

Issue Brief

Application of Mapping to Psychiatric Services

Geographic Information System (GIS) is a tool that originated within health agencies for tracking disease outbreaks. An application that produces maps based on analyzed data, GIS enhances an agency's ability to identify and serve distressed areas. Its use has since been expanded to assist in the geographical planning of service delivery. Psychiatric service providers and researchers should consider GIS as a potential tool in enhancing current services.

Development of GIS

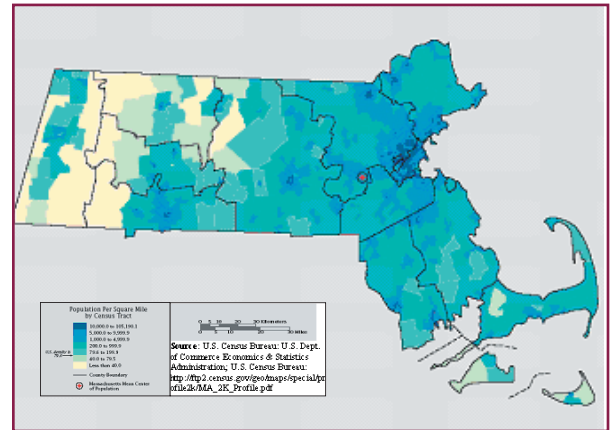
A London physician, Dr. John Snow (1813-1858),¹ pioneered epidemiological mapping. He created the first "pin-point" map to support his theory that the transmission of cholera occurred through contaminated water. It displayed London neighborhoods and plotted the locations of cholera deaths with pins. A large proportion of deaths occurred in the Broad Street neighborhood within the vicinity of a shallow water pump whose source was a contaminated water table. Based on the results of his maps, Dr. Snow successfully petitioned the authorities to move the water pump, after which the number of deaths due to cholera dramatically decreased. Today the computerized version of this process is called GIS.

Applications of GIS

GIS data can be displayed in many formats. "Hot Spot" analysis is a map commonly used among public safety departments. This technique displays areas that have high concentrations of an activity, usually criminal. This map (Figure 1) is a combination of density or rate analysis and

Kristen Roy Bujnowski, M.A. color gradient display. Other types of maps include interactive time-series maps and hazard models (see Box 1).

Figure 1. Example of a Color Gradient Map



A substantial body of criminologic theory and research focuses on the criminogenic role of social environment.² This "ecological" perspective melds a set of explanatory frameworks that emphasize different aspects of individuals' social environment, economic circumstances, their resulting social networks, daily routines and activities. Applying these criminologic perspectives to patterns of offending among persons with mental illness offers much promise as a basis for social science research. Because of its focus on the relationship of place and daily routine to risk of arrest, research

Box 1. Web Links

Example of Time Series Mapping:

http://www.consrv.ca.gov/DLRP/fmmp/time_series_img/
California Land Resource Protection: Farmland Mapping and Protection Services. A series of maps displaying urbanization from 1980 to 2000.

Example of Hazard Modeling:

<http://www.pdc.org/atlas/html/atlas-init.jsp>
Pacific Disaster Center: Asia Pacific Natural Hazards and Vulnerabilities Atlas. Provides examples of how the Atlas can assess earthquakes and tropical storm risks in Southeast Asia.



building on this perspective can generate data useful to residential program planners, case managers, and others involved with sustaining persons with mental illness in the community.

Reintegration Planning

The Statistical Analysis Center (SAC) teamed up with the Delaware Criminal Justice Council's Executive Committee in 1996 to follow the reintegration of newly released inmates. The purpose was to determine how physically accessible rehabilitative services were to parolees based on their respective addresses and available transportation.

Out of those individuals tracked within one year, over half of the parolees were reincarcerated. This prompted the discussion between Delaware officials about whether the lack of rehabilitative services in rural areas was a factor.

The SAC used GIS to examine the problem and found that individuals residing in the northern (or urbanized) part of the state had better access to services both in terms of more services being available as well as being accessible through public transportation relative to parolees in the southern, rural area. As a consequence of

this, parolees in the north were less likely to be reincarcerated. The evidence produced from these maps helped inform planning efforts for the Kent County "Level IV" Community Drug Rehabilitative Program.³

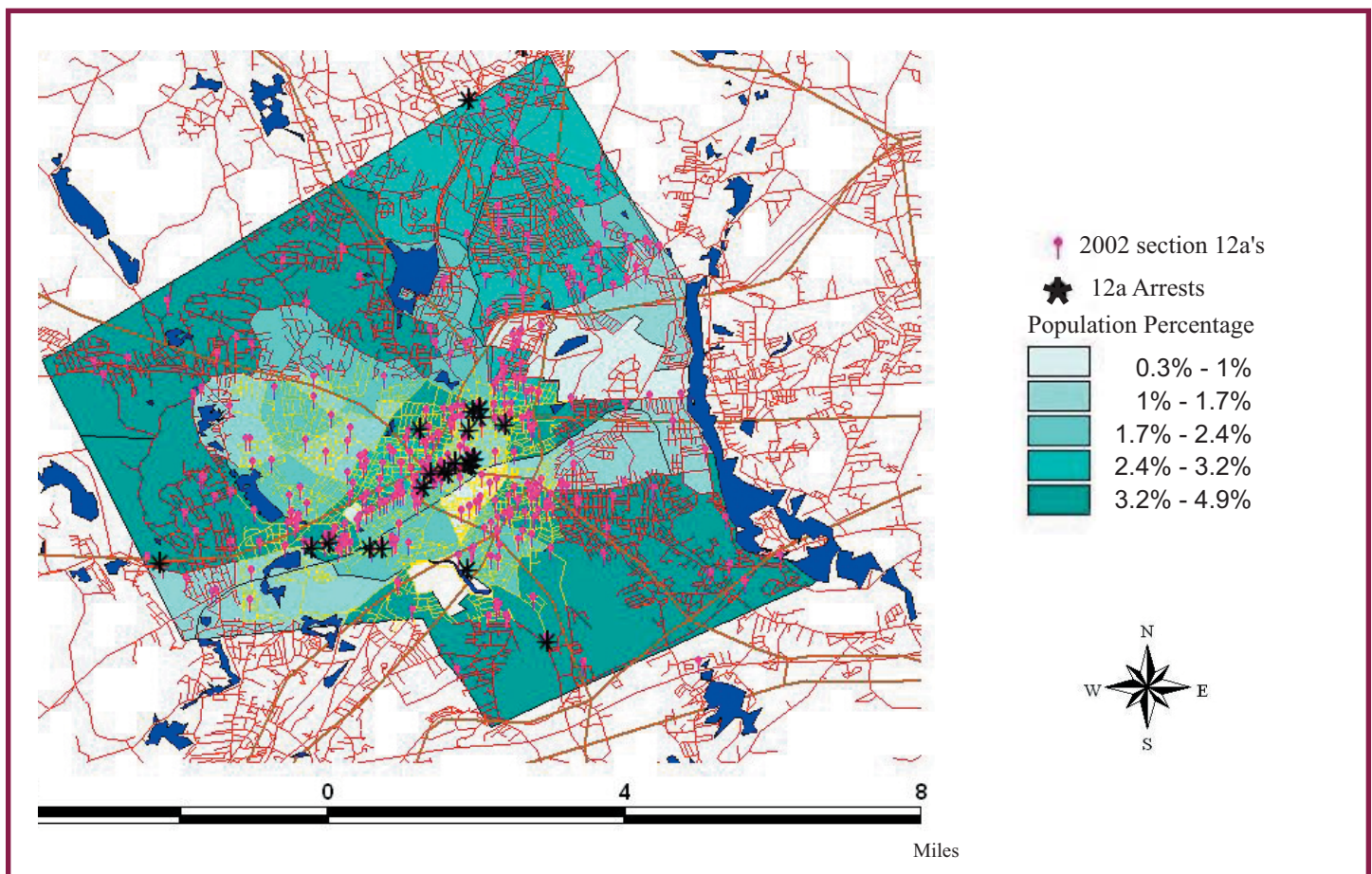
CMHSR Research

Studies of criminality in the general population found that neighborhood characteristics associated with poverty correlated with increased rates of arrest. The CMHSR used GIS to examine arrest patterns among persons with severe mental illness.⁴ The CMHSR obtained the following data from the Worcester Police Crime Statistics Unit:

1. The street locations of all incidents involving persons involuntarily transported by police for psychiatric evaluation (Massachusetts General Law- Chapter 123§12a) and
2. The addresses of any concurrent arrests of those persons during the same year (Figure 2).

All incident addresses were assigned to one of 41 census tracts, and then the corresponding characteristics from the 2000 U.S. Census were reduced using a principal components analysis. This yielded two principal

Figure 2. Crowding and Involuntary Commitment (section 12a's)



components: “Crowding” and “Poverty.” Scores correlated with number of arrests in each census tract: the higher the poverty the greater the number of arrests. These findings suggest that criminological offending among persons with mental illness can be effectively studied using the technique of GIS.

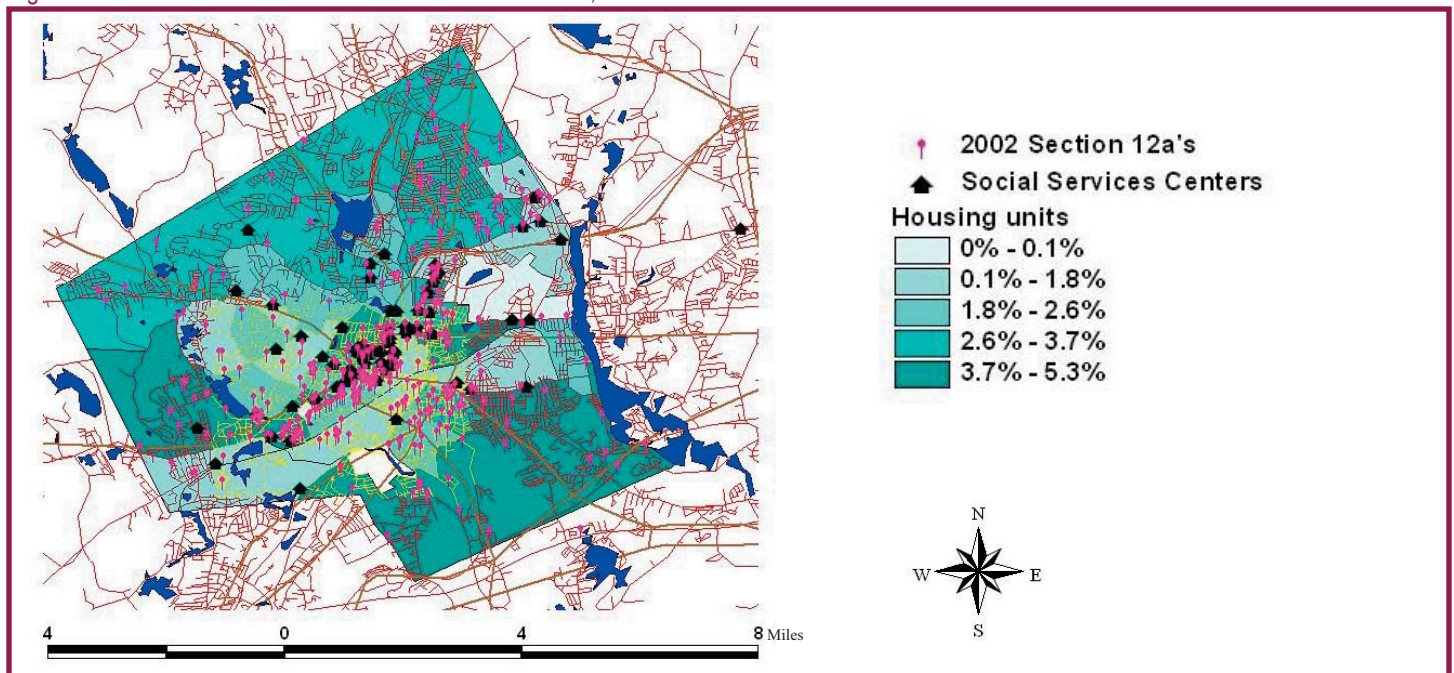
Recommendations for Researchers and Service Providers

Incorporating GIS into future studies could provide a physical representation of the locations of social service agencies in relation to patients' homes, which in turn can be used to demonstrate to policy planners the allocation of resources within their community.

GIS can be used for community planning programs (see figure 3 for example) that seek to maintain clients in their home instead of care facilities or used during the hospital discharge process. The neighborhood environment of the client can be incorporated into the development of safety plans by plotting a patient's residence and entering into the program census and crime data, addresses of pharmacies, liquor stores, or other significant risk and protective factors.

In addition, transportation issues could be addressed with GIS. Client residences can be mapped relative to treatment providers, to display convenient public transportation routes, or to flag the need for transportation planning for persons living in rural areas.

Figure 3. Section 12a's & Social Service Centers. Worcester, MA



References

1. Snow, J. (1855). On the Mode of Communication of Cholera. London: John Churchill, New Burlington Street
2. Silver, E., Mulvey, E.P., & Swanson, J.W. (2002). Neighborhood structural characteristics and mental disorder: Faris and Dunham revisited. *Social Science & Medicine*. Vol 55, 1457-1470.
3. Harris J., Huenke, C., & O'Connell J.P. (1998) Using Mapping to Increase Released Offenders' Access to Services. In Nancy LaVigne & Julie Wartell (Eds.), *Crime Mapping Case Studies: Successes in the Field* (pp. 61-50). Washington, DC: Police Executive Research Forum.
4. Roy-Bujnowski, K. (2003, November). The Application of Social Disorganization Theory to Police Encounters with Persons Perceived to have a Mental Illness. Paper presented at the meeting of the American Society of Criminology, Denver, CO.

Additional Resources

GIS Software

ESRI-ArcView <http://store.esri.com/esri/index.cfm>

Microsoft MapPoint <http://www.microsoft.com/map-point/default.mspx>

MapInfo <http://www.mapinfo.com/>

Geographic Boundaries & Data sources

Census 2000 data & map tools:

<http://www.census.gov/main/www/access.html>

Geographic Network

<http://www.geographynetwork.com/>

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