

# Mapping Crime in South Australia

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## **Development of the Crime Mapping System**

Prior to 1991, the South Australia Police Department purchased a copy of the CDATE system from the Australian Bureau of Statistics (ABS). For the first time, the South Australia Police Department had the latest available census information at their fingertips, thanks to the enormous storage capacity of the compact disk and the mapping capabilities of SUPERMAP. As is often the case, having something which is good makes one desire something even better, and thus the idea of producing an in-house mapping system developed.

The main limitations of the CDATE-SUPERMAP system, from the South Australia Police Department's point of view, were that:

- the maps produced did not depict the areas of greatest relevance to the department, such as patrol areas around police stations or larger administrative divisions;
- the maps, of course, contained only census data and could not easily be adapted to represent crime data; and
- a moderately skilled operator was needed to produce the maps.

The Crime Mapping System (CMS) has been developed in-house to meet the specific needs of the South Australia Police Department by:

- representing the geographical distribution of crime in South Australia in areas of relevance to the police and public;
- enabling the comparison of crime patterns with socio-demographic patterns; and

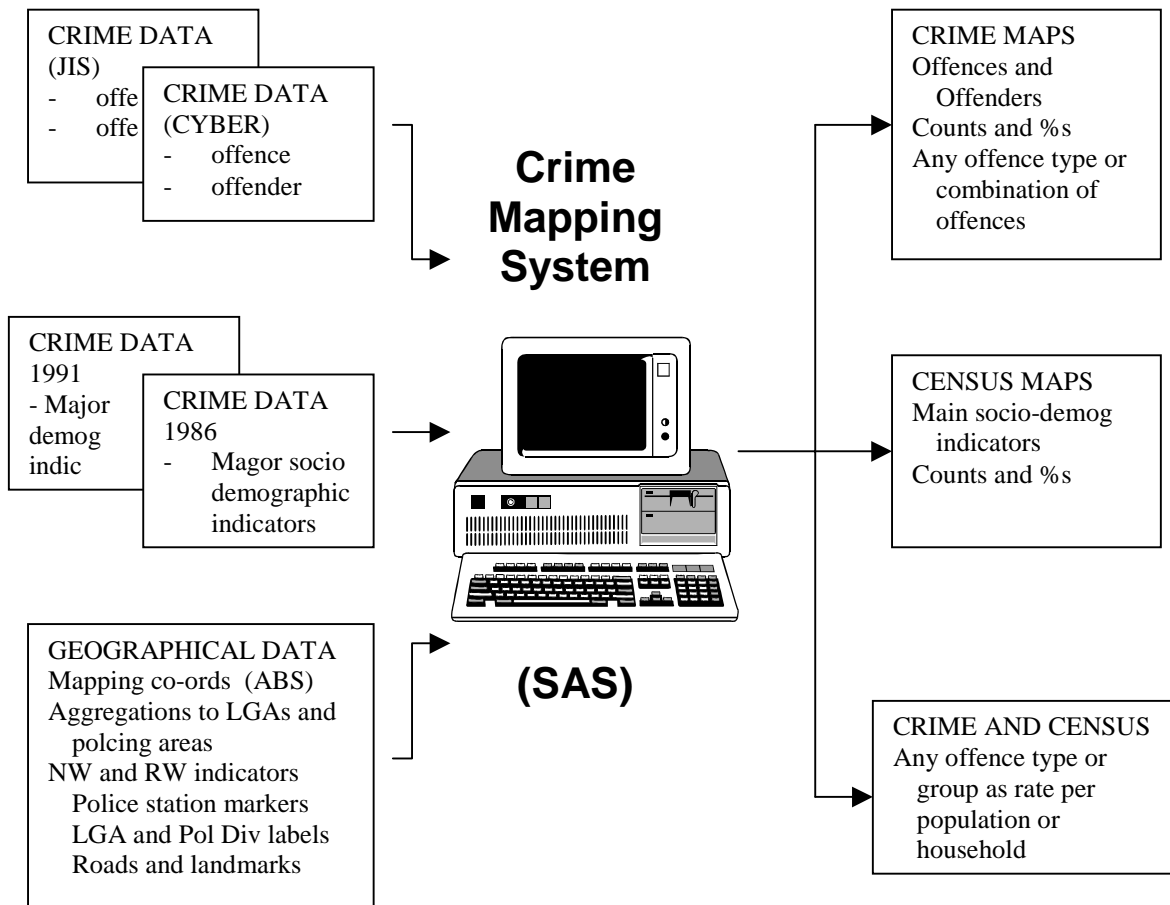
- allowing crime and census information to be combined in various ways to calculate and map standardised rates of offending and other useful percentages.

Furthermore, these objectives have been achieved in a completely menu-driven system which is relatively easy to use. In fact, it is probably true to say that knowledge of census and crime data is a far more important prerequisite for the production and appropriate interpretation of maps, than is knowledge of the CMS itself.

The CMS idea developed into a project and is now a completed system, as a result of funding from the Crime Prevention and Criminology Unit of the Attorney-General's Department. The potential of the CMS as a resource for planning and monitoring of crime prevention initiatives was recognised by the Director of the Crime Prevention and Criminology Unit, Dr Adam Sutton. Thus, the CMS became a key initiative in the South Australian Government's Together Against Crime Strategy.

The primary focus throughout the development of the CMS was the production of maps which showed the incidence of crime at the local neighbourhood level. This focus aimed to enable police and community groups to plan and monitor crime prevention programs in a way which had not been previously possible.

*Figure 1*  
**The Crime Mapping System**  
**A Summary of Inputs To and Outputs From the System**



## Structure of the Crime Mapping System

The CMS collects no data of its own. It is merely a way of representing census and crime information obtained from other sources-namely the CDATE system and the South Australia Police Department's Crime Reporting System.

Data currently held relates to the 1986 census, offences reported since the beginning of 1986, and offenders apprehended over the same period. A selection of key socio-demographic indicators has been incorporated into the CMS from the CDATE disk. This information is fairly static in that it cannot be updated until the 1991 census information becomes available on compact disk.

It is intended that the crime data will be updated on a quarterly basis, and the source of crime data for the CMS will change in late 1991 when the Criminal Incident Reporting System becomes operational on the South Australian Justice Information System. The data obtained from the Criminal Incident Reporting System should improve the timeliness, scope and quality of data available for mapping.

Although it was said that the Crime Mapping System collects no data of its own (that is, in an ongoing sense), the one-off task of assembling what could loosely be described as 'geographical data' was actually one of the most time-consuming aspects of the CMS's development. This data drives the mapping capabilities of the system and provides the tailor-made features which were a major objective for the CMS.

Boundary and centroid coordinates for all census collector districts (CDs) within South Australia were purchased from the Australian Bureau of Statistics (ABS). These areas were then aggregated to make up Local Government Areas (LGAs), Police Districts (patrol areas), Police Divisions (administrative areas), Police Station Towns (major country towns which are Divisional Headquarters) and various other higher level groupings. These groupings of CDs are used to build the outer boundaries and shaded areas within maps, and to aggregate the selected crime or census information for mapping.

An important feature of the South Australia Police Department's crime data collection, which has made this system possible, is that crime reports and apprehensions are recorded against an area which corresponds to the ABS census collector districts (CDs). This means that crime data can be extracted for areas which correspond to those that appear on the maps. Similarly, because Police Districts and Divisions correspond almost exactly with ABS boundaries in the metropolitan area-and are reasonable approximations in rural areas-the boundaries depicted by aggregating CD boundaries are quite realistic.

It is important to note that, in most cases, adherence to ABS standards in the recording of crime and establishment of police boundaries in South Australia has been an important factor in the development of a system which enables crime and census information to be represented side by side, and even combined before mapping.

The final refinement of the geographical data was the addition of a range of what is called 'interpretive' information, such as major landmarks (main roads, rivers, airport, police stations), various other labels and, most importantly from a crime prevention point of view, Neighbourhood

and Rural Watch indicators. The Neighbourhood and Rural Watch indicators enable police to identify within any CD-based map (that is, any map which shows CDs as the shaded areas within a larger boundary) all Neighbourhood Watch areas which were operative on a date supplied by an operator. A similar facility is available for Rural Watch areas. Once again, this facility was only possible because police administrators chose to align Neighbourhood Watch areas with CDs and Rural Watch areas with aggregations of CDs.

The CMS is also capable of mapping external or non-system data provided the data is associated with appropriate geographical units, such as LGAs or Police Divisions. The external data need not be crime related but could represent staffing or workload statistics, for example, to assist in the deployment of police resources.

The CMS resides on an IBM compatible personal computer with historical files accessible via streaming tape. The CMS has been developed in SAS (a statistical analysis computer package) because of its capabilities for integrating complex data manipulations and good mapping facilities into a menu driven system. SAS is also mainframe compatible and is a reporting package used by the Justice Information System on their mainframe machine. Response time for crime maps is not good at the moment because of the size of the data files (approximately 25 megabytes for each annual offence file), but this should be improved with the next release of SAS which will contain an indexing capability.

### **Crime Mapping System Outputs and Output Uses**

Outputs from the CMS can be displayed on the screen, saved to a file for incorporation into a document, or printed in colour onto paper or transparencies. The distribution of one crime or census variable can therefore be readily compared with the distribution of another crime or census variable by overlaying a transparency on a printed base map or by simply comparing maps side by side.

The 'Ad Hoc Reporting Facility' is extremely flexible, allowing users to map crime or census data, or combinations of crime and census data, in the following ways:

- Crime Maps
  - by selecting any offence type or types to map by offence location (for crime reports) or offender residence (for apprehension reports);
  - by extracting a subset of a particular offence group for mapping, based on time of offence, offender age or offender sex; and
  - by calculating a statistic which shows the incidence of one offence type or subset of records as a percentage of a larger group and mapping that statistic.
- Census Maps
  - by mapping any of the selected census items as a count or percentage;

- Combined Crime and Census Maps
  - by calculating standardised offence rates by dividing crime reports by either the total population in the corresponding area (most suitable for offences against the person) or by the number of households (most suitable for housebreaks), then mapping the resulting figures.

The capacity to manipulate data before mapping is one of the system's strongest features. This analytical capability enables the user to provide ready answers to highly specific questions. For example, subtle changes in offence patterns in response to specific crime prevention initiatives can be looked for by monitoring changes in the proportion of breaks which have homes as targets, the proportion of housebreaks occurring during daylight hours, or the proportion of property damage offences which occur in schools.

### **Map Types Available in Crime Mapping System**

1. CDs within a Police Station Town
2. CDs within an LGA
3. CDs within an Urban Area
4. CDs within a Police Division
5. Police Districts within Non-Metro Divisions
6. LGAs within the Metro Area (as defined by ABS)
7. LGAs within the Metro Area (as defined by Police)
8. LGAs within the Non-Metro Area (ABS)
9. LGAs within the Non-Metro Area (Police)
10. Police Divisions within Metro Area (Police)
11. Police Divisions within Non-Metro Area (Police)
12. Police Districts within Non-Metro Area (Police)

Each crime or census data item or derived statistic can be mapped into any one of these twelve map types. The map type selected depends entirely on the type of comparison which is required, since comparison between geographical areas within a map is the greatest strength of this mode of representation.

The maps which are most relevant as planning and monitoring tools for crime prevention programs generally show crime and demographic patterns at the greatest level of detail, by CD within a single LGA (map type 2), Police Division (map type 4) or major country town (map type 1), although comparisons across larger areas may suit specific purposes. These maps will be used by the Together Against Crime committees set up by the Attorney-General's Department to inform local communities about crime and social conditions in their area, to monitor and evaluate the Neighbourhood Watch and Rural Watch programs coordinated by police, and to identify crime 'hot spots' for the new Problem Oriented Policing (POP) strategy soon to be fully-implemented by the South Australia Police Department.

### **Suggestions for Establishing Similar Systems**

The use of ABS census collector districts in recording crime, establishing police boundaries, and implementing Neighbourhood Watch and Rural Watch programs in South Australia has been a major factor in facilitating the development of the CMS (in that the ABS CDATA-SUPERMAP system is CD-driven). Of course, geographical coordinates for the areas to be mapped could be derived means other than the CD, such as digitisation, but if these areas are not CD-based then census information will not be able to be fully-utilised by the system.

Several off-the-shelf mapping packages are available in Australia. These did not meet the South Australia Police Department needs for a completely menu-driven, customised package which could also perform complex manipulations of large quantities of data. These off-the-shelf packages, however, may be a cheaper alternative to in-house system development, if they meet an organisation's needs.

The most helpful suggestion which can be made is the offer to demonstrate the South Australia Police Department's Crime Mapping System to organisations interested in developing a similar system. It may be that much of the CMS is not suitable to another organisation, but knowing what is not needed by your organisation is often the most valuable information of all.