



# National Institute of Justice

## Research Preview

Jeremy Travis, Director

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# The Use of Computerized Crime Mapping by Law Enforcement: Survey Results

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Computerized crime mapping technology enables law enforcement agencies to analyze and correlate data sources to create a detailed snapshot of crime incidents and related factors within a community or other geographical area. Interest in this technology within the law enforcement community appears to be gaining momentum, but until recently no systematic data existed on how widely it is used.

As a first step in understanding law enforcement agencies' knowledge of crime mapping, the Crime Mapping Research Center (CMRC) of the National Institute of Justice (NIJ) conducted the nationwide Crime Mapping Survey over 15 months to determine who uses geographical information systems (GIS) and why other agencies are not using this mapping technology. Based on the survey findings, the CMRC will further develop its understanding of how law enforcement agencies use GIS software and the types of maps they produce. The CMRC will then identify training and technical assistance needs, further develop crime mapping resources, and disseminate information to researchers and practitioners.

Although the survey found that use of computerized crime mapping is not widespread at this time, interest among law enforcement agency executives and planners appears to be growing. This comes at a time when the cost for computer hardware and software is declining; the technology's efficiency continues to improve; and access to digital calls-for-service, arrest, and incident data within police departments is increasing.<sup>1</sup> Most of the agencies surveyed were familiar with crime mapping technology, and nearly 20 percent of those departments that presently do not use GIS reported that they have budgeted funds to purchase hardware and software for mapping purposes within the next year.<sup>2</sup>

Computerized crime mapping allows law enforcement agencies to plot crime-related data against a digitized map of a community, city, or region. Crime-related data then can be compared and analyzed with other external data sources. Half of the departments that use computerized mapping report using such external sources as census data, city planning data, parks information, property assessment data, utilities information, and other data sources in conjunction with their crime data. This suggests that many departments consider spatial relationships between crime and other community-level characteristics.

Crime incident data can be geocoded (assigning an  $x$  and  $y$  coordinate to an address so it can be placed on a map) by using either street centerlines (every address within a block is encoded) or parcels (each piece of land that can be bought or sold is encoded). The majority of departments (77 percent) reported using street centerline reference files for geocoding and crime mapping. Many departments (25 percent) also reported using parcel database reference files for geocoding and crime mapping.

## Who uses crime mapping?

The majority of the departments surveyed engage in some form of crime analysis with most (73 percent) conducting analyses to fulfill Uniform Crime Report (UCR) requirements and approximately half (52 percent) calculating statistical reports of crime activity. Only 261 (13 percent) of the departments surveyed, however, currently use any computerized crime mapping. As expected, larger departments (with more than 100 sworn officers) were more likely to use this technology (36 percent) than were smaller departments (3 percent). The

average length of time that departments reported having used crime mapping was 3.3 years.

Most departments (75 percent) that use crime mapping reported that crime analysis staff are primarily responsible for performing computerized queries. Few patrol officers (9 percent) use crime mapping, but this number should increase over time because it has been shown to be a valuable tool in community policing and problem solving.<sup>3</sup> Within smaller departments, however, it appears that mapping responsibility is more evenly distributed across several staff positions, including crime analysts, investigators, patrol officers, and dispatch staff.

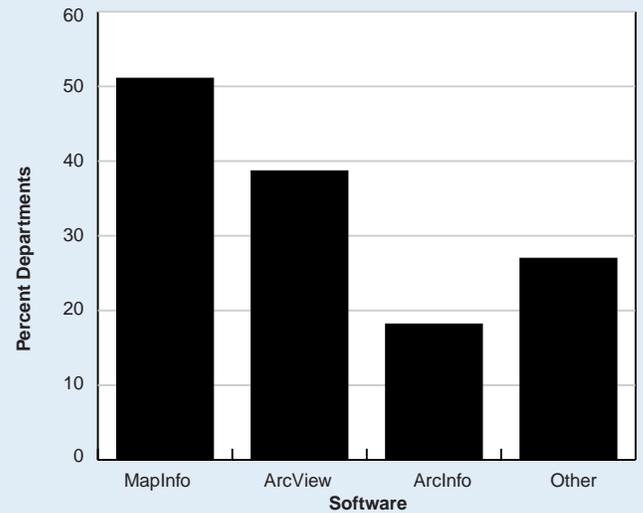
Of departments with computerized crime mapping capabilities:

- 88 percent use commercially available software packages (See exhibit 1).
- 38 percent have customized a commercially available mapping application or have developed a custom mapping program specifically for internal use.
- 89 percent use personal or desktop computers.
- 82 percent use the Internet and other technically advanced resources.
- 16 percent use Global Positioning Systems to assist in their operations.

## Types of crime mapping analyses

The majority of departments (91 percent) reported geocoding and mapping offense (arrest and incident) data, calls-for-service data (65 percent), and vehicle recovery data (52 per-

Exhibit 1. Commercial Mapping Software Used\*



\*Response categories are not mutually exclusive.

cent). Departments also reported geocoding and mapping the UCR Part I crimes: burglary (95 percent), motor vehicle theft (87 percent), robbery (86 percent), rape (71 percent), homicide (69 percent), aggravated assault (62 percent), and arson (40 percent). UCR Part II crimes such as larceny theft (69 percent) and drug offenses (50 percent) were geocoded and mapped as frequently as some Part I crimes.

The mapping application used most frequently is automated pin maps (72 percent), an electronic form of the traditional wall map with pushpins. Most departments

## Survey Methods

The survey was mailed in March 1997 to a sample of law enforcement agencies in the United States. Departments that did not respond to the first mailing were sent a second survey.<sup>a</sup> Surveys were accepted from the field until May 1, 1998.

Sample agencies were differentiated based on whether they employed more than 100 sworn officers (N=871), of which all were sampled, or fewer than 100 sworn officers (N=16,486). Agencies with fewer than 100 sworn officers were grouped by type—municipal police departments, sheriffs' departments, special police, county police departments, State police departments, and combined agency types—and sampled disproportionately by agency type to capture a significant number of respondents from groups, such as sheriffs' departments and special law enforcement agencies, that are often underrepresented in national surveys. The total sample included 2,768 departments, with 2,004 agencies responding.<sup>b</sup>

Those departments that use crime mapping were asked questions such as which staff conduct mapping queries, the extent to which crime mapping is used, the department's hardware and software resources, the types of analyses conducted and their usefulness, the types of map files most frequently used, and the obstacles to initiating a crime mapping program.

### Notes

a. The survey was developed by NIJ staff, reviewed by practitioners and researchers with crime mapping knowledge, and cleared by the Office of Management and Budget. The sample was selected using the Law Enforcement Sector of the Justice Agency List, U.S. Department of Commerce, Bureau of the Census (1994) database.

b. The response rate after two mailings of the survey was 72 percent. The majority (63 percent) of respondents were general purpose municipal police departments.

(77 percent) conduct crime cluster or hot spot analyses, and 86 percent of the departments that conduct these analyses visually identify hot spots; another 25 percent use a computer program that identifies hot spots. Seventy-six percent of departments report maintaining an archive of geocoded crime data that begins between 1990 and 1998. This suggests some interest in long-term analyses for strategic planning purposes.

## The usefulness of crime mapping

Departments reported that mapping improves information dissemination, evaluation, and administration. Specifically, departments use mapping to:

- Inform officers and investigators of crime incident locations (94 percent).
- Make resource allocation decisions (56 percent).
- Evaluate interventions (49 percent).
- Inform residents about crime activity and changes in their community (47 percent).
- Identify repeat calls-for-service (44 percent).

## Obstacles to effective crime mapping

Significant costs exist in setting up a crime mapping system, including those related to accessing and cleaning data, importing data into the GIS, and maintaining the GIS, as well as related training and implementation issues. These costs vary widely depending on the local resources available to the department (e.g., whether the local planning department is performing mapping and will share base maps) and the state of the department's records management system, which will determine how easily data can be downloaded and imported into the GIS. For example, if an agency uses an archaic mainframe system, double entry of all records to be mapped may be required.

Departments that use mapping listed limited financial resources, time, and training as the primary obstacles to their effective implementation of the technology. Departments that do not map identified limited computer and financial resources, in addition to limited time, training, and knowledge, as the primary contributing factors in their decision to implement this technology.

## Conclusions

Increasingly, the criminal justice community and, specifically, law enforcement agencies, appreciate the value and benefits of crime mapping applications and are implementing

computerized crime mapping systems to assist with daily operations. Eighty-four percent of the departments that use crime mapping reported that their leaders financially support mapping efforts, and 85 percent reported that mapping is a valuable tool for the department. Respondent departments indicated that funding for mapping-related efforts came primarily from the department's annual budget, rather than Federal or State sources.

Interest in crime mapping technology continues to grow. For instance, the survey found that of the departments that presently do not use crime mapping, 61 percent believe that software requiring minimal training would be very useful. In addition, NIJ sponsored a crime mapping conference in 1997, the first of its kind, that attracted 400 attendees. The 1998 conference drew more than 800 participants.

Analysis of the survey data continues; NIJ expects to issue a final report on the survey in spring 1999. The final report and survey findings will be posted on the CMRC Web site (<http://www.ojp.usdoj.gov/cmrc>).

## Notes

1. Weisburd, D., and T. McEwen, eds., "Crime Mapping and Crime Prevention," *Crime Prevention Studies*, Volume 8, Monsey, New York: Criminal Justice Press, 1997.
2. All figures reported in this document represent valid percentages, and many response categories are not mutually exclusive. Readers are encouraged to reference the final research report (forthcoming) for specific frequencies.
3. LaVigne, N.G., and J. Wartell, eds., *Crime Mapping Case Studies: Successes in the Field*, Washington, D.C.: Police Executive Research Forum, 1998.

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**This and other NIJ publications can be found at and downloaded from the NIJ Web site (<http://www.ojp.usdoj.gov/nij>).**

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