they were on irregular days.

Table 6.1—Benchmark Difference in Differences by Crime Type, Population-Weighted Least Squares, Beginning Date

Beginning Date	(1) All crime	(2) Violent	(3) Assault	(4) Homicide	(5) Robbery	(6) Property	(7) Theft	(8) Grand Theft Person	(9) Grand Theft Auto	(10) Burglary	(11) Burglary from Vehicle
LibHours	0.0545*	0.0276*	0.0211*	-0.0012	0.0077	0.0269	0.0149	0.0006	0.0041	0.0203*	-0.0129
	(0.0291)	(0.0150)	(0.0110)	(0.0015)	(0.0073)	(0.0272)	(0.0126)	(0.0034)	(0.0108)	(0.0121)	(0.0105)
(r=0.6) * LibHours	-0.0292*	-0.0069	-0.0080	-0.0000	0.0011	-0.0223*	0.0045	0.0000	0.0064	-0.0160***	-0.0172***
	(0.0152)	(0.0070)	(0.0055)	(0.0006)	(0.0031)	(0.0125)	(0.0069)	(0.0013)	(0.0050)	(0.0050)	(0.0064)
(r=1.0) * LibHours	-0.0456***	-0.0135**	-0.0084*	-0.0000	-0.0051	-0.0321***	-0.0072	-0.0001	0.0019	-0.0105*	-0.0162***
	(0.0119)	(0.0055)	(0.0045)	(0.0006)	(0.0035)	(0.0110)	(0.0063)	(0.0010)	(0.0046)	(0.0056)	(0.0047)
Elementary school days	-0.0363	-0.0145	-0.0136*	0.0007	-0.0015	-0.0218	-0.0102	0.0036	-0.0042	0.0117	-0.0227***
	(0.0225)	(0.0102)	(0.0073)	(0.0008)	(0.0070)	(0.0165)	(0.0099)	(0.0031)	(0.0060)	(0.0076)	(0.0074)
Middle school days	0.0842**	0.0206	0.0252**	-0.0016	-0.0029	0.0636*	0.0336*	0.0024	0.0009	0.0132	0.0134
	(0.0422)	(0.0149)	(0.0115)	(0.0013)	(0.0095)	(0.0327)	(0.0180)	(0.0029)	(0.0115)	(0.0142)	(0.0148)
High school days	0.0460	0.0055	-0.0030	-0.0002	0.0086	0.0405	0.0394**	0.0056	-0.0148	-0.0047	0.0149
	(0.0437)	(0.0179)	(0.0119)	(0.0014)	(0.0114)	(0.0341)	(0.0173)	(0.0037)	(0.0123)	(0.0124)	(0.0142)
Other school days	0.1559**	0.0255	0.0125	-0.0032	0.0162	0.1304**	0.0179	-0.0071	0.0342*	0.0402	0.0451*
	(0.0677)	(0.0237)	(0.0207)	(0.0039)	(0.0201)	(0.0535)	(0.0254)	(0.0126)	(0.0202)	(0.0279)	(0.0251)
Constant	10.7123***	1.5852***	1.1695***	0.0609	0.3548**	9.1271***	4.4051***	0.0176	0.7219***	1.3021***	2.6804***
	(0.5003)	(0.2727)	(0.2056)	(0.0578)	(0.1661)	(0.4816)	(0.3077)	(0.0496)	(0.1698)	(0.1511)	(0.2606)
Time fixed effects (day)	X	X	X	X	X	X	X	X	X	X	X
Library-radii fixed effects	X	X	X	X	X	X	X	X	X	X	X
Observations	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830
R-squared	0.203	0.120	0.055	0.010	0.085	0.174	0.154	0.029	0.052	0.046	0.073

Standard in parentheses, clustered at the library level
**** p<0.01, ** p<0.05, * p<0.10*

Notes. This is the first of two benchmark difference in differences, weighted least squares results, for the full sample. Of note are the negative and statistically significant at the one percent level estimates of burglary from vehicle as well as the overall null estimate from overall crime.

Table 6.2—Benchmark Difference in Differences by Crime Type, Population-Weighted Least Squares, Date range equal to one day or zero, Beginning date

Beginning Date	(1) All crime	(2) Violent	(3) Assault	(4) Homicide	(5) Robbery	(6) Property	(7) Theft	(8) Grand Theft Person	(9) Grand Theft Auto	(10) Burglary	(11) Burglary from Vehicle
LibHours	0.0462*	0.0272*	0.0208*	-0.0012	0.0077	0.0190	0.0099	0.0006	0.0014	0.0196*	-0.0126
	(0.0268)	(0.0151)	(0.0110)	(0.0015)	(0.0072)	(0.0248)	(0.0125)	(0.0034)	(0.0107)	(0.0099)	(0.0106)
(r=0.6) * LibHours	-0.0236	-0.0068	-0.0079	-0.0000	0.0012	-0.0168	0.0060	-0.0001	0.0064	-0.0130**	-0.0162**
	(0.0151)	(0.0069)	(0.0055)	(0.0006)	(0.0031)	(0.0121)	(0.0067)	(0.0013)	(0.0046)	(0.0051)	(0.0064)
(r=1.0) * LibHours	-0.0405***	-0.0134**	-0.0083*	0.0000	-0.0051	-0.0271**	-0.0054	-0.0001	0.0013	-0.0080	-0.0148***
	(0.0117)	(0.0055)	(0.0044)	(0.0006)	(0.0035)	(0.0104)	(0.0061)	(0.0010)	(0.0047)	(0.0055)	(0.0046)
Elementary school days	-0.0372*	-0.0143	-0.0134*	0.0008	-0.0017	-0.0229	-0.0108	0.0036	-0.0032	0.0098	-0.0223***
	(0.0210)	(0.0102)	(0.0072)	(0.0008)	(0.0070)	(0.0150)	(0.0093)	(0.0030)	(0.0053)	(0.0072)	(0.0071)
Middle school days	0.0702*	0.0205	0.0251**	-0.0017	-0.0028	0.0497*	0.0287*	0.0023	-0.0047	0.0084	0.0150
	(0.0387)	(0.0149)	(0.0114)	(0.0013)	(0.0095)	(0.0292)	(0.0160)	(0.0029)	(0.0099)	(0.0134)	(0.0148)
High school days	0.0324	0.0053	-0.0032	-0.0001	0.0086	0.0270	0.0293*	0.0059	-0.0120	-0.0048	0.0085
	(0.0426)	(0.0179)	(0.0120)	(0.0014)	(0.0113)	(0.0325)	(0.0161)	(0.0037)	(0.0111)	(0.0122)	(0.0134)
Other school days	0.1536**	0.0254	0.0125	-0.0033	0.0162	0.1282***	0.0302	-0.0074	0.0233	0.0328	0.0492*
	(0.0615)	(0.0239)	(0.0207)	(0.0039)	(0.0202)	(0.0471)	(0.0241)	(0.0125)	(0.0165)	(0.0251)	(0.0267)
Constant	7.7500***	1.5353***	1.1186***	0.0612	0.3555**	6.2147***	2.4531***	0.0178	0.5492***	0.9627***	2.2319***
	(0.4689)	(0.2698)	(0.2050)	(0.0578)	(0.1661)	(0.4046)	(0.1996)	(0.0496)	(0.1777)	(0.1403)	(0.2374)
Time fixed effects (day)	X	X	X	X	X	X	X	X	X	X	X
Library-radii fixed effects	X	X	X	X	X	X	X	X	X	X	X
Observations	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830
R-squared	0.1960	0.1197	0.0552	0.0097	0.0854	0.1640	0.1534	0.0280	0.0495	0.0423	0.0701

Standard in parentheses, clustered at the library level
**** p<0.01, ** p<0.05, * p<0.10*

Notes. This is the second of two benchmark difference in differences, weighted least squares results, for a subsample of only crimes reported within one or two days. Of note are the negative and statistically significant at the one percent level and five percent level estimates of burglary from vehicle as well as the overall null estimate from overall crime.

Table 7—Difference in Differences by Crime Type, Population-Weighted Least Squares, Gang and not gang-related, Date range equal to one day or zero, Beginning date

	Gang-related					Not Gang-related				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Beginning Date	All crime	Violent	Assault	Homicide	Robbery	All crime	Violent	Assault	Homicide	Robbery
LibHours	0.0037	0.0048	0.0041	-0.0006	0.0013	0.0425	0.0224*	0.0167	-0.0006	0.0064
	(0.0063)	(0.0059)	(0.0034)	(0.0008)	(0.0038)	(0.0259)	(0.0132)	(0.0103)	(0.0009)	(0.0052)
(r=0.6) * LibHours	0.0014	0.0019	0.0017	-0.0001	0.0003	-0.0250*	-0.0087	-0.0096**	0.0001	0.0009
	(0.0028)	(0.0027)	(0.0023)	(0.0004)	(0.0014)	(0.0144)	(0.0059)	(0.0044)	(0.0004)	(0.0029)
(r=1.0) * LibHours	-0.0015	-0.0017	0.0005	-0.0003	-0.0020*	-0.0390***	-0.0117**	-0.0089***	0.0003	-0.0031
	(0.0026)	(0.0025)	(0.0022)	(0.0004)	(0.0012)	(0.0113)	(0.0044)	(0.0033)	(0.0004)	(0.0032)
Elementary school days	-0.0049	-0.0044	-0.0050	-0.0004	0.0009	-0.0323	-0.0098	-0.0084	0.0012***	-0.0026
	(0.0042)	(0.0042)	(0.0037)	(0.0007)	(0.0023)	(0.0194)	(0.0085)	(0.0057)	(0.0004)	(0.0059)
Middle school days	0.0066	0.0073	0.0109	-0.0009	-0.0027	0.0636*	0.0132	0.0141	-0.0009	-0.0001
	(0.0089)	(0.0090)	(0.0071)	(0.0010)	(0.0031)	(0.0376)	(0.0126)	(0.0087)	(0.0009)	(0.0088)
High school days	0.0024	0.0015	-0.0055	0.0000	0.0070*	0.0299	0.0038	0.0023	-0.0002	0.0017
	(0.0058)	(0.0056)	(0.0053)	(0.0010)	(0.0036)	(0.0412)	(0.0162)	(0.0093)	(0.0008)	(0.0111)
Other school days	-0.0023	-0.0015	0.0039	-0.0021	-0.0033	0.1558***	0.0269	0.0087	-0.0012	0.0195
	(0.0147)	(0.0141)	(0.0126)	(0.0033)	(0.0054)	(0.0565)	(0.0205)	(0.0133)	(0.0015)	(0.0181)
Constant	0.0444	0.0318	-0.0091	-0.0128***	0.0538	7.7056***	1.5035***	1.1278***	0.0740	0.3017**
	(0.0894)	(0.0897)	(0.0627)	(0.0034)	(0.0632)	(0.4573)	(0.2600)	(0.2091)	(0.0580)	(0.1429)
Time fixed effects (day)	X	X	X	X	X	X	X	X	X	X
Library-radii fixed effects	X	X	X	X	X	X	X	X	X	X
Observations	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830
R-squared	0.0417	0.0417	0.0263	0.0103	0.0238	0.1955	0.1031	0.0452	0.0078	0.0752

Standard in parentheses, clustered at the library level
**** p<0.01, ** p<0.05, * p<0.10*

Notes. This is a gang and not gang-related crime specification table. Here I disaggregate violent crime into gang and not gang related and test using the benchmark specification.

Table 8.1—Robustness specifications, burglary from vehicle

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
LibHours	-0.0126	-0.0018	-0.0129	-0.0043	-0.0110	-0.0001	-0.0114	-0.0025	0.0360	-0.0190
	(0.0106)	(0.0124)	(0.0105)	(0.0128)	(0.0109)	(0.0125)	(0.0110)	(0.0130)	(0.0337)	(0.0529)
(r=0.6) * LibHours	-0.0162**	-0.0221***	-0.0172***	-0.0208***	-0.0172**	-0.0232***	-0.0183**	-0.0220**	-0.0385**	0.0310
	(0.0064)	(0.0077)	(0.0064)	(0.0078)	(0.0073)	(0.0083)	(0.0073)	(0.0086)	(0.0170)	(0.0564)
(r=1.0) * LibHours	-0.0148***	-0.0132**	-0.0162***	-0.0112**	-0.0165***	-0.0150***	-0.0178***	-0.0129**	-0.0315**	0.0428
	(0.0046)	(0.0053)	(0.0047)	(0.0056)	(0.0048)	(0.0055)	(0.0049)	(0.0058)	(0.0150)	(0.0556)
Time fixed effects (day)	X	X	X	X	X	X	X	X	X	X
Library-radii fixed effects	X	X	X	X					X	X
Library fixed effects					X	X	X	X		
Beginning date	X		X		X		X		X	
End date		X		X		X		X		X
Date interval one or zero	X	X			X	X			X	X
Population weighted	X	X	X	X	X	X	X	X		
Observations	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830	214,830
R-squared	0.0701	0.0694	0.0731	0.0718	0.0360	0.0357	0.0382	0.0374	0.0897	0.0911

Standard in parentheses, clustered at the library level. School day variables not displayed

**** p<0.01, ** p<0.05, * p<0.10*

Notes. This is a robustness specification table, testing the benchmark model of burglary from vehicle against many different specifications.

Table 8.2—Overall Summed Library Zones:
1) no size limit specification, 2) 1.5 mile radii size limit specification,
Population-Weighted Least Squares,
Date range equal to one day or zero, Beginning date

Beginning Date	(1) All crime	(2) Violent	(3) Assault	(4) Homicide	(5) Robbery	(6) Property	(7) Theft	(8) Grand Theft Person	(9) Grand Theft Auto	(10) Burglary	(11) Burglary from Vehicle
1) LibHours, full library zone	0.0203	0.0187	0.0140	-0.0013	0.0059	0.0016	0.0099	0.0005	0.0046	0.0111	-0.0245**
	(0.0244)	(0.0136)	(0.0100)	(0.0015)	(0.0070)	(0.0240)	(0.0113)	(0.0033)	(0.0101)	(0.0088)	(0.0099)
2) LibHours, 1.5 mile total radii zone	0.0163	0.0176	0.0130	-0.0013	0.0059	-0.0013	0.0123	-0.0003	0.0059	0.0106	-0.0298***
	(0.0267)	(0.0142)	(0.0105)	(0.0016)	(0.0070)	(0.0260)	(0.0112)	(0.0037)	(0.0104)	(0.0087)	(0.0105)
Time fixed effects (day)	X	X	X	X	X	X	X	X	X	X	X
Library fixed effects	X	X	X	X	X	X	X	X	X	X	X
Observations	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270

Standard in parentheses, clustered at the library level. School day variables not displayed
**** p<0.01, ** p<0.05, * p<0.10*

Notes. This Table uses two specifications of the summed library zones. This takes the library-zones as they were before cutting them into radii, or summing the zones into one larger zone per library. Doing so shrinks the available observations to one third of their previous total as two thirds of the radii observations are missing. The second specification also does not use radii but instead limits the total reach of the library zone to 1.5 miles. Both specifications are to test whether the earlier results are driven by an artifact of the radii map construction or a result of the library hours sphere of influence.

Table 9.1—High Violent Crime Areas Interaction (above 75th percentile), Difference in Differences by Crime Type,
Date range equal to one day or zero, Beginning date, Overall Library Zones, summed library zones

Beginning Date	(1) All crime	(2) Violent	(3) Assault	(4) Homicide	(5) Robbery	(6) Property	(7) Theft	(8) Grand Theft Person	(9) Grand Theft Auto	(10) Burglary	(11) Burglary from Vehicle
LibHours	0.0252	0.0210	0.0179	-0.0008	0.0039	0.0042	0.0100	-0.0003	0.0039	0.0133	-0.0227**
	(0.0251)	(0.0142)	(0.0108)	(0.0014)	(0.0069)	(0.0239)	(0.0116)	(0.0036)	(0.0102)	(0.0086)	(0.0099)
LibHours*Violent75th	-0.0230	-0.0109	-0.0181***	-0.0021**	0.0093	-0.0121	-0.0004	0.0037**	0.0031	-0.0102	-0.0084
	(0.0189)	(0.0070)	(0.0057)	(0.0008)	(0.0057)	(0.0149)	(0.0054)	(0.0018)	(0.0059)	(0.0081)	(0.0063)
Elem. school days	-0.0312	-0.0029	-0.0063	0.0011	0.0023	-0.0283*	0.0003	0.0025	-0.0113**	0.0012	-0.0209***
	(0.0189)	(0.0071)	(0.0050)	(0.0007)	(0.0040)	(0.0146)	(0.0070)	(0.0022)	(0.0052)	(0.0081)	(0.0044)
Middle school days	0.0211	-0.0084	-0.0012	-0.0014	-0.0059	0.0295	0.0133	0.0011	-0.0139*	0.0152	0.0137
	(0.0332)	(0.0121)	(0.0090)	(0.0016)	(0.0075)	(0.0253)	(0.0128)	(0.0022)	(0.0072)	(0.0152)	(0.0135)
High school days	0.0025	-0.0025	-0.0035	0.0001	0.0010	0.0050	0.0051	0.0003	-0.0042	-0.0120	0.0159
	(0.0411)	(0.0170)	(0.0105)	(0.0017)	(0.0103)	(0.0292)	(0.0132)	(0.0051)	(0.0086)	(0.0139)	(0.0128)
Other school days	0.0526	-0.0075	-0.0056	-0.0031	0.0012	0.0601	0.0137	-0.0023	0.0127	0.0178	0.0182
	(0.0494)	(0.0200)	(0.0148)	(0.0032)	(0.0119)	(0.0368)	(0.0149)	(0.0039)	(0.0121)	(0.0209)	(0.0177)
Constant	7.9152***	1.5844***	1.1143***	0.0562	0.4138**	6.3308***	2.1921***	0.0429	0.6263***	1.0256***	2.4439***
	(0.4709)	(0.2723)	(0.2053)	(0.0581)	(0.1685)	(0.4080)	(0.1971)	(0.0513)	(0.1794)	(0.1467)	(0.2396)
Time fixed effects (day)	X	X	X	X	X	X	X	X	X	X	X
Library-radii fixed effects	X	X	X	X	X	X	X	X	X	X	X
Observations	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270
R-squared	0.3218	0.2759	0.1442	0.0248	0.2025	0.2554	0.2627	0.0697	0.0952	0.0979	0.1122

Standard in parentheses, clustered at the library level, population weighted least squares

**** p<0.01, ** p<0.05, * p<0.10*

Notes. This is the first of two interaction specifications, the specifications in this table interact library hours with an indicator variable describing whether the library-zone (not library radii-zones) is in the top 75th percentile of violent crime rates. Of special note are the negative and statistically significant estimates of homicide and aggravated assault.

Table 9.2—Above 25th Percentile Crime Rate Interaction, Difference in Differences by Crime Type,
Date range equal to one day or zero, Beginning date, Overall Library Zones, summed library zones

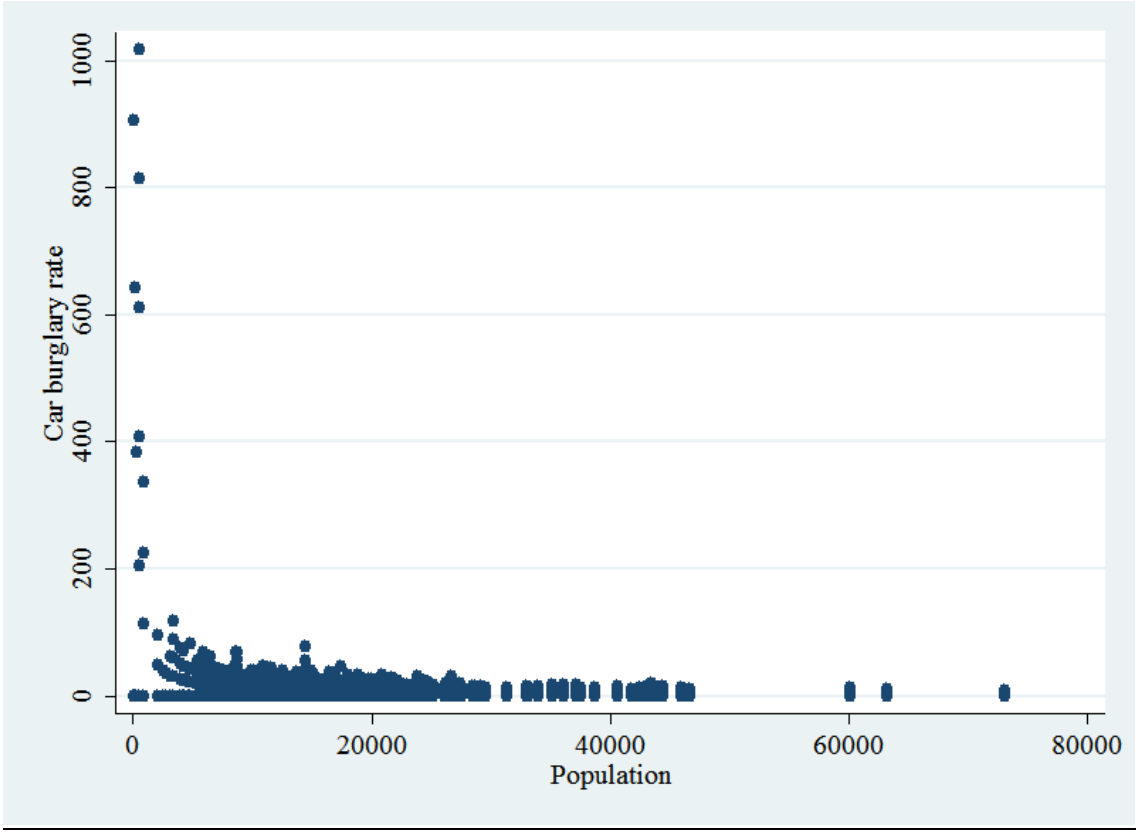
Beginning Date	(1) All crime	(2) Violent	(3) Assault	(4) Homicide	(5) Robbery	(6) Property	(7) Theft	(8) Grand Theft Person	(9) Grand Theft Auto	(10) Burglary	(11) Burglary from Vehicle
LibHours	-0.0080	0.0187	0.0162	-0.0006	0.0031	-0.0268	0.0021	-0.0022	0.0096	-0.0034	-0.0328***
	(0.0299)	(0.0168)	(0.0118)	(0.0015)	(0.0079)	(0.0263)	(0.0123)	(0.0035)	(0.0116)	(0.0092)	(0.0105)
LibHours*Crime25th	0.0320*	-0.0000	-0.0024	-0.0008**	0.0032	0.0320***	0.0089*	0.0030***	-0.0057	0.0163***	0.0095*
	(0.0162)	(0.0090)	(0.0059)	(0.0004)	(0.0040)	(0.0120)	(0.0048)	(0.0009)	(0.0049)	(0.0058)	(0.0049)
Elem. school days	-0.0328	-0.0035	-0.0072	0.0010	0.0028	-0.0294*	0.0001	0.0026	-0.0111**	0.0005	-0.0215***
	(0.0198)	(0.0074)	(0.0056)	(0.0007)	(0.0041)	(0.0149)	(0.0069)	(0.0022)	(0.0052)	(0.0082)	(0.0043)
Middle school days	0.0197	-0.0089	-0.0020	-0.0014	-0.0055	0.0286	0.0132	0.0012	-0.0137*	0.0146	0.0133
	(0.0333)	(0.0125)	(0.0099)	(0.0017)	(0.0076)	(0.0249)	(0.0127)	(0.0023)	(0.0072)	(0.0152)	(0.0134)
High school days	-0.0001	-0.0031	-0.0045	-0.0000	0.0014	0.0031	0.0048	0.0004	-0.0038	-0.0133	0.0150
	(0.0419)	(0.0174)	(0.0113)	(0.0018)	(0.0102)	(0.0292)	(0.0132)	(0.0050)	(0.0086)	(0.0137)	(0.0131)
Other school days	0.0517	-0.0071	-0.0048	-0.0030	0.0007	0.0587	0.0132	-0.0026	0.0129	0.0172	0.0180
	(0.0508)	(0.0209)	(0.0163)	(0.0033)	(0.0119)	(0.0371)	(0.0149)	(0.0039)	(0.0118)	(0.0212)	(0.0177)
Constant	4.6550***	1.1683***	0.8410***	0.0535	0.2737	3.4867***	1.4571***	0.0467	0.1132	0.2508	1.6189***
	(0.4770)	(0.2750)	(0.2087)	(0.0580)	(0.1676)	(0.4123)	(0.1959)	(0.0512)	(0.1812)	(0.1550)	(0.2398)
Time fixed effects (day)	X	X	X	X	X	X	X	X	X	X	X
Library-radii fixed effects	X	X	X	X	X	X	X	X	X	X	X
Observations	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270	72,270
R-squared	0.3219	0.2758	0.1439	0.0246	0.2024	0.2555	0.2628	0.0697	0.0952	0.0980	0.1122

Standard in parentheses, clustered at the library level, population weighted least squares
**** p<0.01, ** p<0.05, * p<0.10*

Notes. This is the second of two interaction specifications, the specifications in this table interact library hours with an indicator variable describing whether the library-zone (not library radii-zones) is in the 25th percentile of overall crime rates. Of special note are the negative and statistically significant estimates of homicide and the positive and statistically significant estimates of property crime.

APPENDIX

Figure A1—Car Burglary Rate vs Population



Notes. This is a plot of car burglary rates of each library-radii-zone vs their population. This figure shows how the variance of car burglary rates, as is any other crime rate, is inversely proportional with population size. This shows the prevalence of heteroscedasticity in crime rate data, and the necessity to utilize weighted ordinary least squares, weighted by population size. This ensures that the lowest population areas, which have the highest variance, will have the least weigh