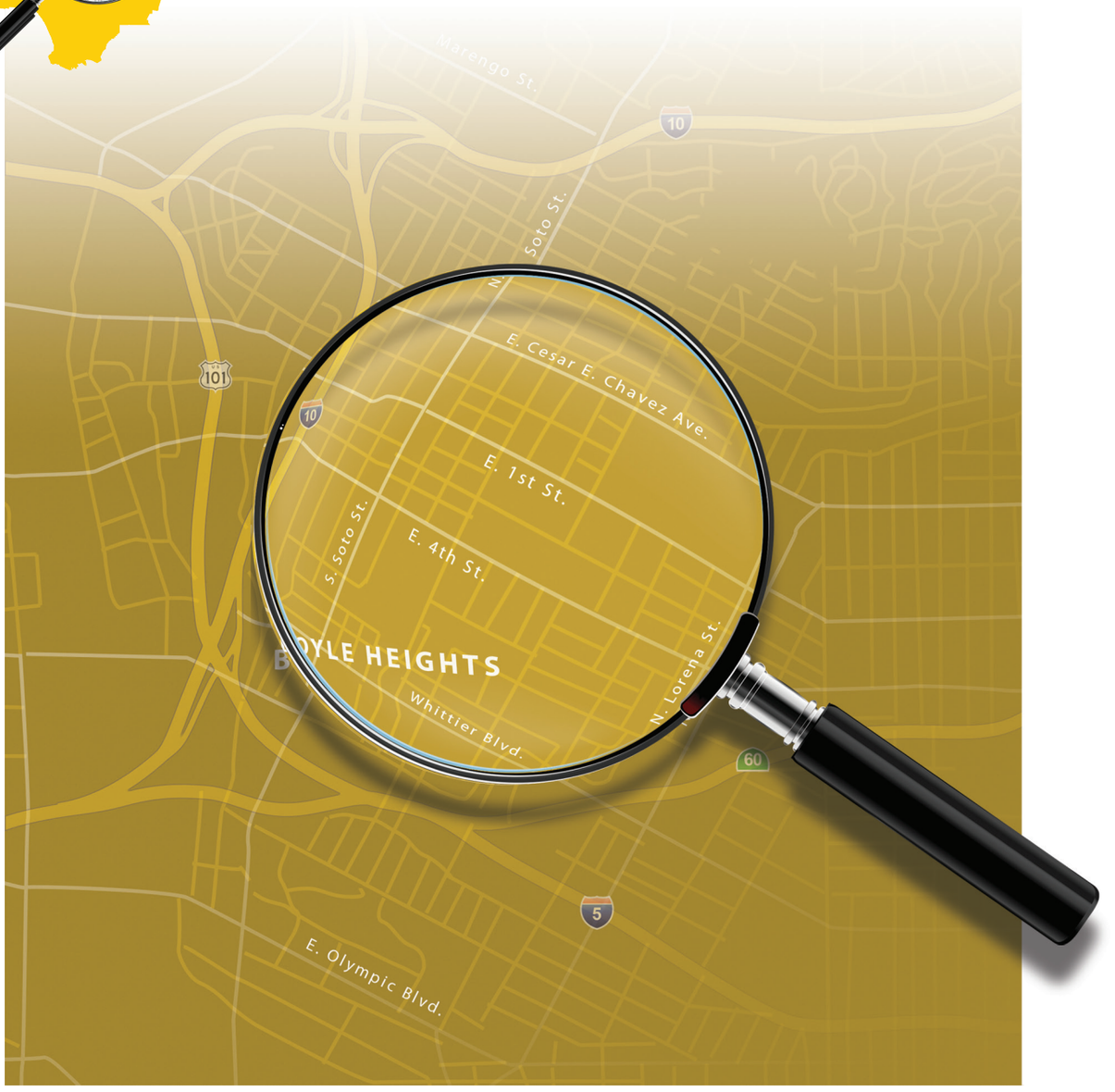
A RESEARCH SERIES OF THE PAT BROWN INSTITUTE AT CAL STATE LA

IN FOCUS: BOYLE HEIGHTS



Community Engagement through Participatory Mapping:

Community Safety in Boyle Heights

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CAL STATE LA
PAT BROWN INSTITUTE FOR PUBLIC AFFAIRS
Unleashing the Power of Participation

Building Healthy Communities
Boyle Heights



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City Heights
Del Norte County Adjacent Tribal Lands
Eastern Coachella Valley
East Oakland
East Salinas (Alisal)
Long Beach
Richmond
Sacramento
South Los Angeles
South Kern
Southwest Merced/East Merced County



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Community Engagement through Participatory Mapping: Community Safety in Boyle Heights

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Goals and Objectives of This Report

- This brief presents a case study of public safety in Boyle Heights to explore the potential prospects for community participatory mapping approaches as alternatives to traditional crime mapping methods. Participatory mapping involves processes in which community stakeholders participate in mapping activities to provide local knowledge and challenge traditional decision making. Such approaches, which can utilize innovations in mapping technology, call for a greater role for communities in contributing to policy research, solutions, and advocacy in community health issues.

Key Recommendations

- Participatory mapping can be used as a tool to engage communities in understanding and contributing to community health to develop more responsive, equitable, and community-supported policy solutions.
- Participatory mapping utilizing innovations in mapping technology requires adequate community capacity in terms of computer and Internet access, computer and data literacy, and the cultivation of effective community facilitators to guide participatory processes.
- Governments using innovations in mapping technology should continue to develop user-friendly interfaces and applications to engage the public, while also taking steps to ensure the accuracy and transparency of the data provided.
- Most important, for participatory processes to have a meaningful impact, public and private institutions must reflect a political commitment to incorporate participatory practices into broader decision-making processes.

INTRODUCTION

Community health entails the well-being of a community shaped not only by individual choices and behaviors but also by social, economic and political contexts. Thus, the determinants of community health have expanded to encompass not only health care, but also housing, employment, the built environment, cultural norms, transportation systems, and public safety (Norris & Pittman, 2000). This policy brief explores the capacity of local communities to contribute to policy research, solutions and advocacy in community health issues. It uses a case study of public safety in Boyle Heights to explore community participatory mapping when community stakeholders—as opposed to technical or policy experts—participate in mapping activities to provide local knowledge, and challenge traditional discourse and decision-making processes. Participatory mapping can be used as a tool to engage communities in understanding and contributing to community health with the goal of developing more responsive, equitable, and community-supported policy solutions.

Community engagement in policy and planning is increasingly seen as important to ensure that outcomes are equitable and responsive to community concerns.

Historically, minority communities—such as in the Eastside Los Angeles community of Boyle Heights—have suffered from traditional policy and planning decision-making processes that failed to sufficiently engage community residents. For example, despite community opposition, decisions in the 1950s and 1960s led to the construction of a disproportionate number of major freeways in Boyle Heights that vivisected the community, displaced residents and created serious public health impacts (Estrada, 2005; Avila, 2014). Since then, there has been greater recognition of the importance of community engagement in policy and planning decisions to ensure that outcomes are equitable and responsive to community concerns.

Today, Boyle Heights is particularly known for its vibrant community organizations that not only play an active role in shaping community outcomes but also frequently represent varied perspectives. For example, in recent years, the changing nature of the Boyle Heights community, such as occurred with the extension of the Metro Gold Line in 2012, has spurred considerable community concern regarding gentrification and residential displacement, with community perspectives ranging from aggressive opposition to development to cautious optimism (Carroll, 2016; Mejia, 2016). Moreover, historically and also in recent years, such law enforcement practices as police use of force have been criticized by minority communities, including recently in Boyle Heights (Mejías-Rentas, 2016).

To contribute to discussions of community health and safety in Boyle Heights, this policy brief explores the prospects for community engagement through participatory mapping practices of community safety issues as an alternative to traditional crime mapping approaches. It suggests a greater role for communities in contributing to the understanding of community safety issues and the development of policy responses supported by innovations in mapping technology and the government "open data" movement, while recognizing the challenges of participatory processes and the importance of support from public and private institutions.

Public safety continues to be a salient issue in urban neighborhoods as neighborhood conditions—including social interactions and relationships, peer influences, crime, and violence—significantly affect the life outcomes of neighborhood residents (Ellen & Turner, 1997). Significant debate exists, however, regarding the most appropriate means to increase community safety. Policy researchers of community safety must tread cautiously not only to avoid repeating past mistakes but also to recognize that policy prescriptions embody value-based judgments that can entail contested community impacts. Participatory

mapping can be one way to engage varied community interests and perspectives with the goal of developing more responsive, community-supported policy solutions.

Traditional approaches to mapping crime may limit our understanding of the complex factors that shape these patterns, and the range of possible policy responses.

This policy brief first traces the history of crime mapping and the emergence of critiques of traditional mapping practices. Second, it explores both the opportunities and challenges of applying participatory mapping to community safety. Third, using a case study of Boyle Heights, this policy brief examines the prospects for participatory mapping by examining the spatial and temporal patterns of crime in the community through traditional descriptive and Geographic Information Systems (GIS) analysis of reported crime incidents from 2005 to 2012, while suggesting opportunities for alternative participatory mapping practices.

Case study analysis found that reported incidents of all types of crime in Boyle Heights declined significantly between 2005 and 2012. Moreover, GIS analysis identified unique and changing spatial patterns of nonviolent, violent and gang-related crimes in Boyle Heights from 2005 to 2012. Using only these traditional approaches, however, limits our understanding of the complex factors that can shape these patterns and the range of possible policy responses. Alternative participatory mapping practices used in conjunction with public data and mapping technology made accessible by the City of Los Angeles can be a useful in engaging communities in developing a more nuanced understanding of what contributes to community safety.

Finally, this report concludes with a discussion of the necessary community and government capacities to support the incorporation of participatory processes in decision-making processes as well as other potential opportunities for community engagement through participatory mapping. In particular, participatory mapping utilizing innovations in mapping technology requires the strengthening of community capacity in terms of computer and Internet access, computer and data literacy, and the cultivation of effective community facilitators to guide participatory processes.

In addition to community capacities, adequate government capacities are necessary to foster participatory decision-making processes that can effect systemic change. Governments exploring innovations in mapping technology should continue to develop user-friendly interfaces and applications to engage the public while also taking steps to ensure the accuracy and transparency of the data provided. Most important for participatory processes to have a meaningful impact, public and private institutions must reflect a political commitment to incorporate participatory practices into broader decision-making processes.

A Brief History of Crime Mapping and the Emergence of Critical Cartography

Crime mapping has been practiced for more than 180 years. Its origins can be traced to 1829 when French attorney André-Michel Guerry and Venetian geographer Adriano Balbi produced a set of three shaded maps of France that depicted crimes against persons, property crimes and education levels by district (Friendly, 2007). In 1833, Guerry published what is considered one of the "foundation studies of modern social science" by assembling maps and tables of data that suggested surprising relationships among multiple social variables, including crime, literacy, suicides and other "moral statistics" (Friendly, 2007). In the same period, Belgian academic Adolphe Quetelet produced similar works that identified spatial relationships between crime and social variables; together, Guerry and Quetelet are credited with founding the modern cartographic sciences. In the

United States, sociologists such as University of Chicago's Clifford R. Shaw and Henry D. McKay began mapping social variables in the early 1900s, and produced maps that associated juvenile delinquency in Chicago with community and neighborhood variables.

Prior to the advent of desktop computers in the 1970s and 1980s and the development of mapping technology, U.S. police departments were limited in their analysis of spatial patterns of crime (Chamard, 2006). Some police departments used simple techniques, such as marking incidents of crime using pushpins on large paper maps (Chamard, 2006). By the late 1990s, however, approximately 36 percent of large U.S. police departments utilized computerized crime mapping to analyze spatial patterns of crime, according to one national survey (Mamalian & LaVigne, 1999). In evaluative studies, crime mapping and hot spot policing have been found to have modest but meaningful impacts on crime reduction (see Braga, Papachristos, & Hureau, 2014 for a systematic review). Moreover, U.S. police departments increasingly have made crime maps accessible to the public and even interactive through Web-based technologies (Ratcliffe, 2002).

Critical cartographers argue that power is enacted through both the creation and use of maps.

Drawing attention to the dynamics of power and politics involved in mapping and cartographic representation, the contemporary critical cartography movement emerged in the 1990s to critique the traditional perspective of maps as neutral, objective documents (Crampton & Krygier, 2005). In contrast, critical cartographers argue that power is enacted through both the creation of maps (choosing what should be represented and how it should be done) and the use of maps (e.g., in identifying desirable and undesirable areas). For example, crime maps involve a subjective choice to document reported incidents of certain types of crime, potentially leading to under- or over-representation, while error can be introduced, intentionally or unintentionally, through the recording, geocoding and analysis of crime data. Critical questions emerge regarding the impact of crime maps on neighborhoods, such as on individual privacy, neighborhood stigmatization, residential and commercial prices, insurance eligibility and premiums, economic and community development, and policing practices (Ratcliffe, 2002).

Participatory Crime Mapping as an Alternative: Opportunities and Challenges

Although crime maps as socio-political constructs have been critiqued as tools sometimes used to stigmatize and control communities, they also can serve as powerful communicative tools to engage the public and promote social justice (Kindynis, 2014). For example, participatory mapping can be a corrective practice when community stakeholders engage in mapping to provide local knowledge and challenge traditional discourse and decision making (Wood, 2010). Participatory mapping may allow community stakeholders to share knowledge, perceptions and experiences that may differ from those of technical experts, facilitating problem solving. Moreover, it can serve as a springboard for productive dialogue among community stakeholders about local landscapes as "drawing maps became a visual form of conversation" (Bauer, 2009, p. 247). In this sense, both shared and conflicting or contested knowledge among community stakeholders can be explored (Heesen et. al, 2014). Participatory mapping also has been called "counter mapping" by artists, activists and academics and can convey alternative or marginalized interests, such as showing locations of police use of force or marking networks of U.S. prison systems (Kindynis, 2014).

In one case study in Pretoria, South Africa, community members drew and compared maps of places in the community where they felt threatened; they visited and photographed these sites, and discussed and developed ways to increase safety (Liebermann & Coulson, 2004). Community members, who identified

five times as many places of concern as police did in a similar workshop, proposed their own solutions, such as having teachers monitor an alley that children use to travel to and from school (Liebermann & Coulson, 2004). Through the exercise, community members demonstrated local knowledge that surpassed the knowledge of outsiders, including law enforcement (Liebermann & Coulson, 2004).

Participatory mapping offers the opportunity to engage the public, promote social justice, challenge traditional discourse, and facilitate problem-solving.

Participatory mapping also has been utilized to engage youth effectively, particularly concerning community health and safety. Case studies suggest that participatory mapping generates active and thoughtful discussion among youth regarding the relationship of community safety, the built environment, and social interactions while providing young people with knowledge and experience in researching, problem solving, and community advocacy (Literat, 2013; Teixeira, 2014; Zhou, Li & Larsen, 2015). For example, in one central Los Angeles neighborhood, high school students used maps to show areas in their neighborhood where they felt comfortable or unwelcome (Literat, 2013). Students shared their maps, and then utilized the Google Maps Street View function and Google Earth to visualize and investigate these places (Literat, 2013).

In another case study in Yantai, China, 327 children 10 to 13 years old identified "play places" and "bad places" in their community through participatory mapping, and shared factors that shaped their perceptions (Zhou, Li & Larsen, 2015). Researchers concluded that participatory mapping can not only engage children as active researchers but can also support evidence-based design and planning (Zhou, Li & Larsen, 2015). Finally, in a case study of participatory mapping in Pittsburgh, PA, teenagers used participatory photo mapping, which incorporates photographs in maps, to identify and analyze vacant neighborhood properties that posed community safety concerns, then used their research to advocate for innovative solutions, such as grant support to transform several vacant lots into community gardens (Teixeira, 2014).

The evolution of mapping technology combined with the public sector open data movement, which seeks to make data more accessible to the public, helps support the prospects for participatory mapping. Mapping technology has become increasingly accessible to non-experts through the development of more affordable user-friendly desktop software; Web-based mapping interfaces that require only a computer and Internet connection; and mobile applications. Such online programs as Google Maps and downloadable applications like Google Earth have increased participation in mapping and encouraged innovative uses (Tulloch, 2007). Moreover, public agencies increasingly have provided GIS data online in recent years (Ganapati, 2011). For example, the City of Los Angeles launched its open data portal in 2014 (https://data.lacity.org/), which includes more than 300 public data sets. Many of these data sets, which previously were not readily available to the public, can be seen in map format, including reported incidents of crime from the Los Angeles Police Department.

Although it can be used as a corrective practice to traditional mapping approaches, participatory mapping has engendered its own critiques and challenges. First, capacity issues still exist when engaging in participatory mapping as communities may have uneven access to resources, such as computer hardware, high-speed Internet access, and proficiency in computer and data skills (Elwood, 2006; Ratcliffe, 2002; Sawicki & Craig, 1996). Second, like traditional maps, participatory maps also can be used to either empower or disadvantage different groups. Participatory maps can help a community identify and

manage its resources and solve local problems, but they also can make a community more legible to outsiders who can utilize these maps for other purposes (Fox et al., 2006; Bauer, 2009). Local power relations and conflicts can become inscribed in participatory maps depending on who participates in their production. Thus, it may be useful for a community to produce different maps capturing different perspectives as a catalyst for discussion as opposed to attempting to produce a participatory map inclusive of all community perspectives (Heesen et al., 2014).

If participatory processes are to have meaningful impact, public and private institutions must be committed to incorporating them into broader decision-making.

Finally, participatory mapping processes and outcomes require political engagement with public and private institutions and decision-making processes to effect systemic change (Elwood, 2006; Kim, 2015). Many participatory mapping endeavors focus on the process without sufficient attention to what might result from their production (Kim, 2015). Without institutional engagement, responsibility for community safety can shift to non-governmental organizations and individuals, which may be limited in their resources and ability to effect systemic change (Kindynis, 2014). Powerful institutions—including government, educational, financial, and corporate institutions—can structure the distribution of resources and access to opportunities through the rules and practices they establish. Thus, the more significant barrier to adopting participatory mapping practices across communities may be the political willingness and flexibility of public and private institutions to incorporate broader participatory processes into decision making (Kwaku Kyem, 2004; Ganapati, 2011).

A Case Study of Crime Mapping in Boyle Heights

To examine the prospects for participatory mapping, this policy brief engages in a case study of crime mapping in Boyle Heights. It first identifies spatial and temporal patterns of crime through traditional descriptive and GIS analyses of reported crime in the community. These analyses demonstrate that crime in Boyle Heights declined dramatically between 2005 and 2012, with overall crime rates lower than the overall rates in the City of Los Angeles beginning in 2007. Through GIS analysis, this study identified unique spatial patterns of nonviolent, violent and gang-related crimes in the community. The analysis found that the density of crime hot spots in Boyle Heights declined between 2005 and 2012, in part because of the dramatic reductions in crime in the community overall during this period; however, some areas with higher concentrations of crime persisted through 2012.

Although traditional descriptive and GIS analyses of reported crime are useful for identifying spatial and temporal trends, there are limitations to understanding the complex factors that can shape these trends and the range of possible policy responses. Thus, this policy brief suggests opportunities for alternative participatory mapping practices to engage communities in developing a more nuanced understanding of what contributes to community safety. Participatory mapping practices using the City of Los Angeles' Open Data Portal, which makes crime data easily accessible by the public, and online mapping applications, such as the Google Maps Street View function, are explored as tools to assist in community discussions.

Descriptive and GIS Analysis of Spatial and Temporal Patterns of Crime

Using traditional descriptive and GIS analyses, this policy brief examines reported crime incidents in the City of Los Angeles from 2005 to 2012 obtained from the Los Angeles Police Department (LAPD).

Table 1: LAPD Classification of Part I Crimes

AGG	Aggravated Assault
BTFV	Burglary/Theft from Vehicle
BURG	Burglary
GTA	Auto Theft
GTP	Personal/Other Theft
HOM	Homicide
ROBB	Robbery

The LAPD data consists of locations of reported incidents of Part I crimes as classified in Table 1 and reported incidents of gang-related crime. Selected crimes, such as rape, were excluded from the data set for confidentiality reasons because of the possibility that the victim could be identified. Reported gang-related incidents of crime are determined by the LAPD using criteria developed by the Department, such as whether the suspect is identified as a gang member or whether the crime occurred in a known gang area.

The 2005-2012 LAPD dataset for the City of Los Angeles included approximately 959,098 crime reports. Based on the California Endowment's Building Healthy Communities Initiative boundaries, neighborhood boundaries for Boyle Heights were digitized using ArcGIS and used to extract the reported crime incidents that occurred in Boyle Heights from the LAPD data set.[1] This process yielded approximately 20,303 crime incidents within a 6.6-square-mile area for Boyle Heights from 2005 to 2012. Steps were taken to identify and, when neccesary, correct geocoded data points. Population estimates for the City of Los Angeles from 2005 to 2012 were obtained from the U.S. Census to calculate crime rates; the population of Boyle Heights was extrapolated from U.S. Census data based upon Los Angeles Department of Planning information. Descriptive analysis was conducted on the reported crime incidents for the City of Los Angeles as a whole and for Boyle Heights.

The reported incidents of crime in Boyle Heights were mapped using ArcGIS, and spatial and temporal patterns of crime were identified through a kernel density analysis of the data. Kernel density analysis creates a continuous surface of crime density based upon individual crime locations. The smooth surface depicts variation in the density of point events across a geographic area. This analytical technique often is used to identify hot spots, or areas with greater than average numbers of incidents or events of interest. An incremental mean threshold approach was applied to the kernel density analysis, which allows for a standard comparison of hot spots based on mean density (Chainey & Dando, 2005).

Descriptive and GIS analyses of the reported incidents of crime in the community of Boyle Heights demonstrates a significant decline in crime between 2005 and 2012. Boyle Heights experienced an increase in crime in 2010 and 2012, however, compared to each preceding year. Total crime decreased from 3,573 reported incidents in 2005 to 2,116 reported incidents in 2012, dropping from 41.6 crimes per 1,000 people in 2005 to 23.9 crimes per 1,000 people in 2012, as shown in Table 2. Beginning in 2007, the overall crime rate in Boyle Heights was lower than the overall crime rate for the City of Los Angeles, as seen in Figure 1.

The decline in reported crimes in Boyle Heights reflects a broader trend of declining crime experienced in the City of Los Angeles as a whole. Between 2005 and 2012, reported crimes in Los Angeles decreased from 141,256 total crimes reported in 2005 to 104,108 in 2012. The total crime rate in the City of Los Angeles fell from 37.9 crimes per 1,000 people in 2005 to 27.0 crimes per 1,000 people in 2012. While experiencing an overall lower crime rate than the City of Los Angeles beginning in 2007, Boyle Heights exhibited higher crime rates for some types of crimes than the City of Los Angeles. For example,

[1] For the 2005 to 2009 data set, the LAPD provided geocoded locations of reported crime incidents; for the 2010 to 2012 data, the LAPD provided only the locations of reported crime incidents, which the author geocoded using ArcGIS.

Table 2: Crime Rates (Crime per 1,000 People) in Boyle Heights, by Year and Type

	2005	2006	2007	2008	5009	2010	2011	2012
Total Crimes	41.6	36.9	31.8	30.6	21.0	25.4	21.5	23.9
AGG Aggravated Assault	5.3	5.9	4.7	4.0	1.9	2.8	2.6	2.5
BTFV Burglary/Theft from Vehicle	11.3	6.8	5.7	5.7	4.5	5.5	5.1	4.7
BURG Burglary	3.1	3.3	2.8	3.4	2.0	1.9	2.2	2.2
GTA Auto Theft	11.4	9.6	9.2	8.6	5.4	7.0	4.4	6.3
GTP Personal/Other Theft	0.2	0.2	0.3	0.2	0.1	0.2	0.2	0.1
HOM Homicide	0.2	0.2	0.2	0.1	0.1	0.2	0.1	0.1
ROBB Robbery	3.3	3.8	3.5	3.2	2.8	3.2	2.7	2.4
THEFT	6.8	7.0	5.5	5.3	4.2	4.6	4.2	5.4

Boyle Heights generally had higher rates of aggravated assaults, auto thefts and homicides than Los Angeles as a whole.

Categorizing crime into violent (aggravated assault, homicide and robbery) versus nonviolent (burglary, theft, auto theft and burglary/theft from vehicle) crime also reveals noteworthy trends. The proportion of reported incidents of violent crime to total crime in Boyle Heights declined each year after 2006 until 2010. In 2012, violent crime constituted 21 percent of total crime in Boyle Heights, which is the same proportion as in 2005. From 2005 to 2012, the total gang-related crime rate in Boyle Heights declined 54.4 percent to 1.89 crimes per 1,000 people. Although declining, the gang-related crime rate in Boyle Heights each year from 2005 to 2012 was higher than the gang-related crime rate in the City of Los Angeles as a whole.

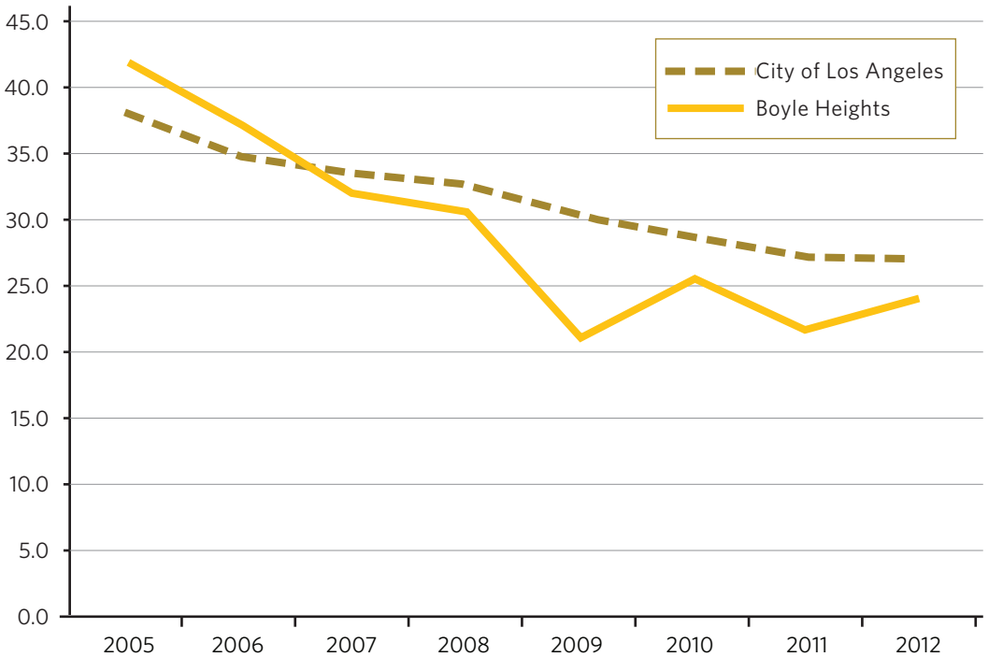


Figure 1: Comparison of Crime Rates per 1,000 People in Los Angeles and Boyle Heights, 2005–20012



Figure 2: Kernal Density Analysis of Non-Violent Crime in Boyle Heights, 2005 and 2012.

In addition to a descriptive analysis of crime trends in Boyle Heights, distinctive spatial patterns of crime in Boyle Heights were identified for violent, nonviolent and reported gang-related incidents of crime between 2005 and 2012 using GIS analysis. Kernel density analysis of each of these categories of crime was conducted by year to identify locations in Boyle Heights with higher densities of nonviolent, violent and gang-related crime incidents.[2] As illustrated in Figure 2, the 2012 kernel density analysis of nonviolent crimes in Boyle Heights demonstrates a decline in the intensity of nonviolent crimes when compared to 2005, with 2005 as the base for comparison; however, persistent hot spots of nonviolent crime in Boyle Heights existed.

The limited scope of this study did not allow for the in-depth analysis of the nature of these hot spots, which participatory mapping could support; however, a preliminary review of the kernel density analysis suggests that nonviolent crime may tend to occur in commercial and business areas, which have higher volumes of people or vehicles and thus greater opportunities for crime. For example, concentrations of nonviolent crime can be seen in 2005 and 2012 along the commercial corridor of Cesar Chavez Avenue in the central area of Boyle Heights.

A similar kernel density analysis was conducted for violent crimes in Boyle Heights between 2005 and 2012 and demonstrated a pattern of violent crimes distinct from patterns of nonviolent crimes (Figure 3). As with nonviolent crimes, the intensity of concentrations of violent crimes decreased from 2005 to 2012, with 2005 as a base for comparison. In 2005, violent crimes were concentrated primarily in the central portion of Boyle Heights along Cesar Chavez

[2] In the kernel density analysis, the mean (or average) densities of crime were calculated and used as a basis of comparison to depict spatial variation in crime densities in Boyle Heights. The 2005 mean crime densities subsequently were used as a basis for comparison to the mean crime densities calculated for 2012.



Figure 3: Kernal Density Analysis of Violent Crime in Boyle Heights, 2005 and 2012.

Avenue. In 2012, concentrations of violent crimes persisted along parts of Cesar Chavez Avenue. Again, because of the limited scope of this study, further research, perhaps through participatory mapping, is necessary to determine why these areas might be locations for high concentrations of violent crimes.

Finally, a kernel density analysis was conducted on gang-related crimes in Boyle Heights from 2005 to 2012. The concentrations of gang-related crimes in Boyle Heights declined significantly from 2005 to 2012, with 2005 as a base for comparison (Figure 4). As gang-related crimes constitute a significant proportion of violent crimes, spatial patterns of violent and gang-related crimes share some similarities. In 2005, gang-related crimes also appear to center around Cesar Chavez Avenue in the central portion of Boyle Heights; however, some interesting shifts in the patterns of gang-related crime occurred between 2005 and 2012. In 2005, higher concentrations of gang-related crime occurred in the southern portion of Boyle Heights between Olympic Boulevard and 8th Street, near the Estrada Courts public housing development. In 2012, higher concentrations of gang-related crime persisted near the Ramona Gardens public housing development in northeast Boyle Heights and the Pueblo del Sol public housing development in the western portion of Boyle Heights. Again, further research is necessary to understand these shifting patterns.

Discussion of Descriptive and GIS Analysis

Descriptive and GIS analyses of reported incidents of crime in Boyle Heights demonstrate several notable trends from 2005 to 2012. First, the descriptive analysis found that reported incidents of all types of crime in Boyle Heights declined significantly between 2005 and 2012. Except for robberies, crime declined more dramatically in Boyle Heights than in Los Angeles as a whole during those years. In fact, after 2007,



Figure 4: Kernal Density Analysis of Gang-Related Crime in Boyle Heights, 2005 and 2012.

Boyle Heights had a lower total Part I crime rate than the City of Los Angeles. Although all crimes declined between 2005 and 2012 in Boyle Heights, the community experienced increases in 2010 and 2012. Boyle Heights had a higher proportion of violent crimes to total crimes than the City of Los Angeles. Although gang-related crimes declined from 2005 to 2012, Boyle Heights also had a higher crime rate for gang-related crimes than the City of Los Angeles.

Second, GIS analysis identified changing spatial patterns of nonviolent, violent and gang-related crimes in Boyle Heights from 2005 to 2012. For all types of crimes analyzed, the intensity in the concentrations of crime notably declined from 2005 to 2012. The GIS analysis demonstrated that different types of crimes have different spatial patterns. For example, nonviolent crime seemed to occur in Boyle Heights' high-traffic commercial areas, while violent crime seemed to occur in the central area of Boyle Heights along Cesar Chavez Avenue. Gang-related crime seemed to be located near public housing developments in the community.

It should be noted that this analysis has several limitations. First, it relies on the LAPD's reported incidents of crime, which may not include all public safety concerns in the community and which may involve other data limitations. Classifying and geocoding the locations of reported incidents of crime also are imperfect processes. For example, a 2014 *Los Angeles Times* investigation of one year of reported incidents of crime ending in September 2013 found that the LAPD misclassified more than 1,200 violent crimes as minor offenses, which prompted the LAPD to reform its crime classification system (Rubin & Poston, 2014a). Moreover, definitions of gang-related crimes can vary, which can affect analysis results. Most important, as noted previously, the narrow scope of this analysis limits the ability to explain why crime

declined significantly in Boyle Heights and in the City of Los Angeles during the study period or what factors contribute to the spatial patterns of crimes in a community.

The trends observed in Boyle Heights and the City of Los Angeles follow a national trend in crime rates, which have declined in recent years despite the recent economic downturn. Scholars have suggested various factors that may have contributed to the sustained decline in crime rates in recent years, including but not limited to changing demographics and the aging of populations, the existence of more social programs, the effects of incarceration and new policing strategies, and the declining risks of exposure to lead that may have had serious cognitive effects; however, national crime rates then increased for the first time in six years in 2012.

According to the Federal Bureau of Investigation, the national rate of violent crime in 2006, before the economic downturn, was 473.5 crimes per 100,000 people; it fell to 386.3 crimes per 100,000 people in 2011 and rose 0.7 percent to 386.9 crimes per 100,000 people in 2012. In 2014, the LAPD reported the first increase in violent crime in the City of Los Angeles in more than a decade (Rubin & Poston, 2014b). In 2015, both violent and property crimes rose for the first time in the city since 2003, with crime at its highest level since 2009, which city officials attributed to increased homelessness and gang activity (Poston, 2016). In 2016, both violent and property crimes rose again in the City of Los Angeles; however, crime levels still remained below rates reported in previous decades (Chang & Lau, 2016). Analysis of post-2012 data is necessary to determine how these trends have progressed in Boyle Heights.

Prospects for Participatory Mapping in Boyle Heights

Although the limitations of descriptive and GIS analyses prevent a more detailed analysis of the factors that may shape the spatial concentration of crime in Boyle Heights, participatory mapping may be used as an alternative tool to assist community stakeholders in continuing to understand and improve community safety and community health. In identifying crime hot spots through traditional approaches, in-depth analysis of the characteristics of these hot spots and the nature of the problem is rare (Rosenbaum, 2006). Participatory mapping could be used as an alternative tool that helps communities contribute to greater understanding of community safety issues and the development of policy responses. A four-stage process is outlined below that could engage community stakeholders, such as young people, in participatory mapping processes.

Participatory mapping can encourage a broader range of community insights into community safety and health, and thereby expand the range of possible policy responses.

Stage 1: *Mapping Community Understandings of Safety*

As an alternative to traditional mapping practices, participatory mapping incorporates local knowledge and understanding of community issues and has been utilized in a range of policy issues, including public health, environmental risks and resources, and public safety. Community organizations in Boyle Heights can play a role in identifying and convening residents to engage with mapping processes. For example, participants could be high school students or residents of a particular area of Boyle Heights. As with case studies of community safety discussed in previous sections, participants can utilize maps to identify neighborhood places of safety or comfort, or fear and discomfort; or community members can analyze a particular interest, such as mapping the locations of public art displays and exploring the impact of public art on community feelings of safety or comfort in a particular area.

Mapping these places can be approached in various

ways. For example, in the case study of young people mapping in a central Los Angeles neighborhood, participants indicated areas they considered comfortable or unwelcoming using markers on paper map printouts of their neighborhood (Literat, 2013). In the case study of participatory mapping in Pretoria, South Africa, community members, after completing an individual mapping exercise, used tracing paper overlaid on a large-scale map of the neighborhood to combine their perceptions of dangerous places in the community (Liebermann & Coulson, 2004). This process can be the catalyst for discussion of factors contributing to perceptions of comfort and discomfort, which may lead to meaningful insights about community safety.

***Stage 2:** Comparison of Community Understandings of Safety to Traditional Crime Maps*

Participatory mapping of community comfort and discomfort can be followed with a comparison of these participatory maps with traditional crime maps. For example, do places of discomfort on participatory maps align with crime hot spots on traditional maps? If so, how do participants explain their understanding of these places? In other words, what do community members understand the problem to be? If the participatory and traditional maps do not align, does this discrepancy affect their perceptions? Besides incidents of crime, what other factors may contribute to feelings of discomfort?

Traditional crime maps previously were not as accessible to the public as they are today. The evolution of mapping technology and the emergence of the government open data movement create greater opportunities for community engagement. For example, prior to the launch of the City of Los Angeles' Open Data Portal, requests for crime data were submitted to the LAPD for review and approval, a process that could require significant time. Moreover, analysis of crime data required access to and knowledge of GIS software.

Today, LAPD crime data can be viewed and downloaded by the public from the city's Open Data Portal. To date, the city has made available raw crime data from 2011 to present with expanded categories of crimes. Many of these datasets can be visualized as maps with the option to view the data as points representing reported incidents of crime or as heat maps that indicate spatial concentrations of crimes. Filters can be applied to the data to examine certain types of crimes, and users can search by Zone Improvement Plan code or address to navigate to a neighborhood or location.

The portal includes additional public safety data for selected years that can be mapped, such as arrests made in the City of Los Angeles or the location of streetlights. The site in its nascent form has challenges related to usability and requires some knowledge to navigate. For example, the crime datasets do not include detailed legends or codebooks to help unfamiliar users understand the various data attributes. No explanation regarding the methodology used to generate the crime heat maps is included. However, the open data portal represents a significant advance in access to government data and creates increased opportunities for community engagement.

***Stage 3:** In-Person or Online Investigations of Places of Comfort and Discomfort*

After developing participatory maps and comparing them to traditional crime maps, participants can identify particular community locations of interest for more in-depth analysis and discussion. These discussions can be facilitated through either in-person visits to these sites or virtual visits through the use of online imaging programs. For example, in the case study of participatory mapping in Pretoria, South Africa, participants visited the shared places of concern, photographed the sites, and engaged in productive discussions of their knowledge and experiences with the site, which often differed based on the characteristics of the participant, such as their age and gender (Lieberman & Coulson, 2004). Participants also could discuss locations with community members, business owners, and school administrators.

In contrast, in the case study of participatory mapping in a central Los Angeles neighborhood, young participants utilized the Google Maps Street View function to visualize, investigate and "in a sense, demystify" places in the community that they perceived as uncomfortable or unwelcoming (Literat, 2013). Google Inc.'s Street View imagery allows users to view photographs of locations around the world selected on an interactive map. It provides a safe, low-cost and time-efficient means of examining features that may elicit further discussions about community safety. In April 2014, Google unveiled access to historical imagery dating to 2007 through its Google Street View program. A rich source of information, historical imagery allows users to document and investigate changing community features that may affect community safety and may be of particular interest in such dynamic communities as Boyle Heights. Consistent archival imagery is not available for all years at all locations, but many locations in Boyle Heights have imagery from 2007, 2008, 2009 and 2012, 2014 and 2015. Users select the imagery year by toggling through a menu.

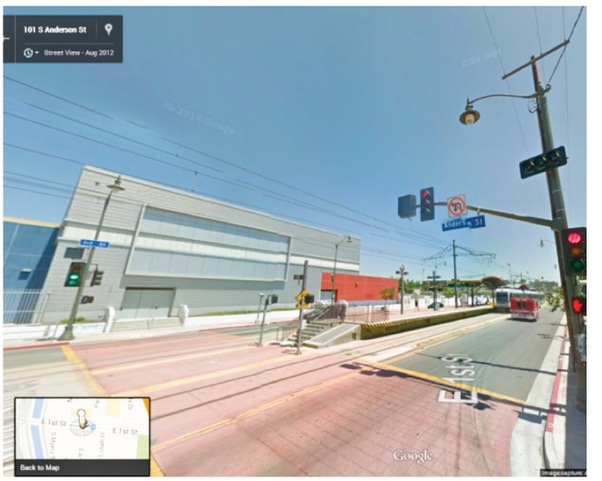
In 2009, the Los Angeles County Metropolitan Transportation Authority opened the extension of the Metro Gold Line into Boyle Heights with four stations along 1st Street: Pico/Aliso, Mariachi Plaza, 1st and Soto, and 1st and Indiana. Examining the kernel density analysis showed that concentrations of crime declined along 1st Street between 2005 and 2012; however, areas of crime still persisted along some parts of 1st Street in 2012. As seen in Figure 5, at the Pico/Aliso station area near 1st and Anderson streets, significant changes in the built environment occurred not only with the construction of the ground-level Metro station but also with the completion of the Felicitas and Gonzalo Mendez High School on the north side of 1st Street, which opened in fall 2009.

The Pico/Aliso station is a narrow platform located in the middle of 1st Street that stretches from Anderson to Utah streets. On the south side of 1st Street, historic Google Street View imagery from 2008, 2009, and 2012 depicts a strip of commercial buildings, including a pizza restaurant. It is not clear from the imagery whether the other buildings are occupied or vacant. A vacant lot sits at the southeast corner of 1st and Utah streets. By 2012, the imagery captures a colorful mural on the wall of the commercial building on the south side of 1st Street at Anderson Street, where the nonprofit Self-Help Graphics & Art, Inc. visual arts center moved in 2011.

In 2005, the area near the Pico/Aliso station experienced a statistically significant concentration of



Pico/Aliso, 2008 (earliest imagery available)



Pico/Aliso, 2012

Figure 5: Google Stret View Images of Pico/Aliso Gold Line Metro Station in Boyle Heights.

nonviolent crime; five reported incidences of theft from vehicle/theft and one reported incident of vehicle theft occurred in 2005 in the area on six days. However, from 2007 to 2012, the area was not a statistically significant area for nonviolent crime. A similar pattern existed for violent crime with a statistically significant concentration of violent crime occurring in 2005 but not from 2007 to 2012. In 2005, three robberies and four aggravated assaults were reported, although the aggravated assaults all occurred on the same day. In 2012, only one violent crime incident—a robbery—was reported near the station.

The construction and operation of the Metro station during this period may have reduced opportunities for crime with more daily activity and fewer targets, such as parked vehicles, in the area. New tenants may increase the number of people who care for and monitor areas, thus deterring crime (Eck, 1994). Community stakeholders could provide more meaningful insights based on their own experiences and observations of the practices, processes and environmental elements that might contribute to patterns of crime and safety.

***Stage 4:** Development and Advocacy of Policy Solutions*

Drawing upon local knowledge shared through participatory mapping, a course of action could be developed and advocated by community members as exemplified in the case studies of participatory mapping in Pretoria, South Africa (Liebermann & Coulson, 2004), and Pittsburgh (Teixeira, 2014). Participants, as opposed to community outsiders, should determine how this shared knowledge is utilized. Action could range from implementing community-based solutions to engaging with public and private institutions and decision-making processes.

Initial interviews with community stakeholders in Boyle Heights already have lent interesting insight into the factors that may support community safety. For example, community stakeholders cited the increased social engagement and activism of residents, nonprofit organizations and local businesses in changing culture and promoting the active use of community spaces, which deter crime. Community stakeholders also suggested that infrastructure improvements—such as improved street lighting—helped to facilitate these changes. Young people in Boyle Heights also have suggested greater engagement with police (Garcia, 2016).

The development of policy solutions and advocacy strategies requires a joint endeavor among participants that may facilitate a greater understanding of the complex factors, interactions and relationships that contribute to community safety; however, this endeavor also may involve conflict regarding different perspectives of the most appropriate way to address community safety. For example, disparate views may exist in Boyle Heights regarding the impact of various approaches to gentrification or the use of suppressive approaches to crime control. Navigating these complex political dynamics, which are characteristic of many communities, requires the capacity of community leaders to facilitate inclusive yet productive discussion. The final section of this policy brief explores the necessary capacities—both community and government—to facilitate participatory mapping processes.

Necessary Community and Government Capacities to Support Participatory Mapping

As an alternative to traditional mapping practices, participatory mapping presents opportunities to engage community stakeholders, share valuable local knowledge and develop innovative policy solutions to enhance community health. Although this policy brief presents a case study of exploring community safety in Boyle Heights, participatory mapping can be utilized in numerous policy areas. For example, the City of Los Angeles' Open Data Portal includes spatial data—such as the locations of foreclosures, affordable housing developments and active businesses in the city—that could be used to generate community discussions about gentrification, development and other quality-of-life issues, such as in a recent protest against art galleries that some com-

munity activists believe do not serve the neighborhood (Chang, 2016).

In 2015, Los Angeles County launched its own open data portal (https://www.data.lacounty.gov) that includes spatial data on many county services, including locations of county arts and culture resources, and health, mental health and social service providers as well as detailed property information from the Los Angeles County Office of the Assessor.

However, participatory mapping is not without its own challenges and limitations. To support productive participatory processes, both community and government capacities are necessary, and public, private, and nonprofit institutions can play a role in supporting the development of these capacities.

First, to support participatory mapping and utilize the growing number of online mapping resources, communities require adequate access to computers and reliable Internet connections. Although computer and Internet accessibility has grown significantly, digital divides related to socioeconomic status still exist. According to the U.S. Census, although the percent of all U.S. households with access to the Internet increased from 50.6 percent in 2001 to 74.4 percent in 2013, 90 percent of households headed by a person with a bachelor's degree or higher had Internet access, compared to 62.9 percent of households headed by a person with only a high school diploma. In 2013, 77.4 percent of White households and 86.6 percent of Asian households had Internet access compared to 61.3 percent of Black households and 66.7 percent of Latino/Hispanic households (U.S. Census, 2013). Government and nonprofit organizations can enhance accessibility to computers and the Internet by supporting and increasing the number of places with community access, including schools and libraries, with well-trained staff who can assist users.

Second, sufficient community capacities in computer and data literacy also are required to utilize online resources that can be enhanced with training supported by government and nonprofit organizations. The increasing availability of online resources, such as mapping programs and government open data sites, has been touted as a means to empower communities. However, according to a 2013 Pew Research Center survey, although 19 percent of those surveyed who do not use the Internet cited cost of access to computers and the Internet as a reason, 32 percent cited difficulties with using computers or the Internet (Zickuhr, 2013). Growing attention has been paid to the need for data literacy—conceptualized in one manner as "the desire and ability to constructively engage in society through and about data"—to facilitate community engagement and empowerment (Bhargava et. al, 2015). In another conception, data literacy involves the ability to read, work with, analyze and argue with data (Bhargava & D'Ignazio, 2015). Without these technical literacy skills, engagement with online resources will be limited.

Finally, to support participatory mapping practices, effective community facilitators are required to foster inclusive and productive processes that navigate the complex political dynamics characteristic of many communities. Although it can "disrupt" traditional hierarchical relationships between institutions—such as the police—and communities, participatory mapping also can disrupt power relations within a community, for example by increasing access to some while diminishing the traditional dominance of others (Liebermann & Coulson, 2004). Competing viewpoints can emerge from community members, which can present challenges to developing a shared understanding of problems and shared agreement on solutions. For example, different community members may have different conceptions of what contributes to community safety issues and appropriate policy responses. In these cases, capable facilitators that can be developed with the support of government and nonprofit organizations are needed to respond sensitively to and manage community interactions.

In addition to community capacities, adequate government capacities are necessary to foster more inclusive decision-making processes that can effect systemic change. First, while the open data movement marks

a significant advancement in public accessibility to previously guarded government data, governments should continue to develop more user-friendly interfaces and applications. For example, the City of Los Angeles' Open Data Portal includes a wealth of information; however, the portal is oriented toward technology developers and researchers rather than toward the average community user. Navigating the portal can be challenging, and accessing datasets, which are presented in tabular format, may not be an intuitive process for some. The development of a user guide or instructional video that explains how to search, filter and visualize data may help.

Recently, the city launched the Los Angeles GeoHub (http://geohub.lacity.org/), which aims to serve as a public platform for analyzing and visualizing data drawn from the city's Open Data portal. The GeoHub includes a number of user-friendly, pre-made map applications that allow the public to easily visualize and explore a wide range of data for the city, including data relevant to community health, such as the location of food deserts, accessibility to supermarkets, degree of potential exposure to environmental pollutants, and accessibility to emergency rooms. Although applications have not been created for every available data set, the public can use the GeoHub to visualize other data sets as online maps; however, the ability to manipulate these maps requires some training and capacity, which a user guide also could help facilitate.

With public access to myriad data that could be sensitive in nature, such as crime reports, government transparency, accuracy and accountability are vital. For example, LAPD reforms already are underway to ensure the accurate reporting of crime. To facilitate transparency and accountability, the city's Open Data Portal and GeoHub could include detailed descriptions with each dataset. This information could describe how the data are collected, provide definitions for the attributes and categories included in the dataset, and include a brief discussion about the possible limitations. Given the treasure trove of data is widely available to the public, the accurate and appropriate use of it should be encouraged through practical means.

Finally, and most important, expanding opportunities for community participation in decision-making processes can lead to a more comprehensive understanding of community problems and the development of more responsive, equitable, and community-supported solutions; however, for participatory processes to have a meaningful impact, public and private institutions must reflect a political commitment to incorporate these practices in broader decision-making processes. Empowering communities with access to public data and online mapping tools is incomplete without institutional venues for community engagement and channels for community influence in decision making. Feedback mechanisms are necessary to bring together increased access to public data, online mapping resources, the development of shared local knowledge and community-supported solutions to produce systemic change.

In this case study of community safety, the traditional hierarchical relationship between police and communities is disrupted by assigning value to the knowledge and experiences of local residents. This change may not be welcomed or valued by public institutions as participatory processes require an openness and willingness to engage with the uncertainties of participatory processes, and to relinquish some authority and control. This disruption can expand beyond law enforcement institutions. With the evolution of mapping technologies and the emergence of the government open data movement, the prospects for more engaged public decision making through participatory mapping and other practices present opportunities well worth exploring in light of the complex and persistent challenges communities continue to face.

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