

EXPLORATORY ANALYSIS OF THE HOMELESS SHELTER SYSTEM IN COLUMBUS, OHIO

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ABSTRACT. A geographic information system (GIS)-based framework is structured to analyse the spatial characteristics and patterns associated with a system of homeless shelters and services. Given the lack of detailed spatial information available to decision-makers and shelter operators, the siting of new shelters and services is often carried out with little supporting information. The shelter system in Columbus, Ohio is investigated. Personal interviews with shelter providers and local decision-makers offers a look at their collective understanding of the services needed by Columbus' homeless population and the spatial patterns and socio-economic characteristics that define the neighbourhoods in which shelters are located. The use of GIS facilitates an exploratory data analysis that allows these understandings to be examined, affording planners and decision-makers the opportunity to move beyond perceptions of the system. Findings indicate that while many perceptions are supported empirically, there are perceptions that are not substantiated. This research provides a basis for the evaluation of important social services in an urban area where perception influences planning and decision-making.

Key words: homelessness, ESDA, GIS

Introduction

Homelessness is an issue that impacts upon societies around the world. In turn, cities throughout North America and Europe provide a wide range of shelters and services to those who are homeless. By exploring a variety of inherently spatial questions associated with a homeless shelter system, one can generate an improved understanding of the characteristics that define a city's shelter system as well as the ways in which various spatial patterns influence policies shaping the provision of services to the homeless population. For example, where are the prior residences of people who become homeless within a city? Where are employment opportunities concentrated? How is affordable housing distributed throughout a city, and where are homeless shelters located? These are important questions of concern to planners and policy-makers who manage homeless shelters and provide services to the homeless. Unfortunately,

this information is not readily available to shelter providers and decision-makers.

In general, previous homeless research has not examined such complex and inherently spatial questions, yet these questions are important to shelter operators and decision-makers. Sociologists, demographers and geographers have long contributed to our understanding of the political, social and economic processes that lead to individuals and families becoming homeless in the context of North America (Hoch, Rossi, 1989; Glasser and Bridgman, 1999). For example, deinstitutionalization, urban revanchism and NIMBYism are all entwined in discussions concerning the spatial patterns of homelessness and the distribution of homeless shelters within a particular city (Wolch and Dear, 1987, 1993). Rollinson (1998) examined the relationship and distribution of several homeless shelters in Kansas City; however, this analysis captured only a small portion of the city's shelters and did not explore the socio-economic characteristics of the areas surrounding these shelters. Laws (1992) developed a framework to analyse shelter networks that effectively explored the convoluted relationship between the perceptions of shelter provision by shelter operators, local policy-makers and the homeless, and the actual distribution or provision of emergency shelters and homeless services. Existing homeless research has added considerably to the broader understanding of homelessness, and has clearly identified a connection between the local political, social and economic context of a city and the distribution and form of services provided to the homeless. However, this research remains overly descriptive and does not address inherently spatial questions such as how are shelters distributed in relation to employment opportunities, have recent efforts to evenly distribute homeless shelters and housing services been successfully implemented, or where are suitable locations for new homeless shelters? Planners and decision-makers need supportive, quantitative information that explores a

variety of complex spatial patterns and relationships associated with a system of homeless shelters in order to reduce the level of uncertainty under which they currently operate.

A geographic information systems (GIS)-based analysis is ideally suited for examining the types of specifically spatial questions of interest to homeless shelter operators and decision-makers who impact upon the development of the shelter system within a particular community. GIS facilitates exploratory spatial data analysis (ESDA), allowing researchers to perform spatial queries of multiple data layers, providing useful information regarding the distributions, patterns and relationships that exist between different types of spatial phenomena, such as socio-economic and housing characteristics, that are unevenly distributed throughout cities (DeMers, 2000; Clarke, 2003). GIS-based analysis is also unique in that it provides visual output in the form of maps and figures making it broadly accessible (Clarke, 2003). Such analytical capabilities enable perceptions to be examined or explored. This is important when considering the location and development of new homeless shelters and public policies towards the homeless. Such decision-making is often influenced by how shelter operators and government offices perceive or understand spatially based questions regarding the current distribution of homeless shelters, the distribution of people at risk of becoming homeless, and the spatial components that make for a 'successful' shelter (Laws, 1992; Bailey, 2001; Pyle, 2002).

This paper details an approach that may be used to examine spatial patterns and relationships by shelter operators and local decision-makers. It begins with a synopsis of past homeless research, suggesting the need for research capable of addressing location-based questions relevant to shelter operation. In addition, details associated with the political and economic context of Columbus' shelter system are provided. Personal interviews, conducted with shelter operators and decision makers are summarized, providing a look at how they perceive and understand shelter provision, the distribution of shelters throughout the city, and the socio-economic traits that define the neighbourhoods in which they are located. Exploratory spatial data analysis concepts and techniques are then introduced since they offer a useful way to examine spatial questions associated with a city's homeless shelter system. The results of the empirical analyses are presented, followed by a discussion and conclusions.

Background

The primary goal of most homeless research is to develop an understanding of who the homeless are and the processes that contribute to people becoming homeless. At the most basic level, the homeless are defined as people living without a permanent residence (Rossi *et al.*, 1987; Shlay and Rossi, 1992; Glasser and Bridgeman, 1999). More broadly, Glasser and Bridgeman, (1999) identify two schools of thought associated with the causes of homelessness. First, they identify the *personal pathology school*, which emphasizes immediate factors that may cause an individual to become homeless, such as drug addiction, having a mental illness, experiencing a domestic problem, or an unexpected loss of employment. The second school is identified is the *structural school*, which concentrates on the larger, external factors that contribute to homelessness. Typically, the lack of affordable housing and limited accessibility to meaningful employment opportunities are common themes within this literature. In addition, the processes of deindustrialization and deinstitutionalization are often described as impacting upon the size of the homeless population, its demographic characteristics, and the distribution of shelters and services (Dear and Wolch, 1987; Glasser and Bridgeman, 1999).

The distinction between the personal pathology and structural schools is based mainly on 'who' is at fault for homelessness. Over time, the emphasis placed on these two schools has shifted, following larger changes in social, political and economic processes. Subsequently, urban policies towards the homeless also reflect these changes. For example, the development of anti-homeless laws is often viewed in relation to the demise of the welfare state and the development of neo-liberal political ideologies whereby cities compete for limited financial resources (Harvey, 1989; Hertz, 1994; Stoker, 1996; DeVerteuil, 2003).

Another important component of homeless research, and social science research in general, is the role of the neighbourhood (Wilson, 1987; Krivo and Peterson, 1996). In most Western cities, homeless shelters have historically been placed in targeted neighbourhoods, such as the skid rows and transitional areas located immediately outside the downtown (Dear and Wolch, 1987). At the same time, public concern over the concentration of shelters and homeless services is often voiced at the neighbourhood level (Bailey, 2001; Holwager and

Levin, 2003). Shelter operators and public decision-makers tend to work at the neighbourhood scale because their outreach programmes involve discussing their goals and plans with neighbourhood organizations. Thus, research aimed at developing an improved understanding of a city's homeless shelter system should examine the characteristics of the neighbourhoods in which shelters are concentrated.

While previous homeless research has explored neighbourhood characteristics, it remains a difficult task. Some neighbourhoods have well-defined and publicly recognized boundaries, but many are often socially defined by a set of formal and informal institutions such as libraries, public parks, schools and other landmarks (Krivo and Peterson, 1996; Hoholik, 2003). At the same time, socio-economic data that provide information regarding these neighbourhoods are rarely gathered at the neighbourhood scale. US census data, for example, comprises information that is aggregated at varying spatial scales that may or may not match conceived neighbourhood boundaries (Myers, 1992). The majority of research performed on neighbourhoods often relies on census geographies to define utilized neighbourhoods because it is the only scale at which meaningful socio-economic data are available (Wilson, 1987; Krivo and Peterson, 1996; Holloway, 1998). In turn a great deal of homeless research is only able to provide summaries of socio-economic data at the scale of the census tract. Shelter operators and decision-makers need detailed spatial analysis in their planning, yet it is difficult at best to assess locational impacts associated with homeless shelters at the coarse spatial scale of the census tract.

Given limited resources, homeless shelter operators and local governments face a challenging task in examining spatially based questions, such as where are homeless shelters located throughout the city, how are they located in relation to other homeless services, where are the prior residences of the homeless before they experience homelessness? As a result, decision-making and planning is often based on the perceptions and understandings shelter operators have developed over years of working with homelessness in a particular city. While this is not problematic in itself, care must be taken to ensure that such perceptions are accurate. Geographers typically view perception broadly as the way in which an individual remembers something, or how they construct an image of a place or object in their mind (Golledge and Stimson, 1997). This un-

derstanding of perception is derived from psychological research that explores the nuances of perception, and views it as a function of cognition (Lynch, 1960). Clearly, different people use their senses differently, causing them to develop varying perceptions of the same place or object. Further, individuals are generally exposed to a massive amount of environmental stimuli at any given time. As such, perception is also understood as incomplete in that people are unable to process all of the sensory information they are exposed to (Lynch, 1960; Golledge and Stimson, 1997). In turn, shelter operators and decision-makers develop their own images and understandings of their shelter system based on their involvement in the system.

Of importance here is that the homeless literature has tended to focus on how and why homelessness exists in societies by investigating the social and economic characteristics of the homeless as well as structural impacts on this population. Planners and decision-makers, however, must also be focused on improving access to homeless services if strides are to be made in transitioning individuals back into mainstream society (Scioto Peninsula Relocation Task Force, 1998; Community Shelter Board, 2001a; DeVerteuil, 2003). Such accessibility issues are largely a function of spatial arrangement and must be examined at a fine scale. Given that large amounts of public and private funds are distributed throughout homeless shelter systems and the role of decision-makers in locating and siting new shelters and services, it is essential that they have access to as much information as possible regarding the spatial characteristics of their shelter system so that informed decisions are made.

Study region

Columbus, Ohio was examined because it is a growing urban region and it has a relatively well-developed shelter system. Columbus is located in Franklin County and has a population of 711 470. Including neighbouring towns and suburbs, the metropolitan population is 1 068 978 (US Census Bureau, 2000). In 1986 a coalition comprising of private citizens, Franklin County government, non-profit social service providers and faith-based organizations oversaw the development of the Community Shelter Board (CSB). The primary mission of the CSB is to coordinate collaborative planning with partner agencies, (i.e. other homeless service providers and funding agencies) in order to manage

and develop Columbus' homeless shelter system (CSB, 1998). Perhaps the CSB's most significant role is managing the distribution of federal, state, local and private funds to shelters and programmes throughout Columbus' homeless service system. This structure is intended to allow individual shelters and service providers to concentrate on running their facilities instead of competing with each other for limited funds.

Within the shelter system, there is a distinction made between two types of shelters, emergency and transitional, which allow varying lengths of stay and offer specialized services to different subgroups of the homeless population. More specifically, emergency shelters offer short-term lodging for people who have experienced a housing crisis, while transitional shelters and supportive housing provide a stable housing environment and tend to offer a larger set of social and economic services to clients (CSB, 2001a). Although there is this distinction, several shelters offer both types of programmes, often within the same facility. The CSB is also in charge of two broad programmes that aim to change the present configuration of Columbus' homeless shelter system.

The shelter system that the CSB oversees is directly managed by fifteen different organizations, ranging from faith-based groups, such as Lutheran Social Services (LSS), Catholic Social Services (CSS), Volunteers of America (VOA) and the Young Men's Christian Association (YMCA), to secular groups, such as The Open Shelter, Friends of the Homeless and the Homeless Families Foundation. These organizations operate a total of twenty emergency shelters (1 137 beds) and forty-nine transitional shelters with 607 units (1 281 beds) (CSB, 2001b). According to the CSB's Homeless Management Information System (CSB, 2001c), 7 513 different individuals used these shelter services at least once in 2000. Single adult males made up over half of this population (51%), followed by men, women and children in homeless families (36%), and finally single adult females comprise the remaining population (13%). These population characteristics are similar to observed national averages (Rossi *et al.*, 1987; Glasser and Bridgman, 1999).

In order to gain a sense of prevailing perceptions of Columbus' shelter system, personal interviews were conducted with two CSB staff members as well as seven individuals representing the fifteen organizations providing shelter and services to the homeless. These seven organizations control twenty-

five different emergency shelters and 169 transitional housing units. It should also be noted that the first author worked alongside the CSB over a six-month period. Working with the CSB provided insight into their roles and objectives. Given the exploratory nature of this research, interviews focused mainly on creating an open dialogue with each individual in order to allow their perceptions to come out in conversation. Formal questionnaires were not used; instead the general concepts and ideas behind this research were presented to each individual in the hopes of simply starting a dialogue regarding the social, physical and political characteristics that define the shelter system. Douglas (1985) describes the use of similar techniques as 'creative interviewing.'

Discussions with shelter operators typically began with a more generic or technical conversation regarding the structure and role each shelter plays within the system. After several interviews, it was apparent that different shelters offer specialized services to match the needs of homeless individuals with specific problems. As a result, many of the shelters will refer clients to other shelters and service providers that are better suited for them. This interaction among shelters helps to increase their knowledge of the shelter system as a whole. However, this understanding is based largely on the provision of services. Consequently, each shelter is not typically concerned with neighbourhood issues other shelters may be dealing with, as they must focus on their own. Given this, it should be no surprise that neither the CSB nor shelter providers could identify all of the shelters distributed throughout Columbus.

Following these service-based questions, shelter operators often detailed specific barriers preventing their clients from regaining their financial and housing independence. In addition, issues impacting upon the ability of shelters to create new services were also noted. For example, the public transportation system was often cited as being inefficient as well as not providing access to jobs at the cities' periphery. As a result, employment opportunities available to the homeless are viewed as severely limited. In addition to having little access to employment, access to affordable housing is also said to be scarce. This understanding is thought to be a major reason for the increased average length of stay for homeless individuals and families over the past three years (CSB, 2001c).

More specific questions regarding the conditions of the neighbourhoods surrounding each shel-

ter often came up through the course of conversation. In general, all shelter operators agreed that their shelters were located in areas characterized by predominantly minority populations, with low incomes. The term 'declining' was also used by several operators, referring more broadly to the view that shelter neighbourhoods were experiencing some level of outward migration and general economic decline. Educational attainment was believed to be fairly low among the residents of shelter neighbourhoods. In addition, shelter operators often described a lack of safe and affordable housing. In summarizing these characteristics, several operators discussed the communities within their surrounding neighbourhoods as being 'powerless'. That is, there exists a belief in local neighbourhoods that residents are unable to impact upon the location of new shelters.

In general, members of the CSB held similar views and understandings of the neighbourhood characteristics of emergency shelter locations. Many of the same terms were used to describe these neighbourhoods, such as low income levels, low-education levels, low quality housing, and a high proportion of minority populations. Another major concern for the CSB is improving the accessibility of shelters to public transportation and employment centres. However, there are some interesting differences of perception between the CSB and shelter operators regarding the 'power' of these surrounding neighbourhoods. From the CSB's standpoint, many of these neighbourhoods do have power since a number of them have developed community groups whose main concern is monitoring existing homeless shelters within their neighbourhoods.

After discussing similar issues concerning the relationship between shelters and their surrounding neighbourhoods, and trying to understand where the CSB fits into this relationship, one also gains the sense that the development of new shelters is rarely challenged. The CSB attributes this to broad public support, and a recognized need for homeless services more generally. This is not to say that opposition to the development of new shelters does not exist; it simply describes the feelings of the CSB that in many cases they are working with the best interests of the public and homeless in mind and are locating new shelters in acceptable locations. Further, the shelter board has developed a set of basic criteria that they use to guide their site selection. Most of these guidelines revolve around finding the proper type of building that can be rea-

sonably converted into a shelter of some sort. In addition, in order to receive funding, shelters must have 'Good Neighbour Agreement' to also assure local residents and businesses that the shelter will maintain a clean appearance and will not allow loitering outside of the premises (CSB, 1998, 2001a). There is also clearly an effort made to disperse new locations throughout the city, rather than concentrating them in particular neighbourhoods.

To this point it is evident that perceptions exist and influence how the shelter system evolves. We would now like to explore the extent to which these perceptions actually reflect observed conditions.

Exploratory analysis

Exploratory spatial data analysis (ESDA) involves the use of a variety of quantitative methods, including GIS, to help identify patterns and relationships in spatial information (Anselin and Bao, 1997; O'Sullivan and Unwin, 2003). For example, Murray *et al.* (2001) use GIS-based approaches to examine and explain patterns of urban crime. By visualizing spatial information in different ways and exploring relationships between different data layers, such as crime, census information, and service access, Murray *et al.* (2001) identify important underlying processes. Proximity analysis, such as determining the maximum distance a homeless shelter is from a transit stop, is another approach widely used in ESDA to investigate information (Murray *et al.* 2001; O'Sullivan and Unwin, 2003). Anselin and Bao (1997), however, place more emphasis on the use of traditional and spatial statistical techniques to identify relationships between features of interest. ESDA also draws upon other research developed within statistics and knowledge discovery in databases (KDD), such as optimization techniques (Murray and Estivill-Castro, 1998).

A fundamental perspective in ESDA is that data should be approached with few assumptions and research questions do not need to be heavily structured at the onset of analysis (O'Sullivan and Unwin, 2003). Instead, one should allow the patterns and relationships within the data to present themselves. This is counter to confirmatory hypothesis testing typical of statistical analysis. By allowing people to interact with spatial data in a variety of ways, ESDA provides an opportunity for understanding a broad range of spatial issues associated with the object of study as opposed to performing a specific statistical test that examines one particu-



Fig. 1. Homeless shelter distribution in Columbus.



Fig. 2. Homeless shelter capacity.

lar hypothesis. Given the inherent assumption of ESDA that little is known about the particular phenomenon of interest, testing a predetermined hypothesis is not particularly reasonable.

A benefit of a GIS-based approach is that it is possible to take advantage of spatial information produced at multiple scales for examining spatial patterns and relationships (Clarke, 2003). This is

important, particularly for homeless research, as neighbourhoods are nebulous at best with a wide range of interpretations, shaped largely by the scale of the data being used as well as the questions or relationships one wishes to explore. For example, parcel data can be acquired that contain detailed information regarding individual pieces of land in a region. How one defines a neighbourhood

using these data may be fundamentally different compared to how one defines a neighbourhood using census data because the spatial scale of the data is different. Of course, when making comparisons between different neighbourhoods, it is important to define them similarly (i.e. similar size and/or shape) in order to minimize the impact of spatial variability. That is, if one were to measure and compare the employment opportunities surrounding a pair of locations, as will be done below, it would not make sense to use different sized neighbourhoods. The potential differences in size and shape between these neighbourhoods could have a major impact on associated attribute characteristics of neighbourhoods (Openshaw and Taylor, 1981; Monmonier, 1996; Longley *et al.*, 1998). Further, there could be modifiable areal unit problem (MAUP) complications (see Longley *et al.*, 2001) if there is not a rational and consistent interpretation of neighbourhoods. Essentially, how one defines boundaries, scale and unit size may have a significant impact on analytical results. The ability to examine the impact of neighbourhood size and shape enables one to be more confident in the analysis with respect to the notion of a neighbourhood.

ESDA has increasingly gained recognition as its own subfield within spatial analysis (Murray and Estivill-Castro, 1998). Researchers performing ESDA combine a variety of techniques because each offers a unique way to identify patterns and relationships that exist within multiple layers of spatial information. The analysis performed in this paper uses GIS to help visualize spatial data by generating maps that combine spatial data layers across different scales. At the same time, proximity analysis is used to summarize socio-economic characteristics of homeless shelter neighbourhoods. Finally, parametric and non-parametric statistical tests are applied to evaluate how these neighbourhoods are related to typical neighbourhoods in the study region.

Shelter system analysis

The first component of this research involved spatially referencing homeless shelter locations within Franklin County using a GIS (ArcView). The Community Shelter Board provided a complete list of emergency shelters and supportive housing projects containing eight or more units. Subsequently, this list was used to help develop the first comprehensive map of homeless shelters within

Columbus and Franklin County. Figure 1 presents both the emergency and supportive housing units, with the outer-belt (I-270) and major crossroads (High Street and Broad Street) overlaid to provide reference. At first glance it appears that the majority of the shelters are located in an east-west pattern near the center of the city, along Broad Street. More detailed inspection, however, suggests different patterns for emergency and/or transitional shelters. In general, the transitional shelters appear to be more dispersed in areas further away from downtown, whereas emergency shelters tend to concentrate in areas closer to downtown. One aspect not depicted in Fig. 1 is the size of each shelter or the number of people they can house on a given night. Figure 2 shows the number of beds or units, with larger symbols corresponding to greater shelter capacity. This allows for a more subtle understanding of the distribution of homeless services to individuals and families. As such, even though more transitional shelters appear to be located further from downtown, the majority of the transitional and supportive housing supply is actually concentrated within downtown.

Just as one is able to explore individual data associated with each shelter, GIS allows multiple layers to be overlaid together. For example, beyond simply adding roads to help familiarize one with an area, other forms of data may be used. Figure 3 displays the location of housing units subsidized through the Federal Section 8 programme, thereby allowing one to assess the relationship between subsidized housing and shelter locations. Figure 4 presents the Zip code of last residence for all homeless individuals and families from Franklin County who entered the system during the 2001 fiscal year. Thus it is possible to get a sense of where homeless people come from within Franklin County. Associated analysis suggests that higher proportions of homeless *individuals* lived in more centrally defined areas, while high proportions of *families* came from further outside the city's core.

The next component of analysis focuses on developing an improved understanding of the socio-economic and demographic characteristics of homeless shelter neighbourhoods. Spatial queries were performed for shelter locations as well as randomly selected locations using census data (US Census Bureau, 2000), parcel data (Franklin County Auditor, 2000) and employment information (MORPC, 1998). The intent is to assess whether there are differences between the neighbour-

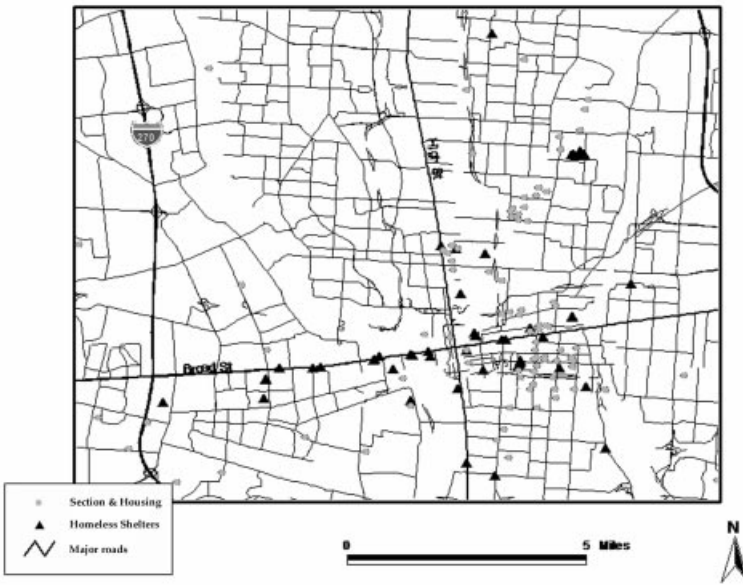


Fig. 3. Homeless shelters and subsidized housing units.

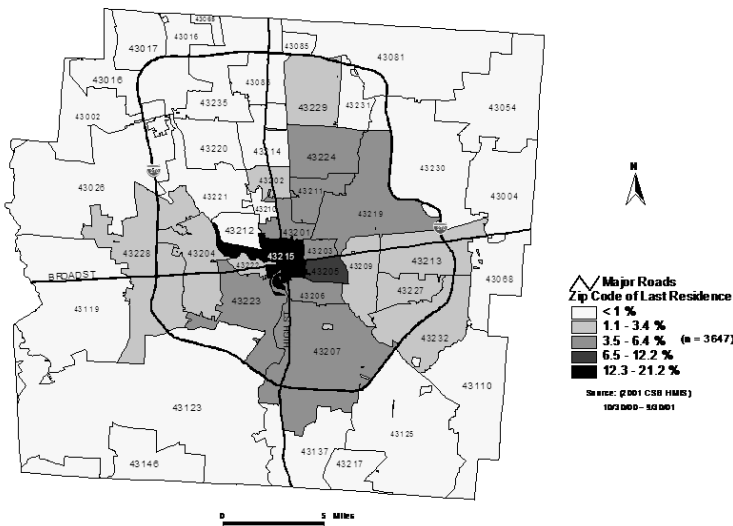


Fig. 4. Zip code of last residence for homeless individuals who entered system between October 2000 and November 2001.

hoods surrounding homeless shelters and ‘typical’ neighbourhoods. This is essential for examining shelter operator perceptions and views. Considering the range of spatial information available in this analysis, two different neighbourhood definitions are used to derive an accurate characterization of areas. One approach borrows from the classic social science approach relying on census block group boundaries (Wilson, 1987; Krivo and Peterson, 1996; Holloway, 1998). While this is conven-

ient, block groups vary in size and shape, so there is a need to define neighbourhoods differently if possible in order to make valid comparisons (Monmonier, 1996).

A second approach for defining neighbourhoods is to rely on the spatial query capabilities of GIS, by using a radial buffer of size α around a point of interest. This buffer is then used to summarize parcel and employment information. For example, an $\alpha = 800$ -metre area is shown in Fig. 5. A major benefit

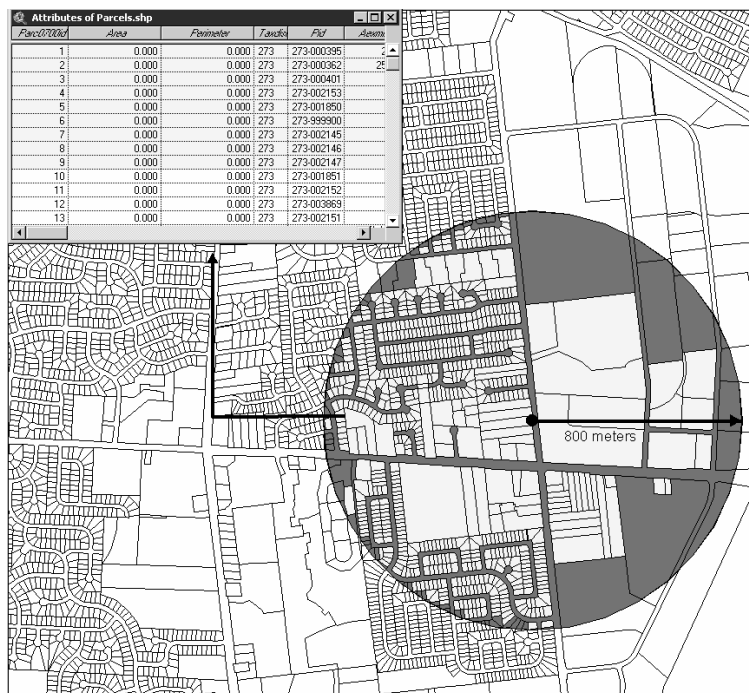


Fig. 5. 800 metre buffer neighbourhood and associated attribute information.

of this approach is consistency in size and shape. Further, the specification of α can be controlled according to intent and purpose. In this work $\alpha = 800$ meters is used since it is a common standard within accessibility research (Levinson, 1992; Levinson and Jurasin, 1999; Anderson, 1999). It is worth mentioning also that we do provide an assessment of alternative neighbourhood sizes by varying α . Random locations for comparison to shelter neighbourhoods were identified using ArcView. Random locations allow for a controlled assessment of distributional variation. Because spatial querying techniques were used to summarize neighbourhood characteristics, obtained attributes do not compare to county averages, as expected. As an example, the number of jobs found within an 800-metre buffer will vary for any point depending on its relative location.

Table 1a presents selected neighbourhood attributes for shelter locations as well as a sample of 150 randomly located neighbourhoods, generated using the buffering techniques. These summary statistics highlight the similarities and differences between the shelter neighbourhoods and typical neighbourhoods found throughout

Columbus. Specifically, the mean number of employment centres surrounding each shelter (358.9) is much greater in comparison to typical locations (77.1). In addition, the mean appraised total value of individual parcels in typical neighbourhoods (\$254 457) was much higher compared to the shelter neighbourhoods (\$198 353). This suggests that homeless shelters are concentrated in areas with high levels of employment activity and low land and housing values. Finally, land use patterns surrounding homeless shelters are characterized by heavy concentrations of commercial land use, as 22% of the parcels in these neighbourhoods are commercial versus 8% in typical neighbourhoods. Summary information derived from the census block group neighbourhoods is presented in Table 1b. On average about 950 people live in the neighbourhoods surrounding homeless shelters, while almost 1600 people live in typical neighbourhoods. The average number of households and families surrounding homeless shelters (183) is also significantly less than typical neighbourhoods (404). These neighbourhoods also appear to be dramatically different in terms of the qual-

Table 1. Comparison of characteristics of shelter and typical neighbourhoods.

<i>Buffer derived variables:</i>	Shelter neighbourhoods	Typical neighbourhoods
Number of employment centers	359	77
Appraised total parcel value	\$254 457	\$198 353
Percent commercial land use	22%	8%
Appraised total parcel value\$254 457	\$198 353	
Percent commercial land use	22%	8%
<i>Census derived variables:</i>		
Population	950	1600
Number of family households	183	404
Median housing value	\$82 680	\$120 608
Median household income	\$25 485	\$50 064
% non-white population	51%	22%

ity of their housing stock, since the average median housing value for typical neighbourhoods (\$120 608) and median household incomes (\$50 064) are much higher in comparison to shelter neighbourhoods (\$82 680 and \$25 485 respectively). Further, homeless shelters appear to be located in areas of the city with the highest concentration of minority populations, as 51% of the populations in these neighbourhoods are non-white compared to an average of 22% for other neighbourhoods. In general, nearly all of the thirty-six variables included in the analysis are differentially distributed between each sample. Specifically, a t-test, Wilcoxon Rank Sum-W and Mann-Whitney U tests were used to test whether or not the shelter neighbourhoods were significantly different from the typical neighbourhoods.¹ In fact, the t-test's 95% confidence interval indicates that the levels of homeowner occupied housing in shelter neighbourhoods are 24% to 38% lower than in typical neighbourhoods. These tests support earlier findings of greater homeowner occupancy levels in typical neighbourhoods compared to shelter neighbourhoods, while shelter neighbourhoods contain fewer families and lower median household incomes.

Discussion

The first step in developing an improved understanding of a homeless shelter system involved visualizing the location of every shelter within the study region. Some of the most important insights for planners and decision-makers are often obtained from this type of analysis. Due to the different roles these individuals and organizations play within the shelter system, as well as the scales at

which they operate, it is difficult for them to develop a system-wide perspective of the homeless shelter system. Understanding where existing shelters are located is vital information when managing existing shelters and siting new shelters/services, especially when considering that planners and local decision-makers are often concerned with distributing shelters evenly throughout a city. GIS allows multiple layers of spatial information to be overlaid along with the shelter locations, providing a sense of how these shelters are related to other spatial phenomena within a city. For example, when the Zip code data for past residence of the homeless are overlaid with the shelter locations, one can see areas for targeting preventive services. These types of insight are important to planners and decision-makers, and serve as supportive information and visual evidence to promote policy development.

As mentioned above, an issue addressed in the research is the potential impact of neighbourhood size when characterizing areas. To address this, additional samples containing 250 random location points were generated, where α was varied between 600 and 1000 metres. These areas were compared using the same tests described above. There were no significant differences from the previously reported findings, with the exception of the number of employment opportunities. This is an expected difference considering that as the neighbourhood size increases, the number of employment centres and employees will increase as well. It is also important to consider how and why the set of random neighbourhoods was generated. Comparing random points to a set of known locations may present comparability issues, considering that some points in the random sample may be located in less urban areas com-

pared to the shelter locations. However, by developing a large number of random locations ($n = 440$) for comparison, the impacts of distributional variation are minimized.

This analysis also used a second neighbourhood definition based on census block group geography. Using multiple neighbourhood definitions allows one to explore relationships between data layers containing different types of information at varying scales. As mentioned above, census block groups vary greatly with regard to their size and shape. Given this, one should be concerned with a common issue in spatial analysis referred to as the modifiable areal unit problem (MAUP) (Fotheringham and Wong, 1991; Longley *et al.*, 1998; Horner and Murray, 2002). As noted above, our findings are stable across varying neighbourhood definitions.

Within the exploratory framework of this research, it was important to consider the views and perceptions of the people who work within it. As such, a number of different people, working at different scales throughout the system, were interviewed in order to gain a sense of how the people who directly impact upon the system characterize and define the system. Again, it is important to see how well their perceptions of the system match the reality found, because these perceptions influence the development of the system and are largely unexplored. In general, most of the perceptions associated with homeless shelter neighbourhoods appear to match the reality presented by the analysis – they are located in low-income neighbourhoods with high proportions of minority residents, regions that have historically served as economic transition zones between the downtown and the periphery. However, the findings that commercial lands make up a larger portion of the parcels within shelter neighbourhoods, combined with the lower numbers of families who live in these neighbourhoods, are of particular importance because they conflict with one of the main perceptions held by the CSB regarding its role and interaction with the communities in which shelters are located. As mentioned above, the CSB feels that shelters are located in ways that incorporate the concerns of the local community surrounding homeless shelters and therefore they have received little public opposition. By virtue of the land use and population breakdowns of the shelter neighbourhoods, it appears that shelters are typically found in places where there are few residents to begin with. Perhaps locating shelters in these types of neighbourhood simply reduces the number of people who

may question or oppose the location of shelters in their neighbourhoods. It is difficult to discuss the degree to which this is true due to the range of factors that contribute to the overall form of the shelter system. That is, the shelter system has developed over time and no data were collected indicating the age of each shelter or the conditions of the neighbourhoods when shelters were first located in these neighbourhoods. However, this does not discount the finding that shelters are located in areas with fewer residents. In fact, it may be of greater importance simply because the CSB does not fully understand this feature of the spatial distribution of shelters.

Another important perception that seemingly would not appear to be true is that shelters are located in areas with few employment opportunities. In fact, compared with the random sample of points, shelters are located in economic ‘hot-beds’. In general, the shelter operators and CSB all described the concentrations of jobs outside the outer belt. This perception does not necessarily represent the reality found in this research. When simply plotting the point locations of employment throughout the study area, one can clearly see that more jobs are concentrated near the central city, along High Street and Broad Street. This, combined with the land use data detailed previously, suggests that shelter areas have high concentrations of job opportunities. However, these findings only deal with the raw numbers of employees and employment centres. As such, they do not provide any information regarding the types of jobs that are concentrated within these neighbourhoods, which is perhaps of greater importance. More specifically, the concentration of office buildings downtown may not represent ideal places for a homeless individual to find a job, and may actually inflate the total number of employees in these neighbourhoods. A further complication is that the employment data reflect headquarter locations, so employment opportunities may actually be more dispersed than suggested in the data.

Conclusions

Homelessness is an important social issue affecting cities around the world. Often, the provision of shelter and services to the homeless is undertaken by a loosely organized system of service providers and public officials who have a limited understanding of system-wide issues. At the same time, these people are directly involved in the system, and over

time have developed perceptions regarding the system. Given the complexity involved in understanding a shelter system, an exploratory analysis involving the use of GIS-based techniques offers a novel approach for examining the characteristics of such a system. In general, perceptions of the Columbus shelter system were supported by observed characteristics identified through spatial analysis. However, the particular finding that shelters are located in neighbourhoods with few residents casts doubt on the perceptions of planners and decision makers that shelters are located with the general support of the community. In addition, the aggregate number of employment opportunities found within shelter neighbourhoods contradicts perceptions that job opportunities are few within these areas. The development of policies and services towards the homeless often takes place with little analysis of the spatial and socio-economic conditions that define the shelter system. By exploring homeless shelter systems in a spatial manner, a more nuanced understanding of the shelter system can be reached by shelter operators and decision-makers, one that is capable of distinguishing between reality and perception.

Notes

1. See Hamilton (1992) and Berman (2002), among others, for a discussion of these tests and associated assumptions.

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