Geo-ethnography: Coupling Geographic Information Analysis Techniques with Ethnographic Methods in Urban Research

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Abstract

This research article focuses on the coupling of geographic information system (GIS) technologies with ethnographic data, an approach we refer to as *geo-ethnography.* The data used here were gathered in an ongoing, multi-site study of low-income families and their children. Throughout our work, the goals have been to think creatively about how GIS can be used in welfare research, to stretch the technology, and to revise the methodologies we currently use. We specifically discuss the ways in which the ethnographic data on families and neighbourhoods have been integrated within a GIS and how these two methods, alone and in combination, help situate families' actions and experiences in time and space and enhance data analysis and interpretation. More specifically, we focus on conceptual and methodological issues we have faced in the process of this integration and on practical strategies for combining qualitative and quantitative research.

Keywords: Geo-ethnography, low-income populations, welfare, family and neighbourhood research

Résumé

L'article porte sur l'association des technologies liées aux systèmes d'information géographique (SIG) et des données ethnographiques, une approche que les auteurs appellent *géo-ethnographie.* Les données de l'article ont été recueillies dans le cadre d'une étude multicentrique encore en cours sur les familles à faible revenu et leurs enfants. Durant l'étude, les auteurs ont tenté de trouver de nouvelles manières d'employer les SIG dans les recherches sur l'aide sociale, afin de repousser les limites de la technologie et de revoir les méthodes actuelles. Plus particulièrement, ils ont examiné les moyens par lesquels les données ethnographiques sur les familles et leur voisinage ont été intégrées dans le SIG et comment ces deux méthodes (données ethnographiques et SIG), seules ou en association, aident à situer dans le temps et l'espace les actions et les expériences des familles et améliorent l'analyse et l'interprétation des données. En outre, ils se sont concentrés sur les problèmes conceptuels et méthodologiques découverts dans le processus de cette intégration et sur les stratégies pratiques visant à combiner les données qualitatives et les données quantitatives.

Mots clés: géo-ethnographie, populations à faible revenu, aide sociale, recherche sur les familles et leur voisinage

Introduction

The effect of recent welfare reform on low-income women and children is the substantive focus of the Welfare, Children and Families Study, a complex, multi-site project (henceforth referred to as the Welfare Project). This article focuses on how geospatial data and geographic information systems (GIS) have been variously adopted in the ethnographic component of the Welfare Project. It is important to note that GIS was not part of the original design of the Welfare Project, and thus, throughout this article, we identify some of the challenges and opportunities faced in promoting GIS within multi-site ethnography and describe some of the ways we have used GIS to facilitate distance-based ethnography. Our goals for the Welfare Project have been to think creatively about how GIS can be used to study the geographies of families, to stretch the GIS technology, and to revisit and challenge important conceptual and methodological issues regarding studies of families and definitions of neighbourhood or context.

An advantage of the mapping and data visualization capabilities of a GIS is that the system can handle data collected on multiple spatial scales. Moreover, the data objects need not be restricted to numerical data, as a GIS can handle "hot links" to a variety of audio, video, image, and text files. In this way an ethnographic researcher can combine, using a geographic framework, different forms of data (narrative text, photographs, audio and video files) and data layers in previously impossible ways. In the context of our work we use GIS to explore and better understand the lives of the low-income families being studied. Our work suggests that combining GIS and ethnography, an approach we call *geo-ethnography*, has many advantages for ethnographic research on low-income families. We caution, however, that GIS and the resulting maps and/or derived new information are not enough by themselves. In the context of our study, we still need ethnographic data to understand the child and family factors, the cultural meanings of place(s), and the political and sociocultural influences on the day-to-day lives of low-income families. We still need ethnography to help us piece together how many of the contextual data sets that can be spatially joined are relevant to low-income families and low-income communities.

We begin this article with description of the Welfare Project, with an emphasis on the main ethnographic components. Next we describe the ethnographic data products generated by the Welfare Project, thereby preparing the ground for a description of how GIS was introduced to the project and the examples, appearing later in the paper, of how GIS is being used to facilitate multi-site ethnographies of families and neighbourhoods. Lastly, we reflect on practical strategies for combining qualitative and quantitative research.

An Overview of the Welfare, Children and Families Study

In 1996, the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) changed the welfare landscape in the United States. PRWORA and the accompanying state legislation have been described as the greatest single shift in social policy for low-income families since the passage of the Social Security Act of 1935; in President Clinton's words, they represented the "ending of welfare as we know it."[1] The Welfare Project is an intensive study in Boston, Chicago, and San Antonio designed to evaluate the consequences of welfare reform for the well-being of children and families and to follow these families as welfare reform evolves (see Welfare, Children and Families 2002 for additional resources).

The Welfare Project includes a focus on children and child development, includes a disability component, incorporates qualitative data from an extensive ongoing family and neighbourhood ethnography, includes both welfare recipients and non-recipients, is based in three different geographical contexts, and is longitudinal in design (see Winston and others 1999 for specific details). The project design has three main components: a survey, an embedded development study (EDS), and an ethnography (see Figure 1). All GIS activities in the Welfare Project are linked directly to the ethnography but not to the survey or EDS components.

The *survey component* includes interviews with some 2400 households with children in low-income neighbourhoods in the three selected cities. Approximately 40% of the families were receiving cash welfare payments at the time of the first interview in 1999. Each household included a child aged 0–4 or 10–14 at the time of the interview; that child and his or her primary caregiver are the focal participants. A second and third survey were completed in 2000/2001 and 2003/2004. The *embedded development study (EDS) component* incorporates the videotaping and coding of caregiver–child interactions, time-study diaries, and observations of childcare settings. The approximately 700 young children in the EDS are drawn from a subsample of families participating in the survey.

The *ethnography component*, the primary focus of the GIS activities on the project, is ongoing in 25 neighbourhoods across the three cities; the ethnography team is tracking 256 African American, Latino, and non-Hispanic white families residing in, or living in close proximity to, these neighbourhoods. The ethnography includes three main parts: family ethnography, disability ethnography, and

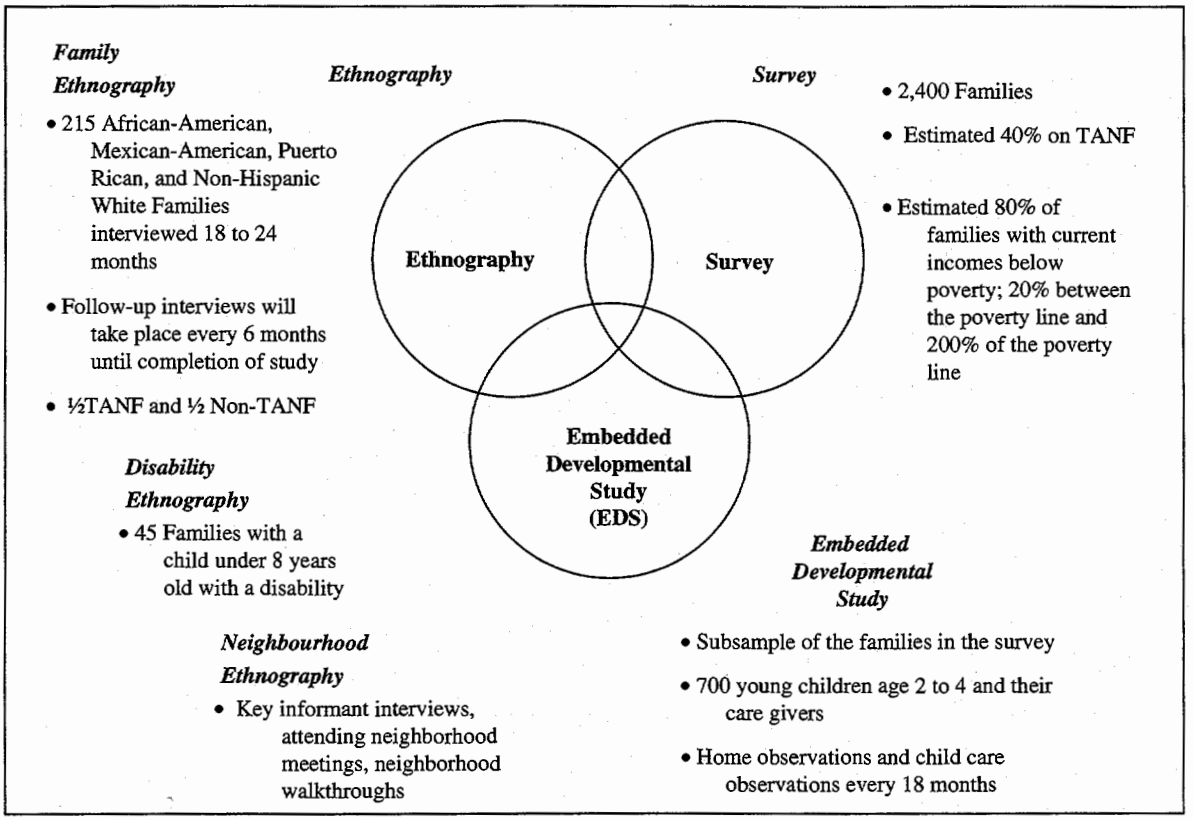


Figure 1. The design of Welfare, Children, and Families: A Three City Study.

neighbourhood ethnography. The 211 participants in the *family ethnography* were recruited through formal and informal sources such as community groups and service agencies as well as through introductions from other study participants. Most families included at least one child aged 2–4, and all were low income, with approximately half receiving welfare at the time of recruitment. Forty-five families included a child under age eight with a disability (the *disability ethnography*). Data collection for the family and disability ethnographies included participant observation and taped, in-depth interviews with families over a period of 18 months (completed in 2002/2003), continuing with follow-up interviews once every six months through 2004. The *neighbourhood ethnography*, which was designed to help us better understand the role of institutional resources and social networks, typically involved collecting data via key-informant interviews, attending local neighbourhood meetings, monitoring local newspapers, and descriptive accounts of neighbourhoods via "walkthroughs" and interviews at community-based organizations, especially those involved in child services and health care.

The specific aim of the ethnographic component (family, disability, and neighbourhood ethnographies) is to better understand how welfare recipients experience changes in welfare regulations and how the decisions and behaviours of low-income families are influenced by the welfare system. The primary research questions arising from the ethnography focus on the transition from welfare to work and back, "making it" financially, health and health care, parenting, social networks, caring for the disabled, and neighbourhood effects on all of the above.

"Structured Discovery," Ethnographic Data Journeys, and Ethnographic Data Products

Within the Welfare Project, we characterize the ethnography as being one of "structured discovery," an approach that focuses on primary research topics while building in sufficient flexibility to capture emergent themes and unanticipated information (Burton and others 2001). That is, many of the data on families take the form of field notes describing naturalistic, loosely structured encounters in which field ethnographers observe behaviours and ask questions about primary research themes based around "modules" developed by senior researchers on the project. These modules cover discussions of the "typical day," welfare reform experiences, household/family structure/power, residential mobility and housing, education, family routines and rituals, family and social support networks, childcare, child and maternal health, and child development, as well as discussions of neighbourhood characteristics.

Thus, the approach to fieldwork revolves around "structured" opportunities for "discovery." For example, in the

context of health-related issues, ethnographic data collection includes multiple encounters with families and greatly facilitates an exploration of multiple health events or issues for *any* family member. Such health events or issues might include routine events such as health clinic visits and experience of common ailments, issues such as domestic violence and substance abuse, and discussions of concerns over local environmental risks such as industrial pollutants or crime. By way of contrast, the survey component of the Welfare Project includes an array of questions and instruments for gathering valuable data on the primary caregiver, such as whether or not she has health insurance through her employer and whether or not her children are covered, but these questions are for the most part closed-ended in format, precluding the ability to explore with respondents additional questions on health-related topics.

ETHNOGRAPHIC DATA JOURNEYS

Ethnographic data are gathered from families and neighbourhoods in Boston, Chicago, and San Antonio and then transferred to two additional sites: the University of North Carolina (UNC) at Chapel Hill and the Pennsylvania State University (PSU). Data on families that include a child with a disability, a special feature of the Welfare Project, are transferred to UNC, and *all* ethnographic data are delivered to the coordinating site or depository at PSU. To gather, organize, analyse, and interpret the data for this project requires a large team. The ethnographic team consists of more than 80 senior ethnographers and research scientists, family and specialized disability ethnographers, neighbourhood ethnographers, coders, and programmers across five sites. All ethnographic data (tapes, transcripts, field notes, documents) from the three cities are archived at the coordinating site, where coders read field notes on their assigned families and recode data in NUD*IST (Non-numerical Unstructured Data Indexing Searching and Theorizing; see Gahan and Hannibal 1998). Each meeting between an ethnographer and a family (typically the primary caregiver) is written up, coded, and recorded in separate data files, with all text coded into categories or nodes. Each node is a three-letter identifier used to highlight text, typically a paragraph within a field note, where reference is made to a specific research topic or theme. In the family ethnography we have at least 12 groupings of nodes, each containing up to a dozen specific sub-themes. For example, 11 nodes are grouped under *Family Codes*, including FEC, which specifically refers to family composition; FRL, referring to family relations; and FRT, referring to family routines. Other groupings of nodes include *Actors* (i.e., key subjects in the family/household), *Health and Nutrition*, *Home, Neighbourhood* (discussed in more detail below), *Perception, Relationships, Welfare/Services, Work and Education,* and *Other*, as well as groupings of nodes for ethnographers' reactions and other logistical matters. Each paragraph or section of text within a field note can be tagged with multiple nodes. Within NUD*IST, all field note and document files are searchable by text (words and phrases) or nodes. For example, to retrieve information on transportation and access to health care, one might request a search on the nodes TRP and HTH.

ETHNOGRAPHIC DATA PRODUCTS

The team at the coordinating site not only codes and recodes data extracted from transcripts and field notes into NUD*IST but also generates a number of specialized databases on each of the families and neighbourhoods. These specialized databases include family profiles, a "life-at-a-glance calendar," and demographic tables. *Family profiles* are evolving documents rewritten after the receipt of each field note. Profiles are structured around primary and discovered research topics and include selected information extracted from field notes (e.g., illustrative quotations around key research themes such as transitioning from welfare to work, parenting, social networks, access to and use of health care). The *life-at-a-glance calendars* are one-page tables in which columns represent specific months of a year and the rows represent key events in the lives of a family, recorded as either events or spells (e.g., birth, death, marriage, cohabitation, residential move, on and off welfare, sanctioning, illnesses, employment and unemployment). These calendars are a visual tool for conveying salient events in the lives of the families and facilitate the identification of temporal clusters or contemporaneous occurrence of events or experiences. The *demographic tables* describe the families at the time of their recruitment to the study and include information on welfare experiences prior to recruitment, TANF (Temporary Aid for Needy Families) status, disability status, marital status, family size, age of family members, place/country of birth, and so on. In addition to these specialized data sets, other data files include spreadsheet data listings of all neighbourhood resources used by families and children, as well as education and residential history files (see examples below). Thus, data gathered as part of the Welfare Project can be found in a variety of text file formats (Word, NUD*IST) and spreadsheets (Excel, DBF), as well as analog audio-visual formats (taped interviews, photographs).

These various ethnographic data products not only include rich data pertaining to our primary research questions, they also include information on specific locations and areas within and beyond the three cities. For example, during an interview with a family, reference may be made to a specific location (e.g., a daycare facility, Head Start program, place of work, welfare agency), to resources in the community (e.g., a library, church, or community group), or to the locations of family members or members of a social network. Similarly, interviews

might focus on individual or family routines such as the journey to work, shopping trips, social events, or regular visits to a health centre. Thus, in the family and disability field notes we frequently find references to specific places and journeys. Within the NUD*IST databases there are nodes for an array of neighbourhood-related issues such as the characteristics of the neighbourhood (NCH), available resources within the neighbourhood (NRS), and perceptions of neighbourhood (NPR). Similarly, a catch-all NUD*IST node, "GIS," refers to geographic information on any location such as an address, cross street, boundary street, or place name. Not surprisingly data coders have added "GIS" nodes to many of the neighbourhood, family, and disability field notes.

Many of the geospatial data described above might have been collected in any ethnographic project similar to ours, if by accident rather than design. However, in our scanning of ethnographic research we have found few instances of the explicit use of primary or even secondary geospatial data to visualize the lives of individuals. This should not be taken as indicating that the coupling of mapping and ethnography has not been discussed (for a useful primer, see Cromley 1999). Similarly, the application of time geography and space-time activity studies, though not necessarily drawing on "ethnographic" data, has seen a rejuvenation of interest in the past few years, led by geographers such as Mei-Po Kwan (see, e.g., her progress report on "time, information technologies and the geographies of everyday life"; Kwan 2002a, 2002b).

Introducing GIS to Ethnographers on the Welfare Project

The coordinating site pursued multiple strategies to introduce GIS concepts and methods to ethnographers. Throughout the project we have worked with one or more sites to create new and integrate existing geospatial databases within a GIS framework. The intent was both to demonstrate to the sites what we could do with the data they collect and to encourage the collection of geographic identifiers, however crude, on the location of family activities and neighbourhood resources within each city.

Prior to this study we (authors Burton and Matthews) collaborated on projects where information derived from ethnographic studies had been presented in map form (e.g., Burton and Graham 1998). Since these early forays into combining data sources and method, our goal has been to think creatively about how GIS can be used in ethnographic research on low-income families, to stretch the technology, and to revise the methodologies we use. Shortly after the Welfare Project received its primary funding and the ethnographic teams in each of the three cities were gearing up for pilot-phase work, we were determined to introduce our colleagues to the potential benefits of collecting geospatial data within the ethnographic component. The first example using geospatial data that we shared with the ethnographic team mapped out "hypothetical journeys" that reflected the typical daily routines of a young mother juggling work, childcare/schooling, and other family obligations (see Figure 2). It is important to note that while this map is based on fictitious data, the actual journey types (multimode journeys consuming considerable time and traversing relatively long distances) are common among Welfare Project study families.

Prior to these early team meetings, few of our colleagues had seen mapped representations of data gathered through ethnographic fieldwork or based on space-time activity data. They were unfamiliar with Hägerstrand's (1970) time geography and space-time activity pathways (Rose 1993; Golledge and Stimson 1997) and geographic research that has mapped out daily routines and/or key anchor institutions in the lives of, and over the life course of, individuals or groups (see Rowe and Wolch 1990; Gilbert 1997, 1998; Laws 1997; Kwan 1999, 2000, 2002b; McLafferty 2002).

The reception of the hypothetical map and the introduction to geographic information systems in general were decidedly mixed. The value of the ethnography is the prolonged contact with families and the resulting rich descriptive data that provide in-depth and nuanced understandings of what it is like to be low-income and minority in an era of welfare transition. In contrast, when GIS was first introduced to members of the ethnographic team as a methodology to use in tandem with ethnographic analysis, there was reluctance on the part of some researchers. Some were not convinced that the time spent collecting the necessary geographic information was worth whatever additional analysis GIS could provide. Moreover, they were not convinced that GIS would contribute significantly to interpretations that could be made from textual data alone or that GIS would offer a better portrayal of families' lives than a coherent ethnographic narrative. There was some concern that complex stories would be simplified and flattened out in two-dimensional models and that, if taken out of the context, without reflecting change over time, these models could distort the analysis or be misread (Skinner, Matthews, and Burton 2005). In short, convincing the ethnographic team of the value of collecting geospatial data on families through the ethnography was not easy.

Although the maps were not always well received, this fact was partially offset by positive curiosity about the geospatial data used to help construct the maps. That is, our colleagues were interested in knowing more about the geospatial data available on streets and transportation networks and, in other examples not reproduced here, the various census geographies and other areal unit boundaries such as police districts, as well as a variety of point feature databases such as the locations and

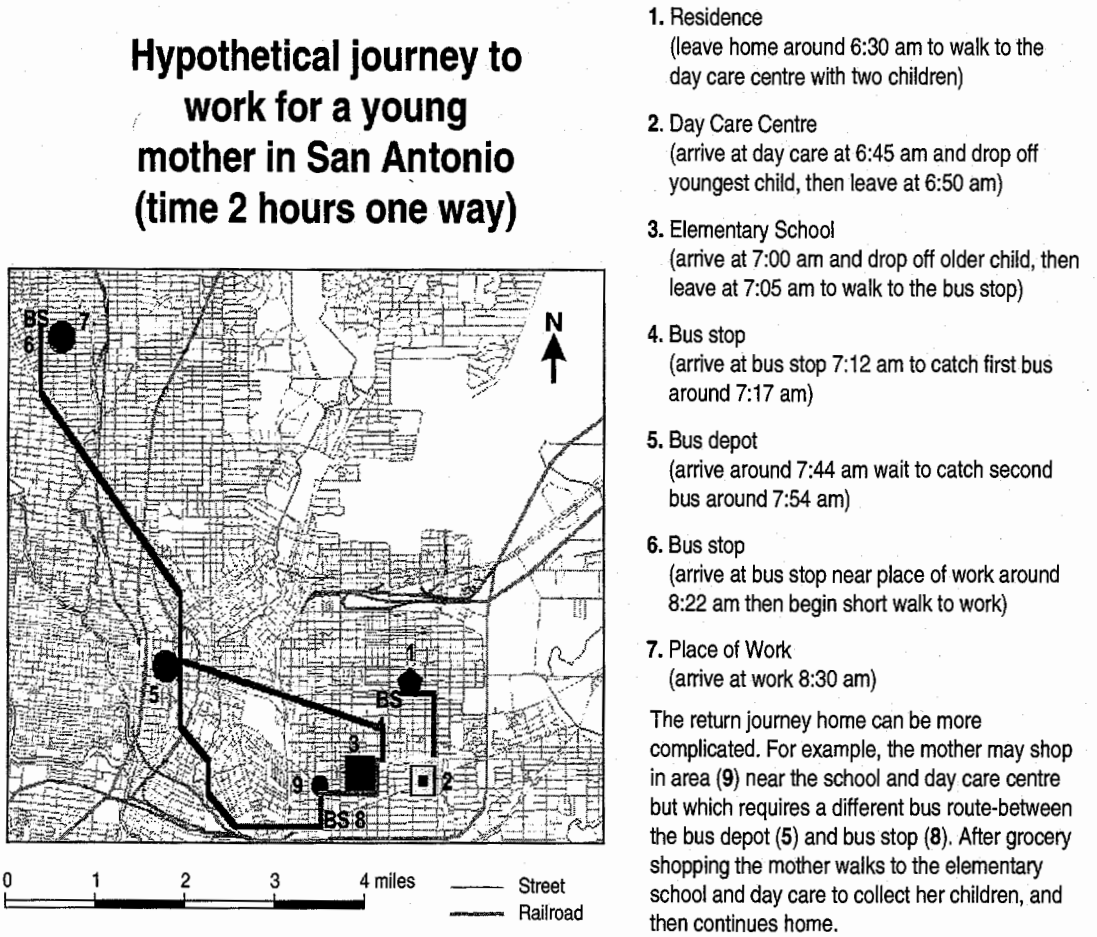


Figure 2. A hypothetical journey.

attributes of Women, Infants and Children (WIC) program clinics. They came to appreciate the contextual geographic databases, specifically the neighbourhood and city profiles, that a GIS could be used to create. It no doubt helped that few others on the project were familiar with demographic, urban, and infrastructure data that could easily be integrated within a GIS.

DEVELOPING CONTEXTUAL DATABASES

In the early stages of the Welfare Project, the GIS activities focused on developing a comprehensive geospatial database for the three cities and, specifically, for the neighbourhoods we were studying. At its most straightforward, this process consisted of gathering as many relevant and timely secondary data as were available either free or at modest cost. In effect, we were building a geospatial database in anticipation of requests for basic locator maps and maps that might display key neighbourhood resources. That is, we were developing GIS projects (one for each city) that would enable one of the GIS analysts on the project to construct a desired map upon request.

The initial geospatial databases included street files (and post-processing of these data to differentiate line segments into freeways, major roads, roads, etc.); rail transportation systems (routes and stop locations); land-use data (presence of water bodies, parks, etc.); an array of area boundaries, including ZIP code and census geographies (e.g., block group, tract); and attribute information for these areas derived from the 1990 and 2000 census (e.g., race/ethnic breakdown, poverty). On this base we added data from a variety of official sources and other data providers. Our goal was to move beyond a limited set of census-derived variables and seek out practical and innovative uses of alternative data (e.g., on crime, health, land use, and transportation) that describe and capture dimensions and characteristics of neighbourhoods not previously contemplated (see Coulton 1997; Sampson, Moronoff, and Earls 1999; Burton and others 2000). Our geospatial database for each city includes aerial photos from the mid-1990s and publicly available tax, property, and land-parcel data. The latter have proved invaluable in generating up-to-date land-use profiles of our study neighbourhoods and have greatly facilitated address-matching tasks. To these data, depending on city,

we have added spatially and temporally disaggregated crime data; integrated data on the locations of family, group, daycare and after-school care centres and facilities, including attribute data on size, years of operation, and age ranges served; and data on all school locations and attribute information on age/grade, sex, and race/ethnicity profiles within schools.

Finally, from the family, disability, and neighbourhood ethnographies (and pilot studies in each of the three cities), we added geospatial data including point features such as family home addresses at recruitment and the locations of recruitment sites (e.g., Head Start, community groups), as well as some area features such as perceived neighbourhood "boundaries" as defined and derived from key informant interviews within the neighbourhood ethnography. We also created study-area boundary files based on hard-copy maps of the census blocks used in the Welfare Project's survey component sampling frame. These secondary data sources were acquired, compiled, processed, and collated by the GIS team at the coordinating site.

TOWARD A VIRTUAL ETHNOGRAPHY

Experienced GIS users will realize that simply having constructed a geospatial database is not the same as making the database easily usable or accessible to novice users, such as many members of our own ethnographic team (i.e., senior and field ethnographers in the three cities and the data coders at the coordinating site). To circumvent some of the problems of access and utilization of these data, we began to explore ways in which graphical user interface tools could be embedded in our GIS project to help novice users navigate both the software and the extensive geospatial data sets being constructed from secondary sources. This work was extended further when we began to work directly with primary data (i.e., geo-coded ethnographic materials, such as family profiles and neighbourhood walkthroughs).

The interface, known as the Welfare Extension (written in Visual Basic for use in ESRI's ArcGIS software by co-author Detwiler), allows the user to visualize and explore contextual geospatial data and their associated attributes in relation to family locations and neighbourhood boundaries (Figure 3). The user is presented with an opening map view for the city of interest containing three layers: a layer demarcating the ethnographic study neighbourhood boundaries and two index layers that allow for efficient retrieval of orthophotographs (aerial photographs) and property-level data respectively. After the user selects the neighbourhood(s) of interest, the map view is automatically re-scaled and centred. The user can then select from an array of data available for the neighbourhood(s). Current options allow the user to retrieve and map neighbourhood ethnographic data derived from walkthroughs and key informant interviews or to map family locations as well as selected census, property/land-use, school, crime, and street file data (these data options are continually being extended to include both more diverse types of geographic data and various family ethnographic data products such as the demographic and family profiles).

Examples of Coupling GIS and Ethnographic Data

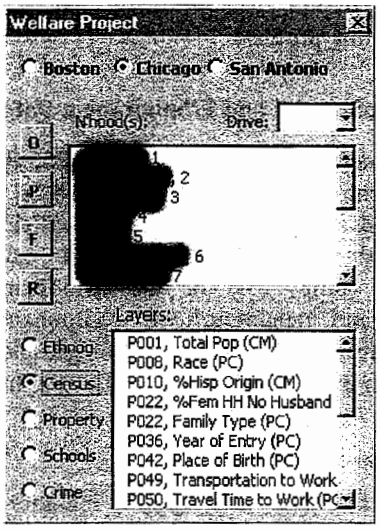
To date, we have combined GIS and ethnographic data in a variety of different ways, many of them based on the retrieval of relevant data through the use of the Welfare Extension. The first three examples that follow are taken from the different components of the ethnography (family, disability, and neighbourhood components), while the fourth draws on the integration of geospatial data from both family and neighbourhood ethnographies.

FAMILY ETHNOGRAPHY

As described above, the family ethnography includes an extensive set of field notes on multiple topics. In recent years we have created maps and images for conference presentations and reports using data from original field notes, family profiles, and the life-at-a-glance calendar (Burton and others 2000; Burton, Hurt, and others 2001; Matthews, Burton, and Hurt 2002; Skinner and others 2005). Thus far we have used GIS to help describe a family's local contexts (neighbourhood resources such as various community services and risks such as crime); to explore the spatial and temporal constraints faced by low-income minority families (e.g., through the mapping of home, daycare, school, and employment locations); and to document how families use the neighbourhoods and cities in which they reside (e.g., social networks, shopping activities).

Because of their detailed nature, both ethnographic and geospatial data can easily be used to identify individuals and neighbourhoods in our study. In recent years, GIS and concerns over privacy have received much critical attention (Pickles 1995; Curry 1997, 1998). Following Mark Monmonier (2002, 1), we note that "the maps one looks at are less important than the spatial data systems that store and integrate facts about where we live and work." For obvious reasons (data restrictions, confidentiality, and privacy concerns), we are not permitted to produce maps that could easily identify individuals. In dealing with *the maps one looks at*, we employ several mapping strategies to avoid privacy violations (Cromley and McLafferty 2002). Such strategies include, but are not limited to, turning off geospatial data layers (such as road network data) so as to avoid providing location clues; displaying data on small-scale maps; aggregating data; and using masking techniques. Regarding *spatial data systems*, the data from the project used in a GIS environment

Step 1: Select City "View"
(and drive for data access clearance)
Step 2: Select Neighbourhood(s)
Step 3: Select "Data type"
(from the list described at right)



Ethnographic Data
Selecting this item generates a list of geocoded neighbourhood walkthroughs and key informant interviews. These data files are uniquely identified based on the neighbourhood ID and date of field note (e.g. BOI-030700). The field notes include geocodes to specify an address, cross-streets or journey segment and thus are loaded into the project as a new theme. Using hot link feature the field note can be viewed by moving the cursor over the point (address)or linear (journey or route) feature.

Schools Data
Selecting this item generates a list of attributes for public (school type, enrollment, racial composition, percent free lunch recipients) and private schools (enrollment and racial composition). A new theme is added to the view either as a point symbol (i.e., school type) or as a pie-chart proportional in size to the enrollment within the school. The selection generates a new shapefile that includes all schools (elementary, middle, high, special and other) that meet the selection criteria that can be found inside the neighbourhood and within a mile of the neighbourhood boundary.

Census Data
Selecting this item generates a list of nineteen census variables including measures that focus on race, ethnicity, place of birth, year of entry, family type, educational attainment, income and poverty. The selection of a variable generates a new layer that includes either a choropleth map ora pie-chart (proportional in size to the population "universe" of interest). These new layers are a reasonable representation of the data with out expecting novice users to design their own map based on legend editor selections.

Crime Data
Selecting this item generates a list of property and violent crime variables. Note that crime data vary widely by city (spatial and temporal resolution). In the case of San Antonio specific property and violent crime data are actual point events that can be selected by date of occurrence (e.g., all burglaries in Jan 2000). The user selects crime type and defines the temporal period of interest. This generates a theme meeting the selection criterion.

Property Data
Selecting this item generates a list of property attributes. Property data vary by city but share many common features such as major land use categories (e.g., residential, commercial, industrial, vacant, tax-exempt, etc.). Similarly, specific land uses can be selected such as religious property, libraries, schools, hospitals, parks and so on. The latter selection generates a new shapefile that includes all properties that meet the selection criteria that can be found inside the neighbourhood and within a mile of the neighbourhood boundary.

Family Data
Selecting this item generates a new point theme that identifies the approximate home location of the families in the study at the time of their recruitment. Only families with the appropriate neighbourhood ID field are mapped. While actual address information is known these data items have been stripped and the attached data file includes only a family ID number.

Road Data
Selecting this item generates a new line theme that includes all streets that can be found inside the neighbourhood and within a mile of the neighbourhood boundary.

Figure 3. The Welfare Project Extension.

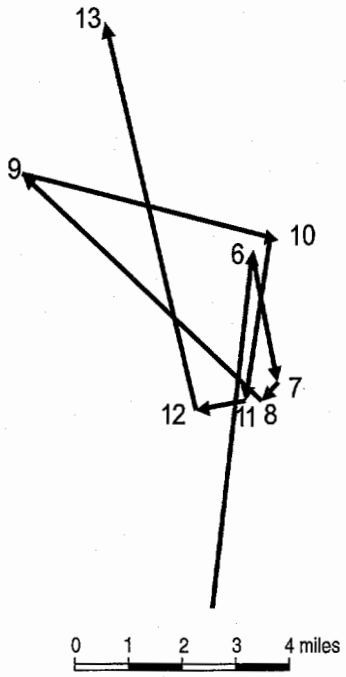
are housed in restricted data directories within a Karlbridge firewall–protected computer network at the host institution, and access is limited to key project personnel and GIS programmers, all of whom are required to have completed the University Institutional Review Board's human subjects training.

The family ethnography includes a module or topical interview focusing on residential mobility. In the example below, the ethnographer recreated from original field notes a listing of all known residential locations and the dates when moves between locations occurred. This information was entered into a spreadsheet and then address-matched. Figure 4 recreates the residential history of a young mother, referred to as Maria. Maria has moved 13 times during her life, including five moves while living with her parents as a child. She left home in 1990 and has since made eight moves, mostly within a relatively small area approximately four miles west of Chicago's Loop. Many of the location changes were of short duration, with moves in the early 1990s frequently involving moving in with another family member. One of the challenges of mapping residential histories gathered in ethnography is not to infer too much from the resultant pattern without an adequate cross-reference and reading of field notes regarding other significant events or periods in the lives of our families. That said, mapping the data has tangible benefits, such as revealing interesting patterns that may have been missed by the family ethnographer, and, at a minimum, may help generate new questions regarding residential stability and mobility among low-income families.

DISABILITY ETHNOGRAPHY

Families in the disability ethnography face unique challenges, juggling work, welfare requirements, and family needs. To explore time and space constraints, the disability ethnography component experimented with the collection of time diaries for a period of one month (November 2000). The intent was to capture location and duration information on all meetings and/or appointments, as well as the journeys undertaken by the primary caregiver of a child with disabilities. The data were collated, entered into a spreadsheet, and address-matched. Maps were generated in part to illustrate the complexity of disability management (Skinner and others 2005).

In the example below, the primary caregiver is a mother, aged 30, who has a seizure disorder and partial paralysis due to a stroke at age 5. At the time of this time-diary study, her family included a 14-month-old son (focal



Maria has lived at eight different locations since leaving her parental home in 1990.

The table below lists the start and end dates of moves, the number of residents at each location and the head of household.

ID	Year Start	Year End	Number of Residents	Head of Household
6	1990	1991	4	Boyfriend's Mother
7	1991	1991	3	Maria's Grandmother
8	1991	1992	2	Maria and Boyfriend
9	1992	1992	3	Boyfriend's Stepfather
10	1992	1994	3	Maria and Boyfriend
11	1994	1994	3	Maria and Boyfriend
12	1994	2000	5	Maria and Husband
13	2000	2000	10	Brother-in-Law

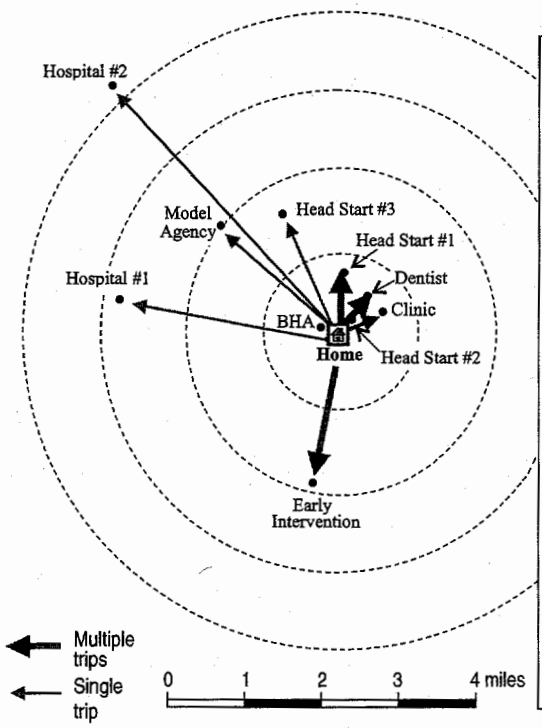
Figure 4. Recreating a residential history from ethnographic data.

child) with significant gastrointestinal problems, seizures, and allergies and a two-year-old daughter who has bent leg bones requiring a brace. The husband (father of these two children) and two other children are present in the home. Over the one-month period, the primary caregiver attended 29 meetings, of which 13 were held in her home (see Figure 5). The home-based meetings were typically for counselling or physical therapy sessions for the youngest child (twice a week on average), although they also included a Head Start home visit and a meeting with an attorney. The remaining 16 meetings were held at one of 10 different locations across the city (two were close to home and are obscured on this map by other data). These included six meetings at three different Head Start locations; two visits to two different hospitals; three visits to an early intervention centre; and visits to a health clinic, a dentist, and a local housing authority office. The primary caregiver was accompanied by at least one child for all but three meetings. Entering these data into a calendar format reveals that all told, during this one-month period, the primary caregiver needed to be at home for her son's physical therapy sessions or attended other mostly health-related meetings on 17 separate days. As one might imagine, the time demands on this particular caregiver make holding a nine-to-five job or fulfilling welfare requirements somewhat difficult. While the family ethnographers are often familiar with the complexity of the lives of the families they study, the visual representation, certainly in cases like the one described above, often better reveal the challenges and constraints the families face and better ground the ethnographic discussions with families about management and coping strategies.

NEIGHBOURHOOD ETHNOGRAPHY

As mentioned earlier in the article, we have identified places and routes within neighbourhood ethnography field notes, focusing on field notes that cover neighbourhood walkthroughs. Early in the collection of neighbourhood ethnographies we selected walkthrough field notes to determine whether data gathered in the field could be easily geo-coded and thus entered into a GIS database. The field notes we selected proved useful for a number of many reasons, of which two are identified here.

First, it was evident that the neighbourhood walkthroughs provided detailed text on a number of specific places (e.g., community resources and anchor institutions) that could be geo-coded. These data provide value added in better understanding neighbourhood resources and risk, especially when linked in with other secondary geospatial data and even more so when linked to the geo-coded data gathered from the family and disability ethnographies. However, the neighbourhood walkthrough field notes do create some problems. That is, neighbourhood walkthrough files inevitably refer to multiple places or routes, requiring that we spent a great deal of time dividing up the field notes so that we could hot-link only relevant text to the appropriate places or routes (indeed,



Calendar of events - one sample month

Monday	Tuesday	Wednesday	Thursday	Friday
		1 a.Travel to/from Early Intervention Program b. Counseling for BC	23	Travel to/from Early Intervention Program
6 Physical therapy for BC	7 Counseling for BC	8 a. Policy Committee meeting b. Progress Review for KC	9 Education Committee meeting	10 Cablevision
13 Physical Therapy for BC	14 a. Dental visit b. Counseling for BC c. Travel to/from Orthopedic appt.	15 a. Parent meeting b. Renewal of Lease (BHA)	16 Head Start 6-month check up	17
20 a. Dental appt. for KC b. Physical Therapy for BC	21 a. Travel to/from Doctor b. Counseling for BC c. Travel to/from Town Policy meeting	22 a. Dental appt. for DC b. Interview for Welfare Children and Families Project	23	24
27 a. Appt. for DC b. Physical Therapy for BC	28 Counseling for BC	29 Parent Group meeting	30	

Figure 5. A map and a calendar representation of trips made and meetings attended during one month by a primary caregiver in a disability family.

we face a similar problem with data gathered via key informant interviews – that is, it would be easy to geo-code the key informant field-note text file to the location of the interview, but often the key informant refers to many places within an interview, as well as locations in and around and even beyond the neighbourhood). It is important to note that we have faced challenges; specifically, we were unable to keep pace with the number of files arriving from the study sites, to the degree that geo-coding neighbourhood data files is now performed on an *ad hoc* basis.

Second, during the early stages of the neighbourhood ethnography we were able to demonstrate to the ethnographic team an important data-verification function of GIS. To demonstrate data verification, we dissected a neighbourhood ethnographer's walkthrough field notes and geo-coded specific text to places the ethnographer observed and routes he or she walked. This allowed us to recreate or trace the ethnographer's route through the neighbourhood. This route was overlaid on the neighbourhood boundary as defined by the ethnographic component. By mapping the route of the neighbourhood walkthrough, we can easily identify instances where the ethnographer is inside or outside the neighbourhood of interest. In an example taken from the early stages of the ethnography, an ethnographer was observed to be "outside" the study area. Field notes reveal that the ethnographer is aware of considerable differences in physical structure and socio-economic and racial composition:

> I headed east again . . . the residential part of the neighborhood. Very different. Quiet. Working and middle class houses. Some were old. Several were recently renovated. I saw few people, but these were different races, Afro-American, white, and occasional Latino and apparently middle class professionals." (A neighbourhood ethnographer's field note, Boston, 17 June 1999)

The ethnographer continues on their journey, making additional references to the surroundings. Later during the walkthrough the ethnographer re-enters the study neighbourhood and immediately notices a change:

> I was heading back . . . . The neighborhood became less middle and more working class, leaning toward poor. Suddenly, I saw a few Latino faces again. I heard Latino music. The closer you get to [. . .] the greater the number of Latinos." (A neighbourhood ethnographer's field note, Boston, 17 June 1999)

While the ethnographer was aware that the character of the neighbourhood and the people in it seemed to be changing, the visualization of the descriptions hot-linked to known locations within a GIS could verify that the ethnographer had indeed walked out of the study neighbourhood (in this particular instance, by almost half a mile) and identify when and where

the neighbourhood was re-entered. These techniques, while difficult to operationalize in near real time (without use of global positioning system [GPS] units), can nevertheless prove extremely useful in exploring definitions of geographically demarcated units and the fluidity of the boundaries of those units for, in our case, the low-income families of interest (see next example).

NEIGHBOURHOOD AND FAMILY ETHNOGRAPHY

We have integrated geo-coded neighbourhood and family ethnographic data to explore important conceptual issues associated with research on families and neighbourhoods. Perhaps the most important is the degree to which neighbourhood context matters for families (see Brooks-Gunn, Duncan, and Aber 1997a, 1997b; Martinez 2000; Booth and Crouter 2001). Unfortunately, both spatial issues and the characteristics of neighbourhoods have been poorly conceptualized in family sociology and demographic research. Indeed, reviews of the literature on neighbourhood effects on child development, health, and well-being have been quite critical of past research methods and particularly of the data sets used (see Gephart 1997; Furstenberg and Hughes, 1997; Coulton 1997; Leventhal and Brooks-Gunn 2000; Burton and Jarrett 2000). As Furstenberg and Hughes report,

> the primary impediment to progress in understanding the effects of neighborhoods on children continues to be the lack of data sources that contain information on neighborhoods, families and children. (1997, 353)

A key question is, *How do we measure neighbourhood or context?* Much current urban demographic and quantitative research describes context or neighbourhood as equivalent to a census tract, relying heavily on a limited set of census variables, and rarely considers including measures of neighbourhood resources or lack there of (e.g., retail, business, and health and social service environments, transportation infrastructure, and land use) or neighbourhood risks (e.g., crime). In general, the tract-level studies offer weak and generally mixed evidence on the influence of neighbourhood effects (see reviews by Gephart 1997; Leventhal and Brooks-Gunn 2000). A related problem is that the effects of the local environment on family or individual well-being presumably depend on how much the family or person is exposed to the neighbourhood where they live (Sastry and others, 2002). Neighbourhood boundaries, as operationalized by researchers, are likely to be less salient for individuals whose routine daily activities do not occur in the neighbourhood of residence. As Sastry and others note

> While there is a large body of research on issues such as journey to work, considerably less is known either about the overall spatial patterns of daily life or, more specifically, about the salience of neighbourhoods, whatever the definition, for individuals and families (2002, 3).

Preliminary analysis of ethnographic data from Boston families reveals that census tracts do not capture many activities and/or locations relevant to a family's routine activities (Matthews and others 2005). To paraphrase Ronald Abler, John Adams, and Peter Gould (1971), some areal units are particularly sacred once they have been established, even though they may later become serious obstacles to solving contemporary problems. Figure 6a reveals that three families who reside in the same census tract use and rely on resources and social networks across larger areas than the immediate context as defined by the census tract boundary (and even neighbourhoods as defined by our own study – not shown on the maps). Indeed, in the preliminary work based on data on more than 1000 locations referred to in field notes from 34 families, we find that most of their activities (uses of specific locations), indeed more than 90% of all geo-coded activities, are outside the census tracts of residence. When these activities are broken down by different domains of the families' lives, we see, not surprisingly, that those activities closest to home are associated with food or grocery shopping, educational activities, recreation, health services, and other (i.e., non-health related) services. However, in no domain category is the percentage of anchor locations found in the home and immediately adjacent tracts combined greater than 30% of the total, with food the most "local" of all activities. Similarly, non-food shopping activities, work locations, and social support networks (perhaps somewhat surprisingly) are mostly found in distant locales. Again, these findings are not altogether surprising, as most low-income families do not live near their either places of work or the larger shopping centres.

As another example, Figure 6b shows the locations of family and child resources in relation to a family's home. Again, this family's activity space, focusing on family and neighbourhood resources they refer to, is up to two miles east of their residence and mostly outside their immediate census tract. The reason for the mismatch between residence and use of resources, although not shown here, is largely explained by the family's social network and past residential history (i.e., a number of family members and friends reside in the area where anchor institutions and resources are concentrated, and the mother has lived in and is familiar with this area).

In the Welfare Project we use existing data sets, augment them with new and refined measures of spatial context and structure of the urban environment, integrate these data with ethnographic data, and then analyse the data using visualization/mapping techniques. Our application of GIS focuses on retrofitting data on contexts or neighbourhoods and on the integration of ethnographic data on low-income families. This process results in a

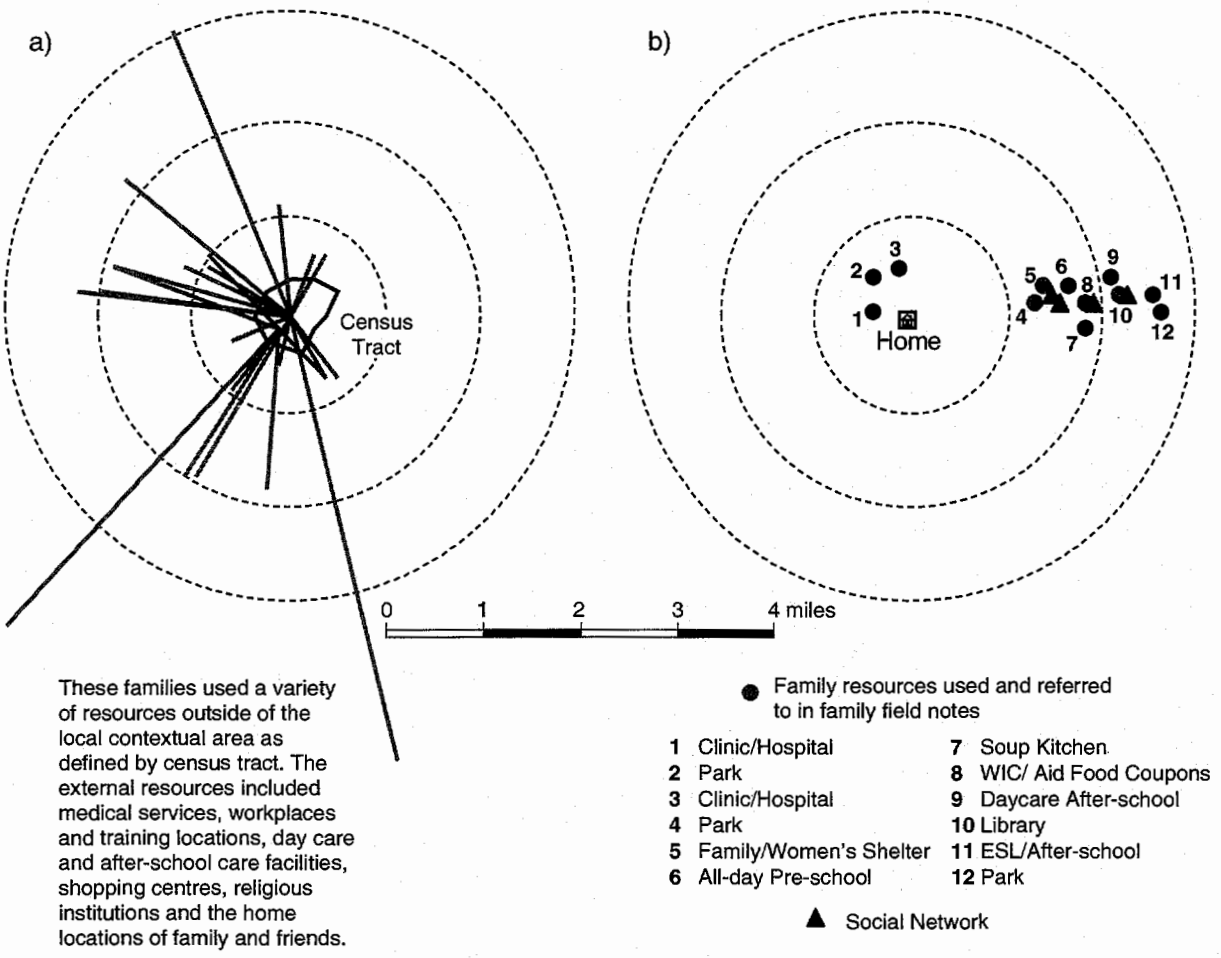


Figure 6. (a) Census tract as context? Spatial profiles of three families who reside in the same census tract. (b) A family's local anchor institutions and resources mentioned in ethnographic field notes.

better understanding of low-income families' mobility, their use of and access to services, and an array of well-being-related issues. The interface or coupling tools we have developed facilitate a more flexible "viewing" of our study families and allow novice GIS users to visualize and better understand the complexity of the lives of low-income families and the strategies they adopt in navigating a fluid welfare reform landscape, thereby enhancing data analysis and interpretation. In our work to date we have explored the integration of both quantitative and qualitative data on families and neighbourhoods to help better understand different forms of spatial behaviour (Golledge and Stimson 1997). We have begun to explore different dimensions of mobility and the use and knowledge of space by families, with an emphasis on the use and accessibility of services, housing, and employment; the presence and maintenance of social networks; and the use of local and non-local opportunities or resources relevant to family well-being (Burton and others 2000; Matthews and others 2002; and Matthews 2005). In other words, we are exploring spatial and temporal entrapment and the ability of families to jump scale, that is, to take advantage of non-local networks of social and institutional support, stretching and redefining their own complex family geographies (Aitken 1998).

Some Challenges in Coupling GIS and Ethnographic Data

Combining methods makes clear that GIS has advantages for family ethnography (Skinner and others 2005). First, GIS has proved to be an effective tool by depicting, in a single image, the intense effort it takes for primary caregivers to create and maintain both work and family responsibilities and their social and service networks aimed at promoting family health and well-being – an effort that may surprise some, including policy makers (see Figures 2 and 5). The ethnographic description of a family's efforts and experiences is still crucial, but for some audiences, a GIS image may have an immediate impact and provide a more powerful statement than a narrative account. Second, GIS is an effective tool in analysis. Maps can suggest interpretations that we might otherwise overlook. GIS can quickly identify families that

are more isolated, have fewer supports, and access fewer outside resources and services. GIS can show how far families have to go for different types of services that enhance their children's development and well-being. Thus, maps of families' navigations may foster comparisons not easily perceived through text alone. Third, GIS can also help us plot any significant changes in families' constructions or routines over time, such as identifying changes in the intensity and range of families' use of community services and activities over time.

In spite of these advantages of employing GIS technology, we caution that GIS and the resulting maps are not enough by themselves. For example, one of the challenges inherent in ongoing ethnographic research concerns analysis, the salient questions being *when* and *how* to analyse data. In many ways, analysis within ethnography is an ongoing process, with each successive interview and field note adding something new and prompting a re-analysis. The GIS database evolves in parallel with the ethnography, but the typical end product generated from GIS is a static map, one that may quickly be out of date. Again, without reference to accompanying ethnographic field notes, the maps need not and probably do not convey the whole story, and certainly they cannot describe the dynamics of the individual or family story.

The volume and diversity (text, audio, video, image) of ethnographic data is a key concern in any attempt to integrate GIS and ethnography, raising many logistical issues. Simply working with the data, verifying geospatial data accuracy, and organizing data in ways that facilitate linkage to a GIS project can be very time consuming, so much so that the Welfare Project's GIS team now deals with map requests in "reactive" mode. That said, when a request is received to work with data on one or more specific families (e.g., to produce a series of maps for a conference presentation or poster), our data management system allows us to retrieve data products efficiently from the secure project server, while the Welfare Extension facilitates the retrieval of important locator and contextual data for specific neighbourhoods or for any area within the relevant city. Moreover, the GIS team can draw upon multiple team members (ethnographers from the relevant city as well as data coders at the coordinating sites) to verify data and to ensure that we are representing the lives of individuals and families appropriately.

In other respects, too, a GIS-focused approach is certainly not a panacea. Handling primary and secondary geo-coded data can be a methodological minefield. In addition to concerns over access to theoretically relevant and timely data, we also faced a number of challenges regarding the quality of the geospatial data collected by the ethnographic team. At the beginning stages of the project, the quality of geospatial or geo-coded data from the sites varied widely. The most problems we commonly encountered included missing, inadequate, incorrect, inconsistent, and abbreviated geo-codes. We checked and rechecked locations and family routines and the geographic data sets on which these were mapped. When necessary, ethnographers returned to families and neighbourhoods to verify data points and families' explanations of their routines and experiences. We were fortunate that the structure of the project allowed for the GIS team members to query the data collectors themselves and reconcile the most egregious data issues.

It is worth returning briefly to the issue of privacy and the risks of identifying individuals. The ethnographic data files include information on the location of key anchor points such as home, workplaces, grocery stores, and paediatricians' offices. The GIS programmer works directly with address, typically cross-street, information, removing all identifying information (i.e., any family ID, if it existed) from geospatial data files once the files are geo-coded. As implied above, we use geo-coded data to visualize family activity spaces over various time scales (typical daily, weekly, or monthly journeys) and geographies (neighbourhood, town, county, study area), but when we do so the maps are devoid of any "referencing" data such as streets and are reproduced only at small scales, preventing identification of home addresses or other key anchor points of an individual or family. Access to raw data for this project is limited, as data are housed in heavily restricted data directories within a Karlbridge firewall–protected computer network.

A strategy we have pursued for both training and generating interest among field ethnographers in collecting geospatial data is to visit their sites and present to them material derived from their own field notes. This has allowed us to draw attention to the need for accurate, complete, and consistent data and provides an opportunity for the ethnographers to view the lives of their families from a different perspective; the process can also trigger discussions of the opportunities and constraints faced by the family. As field notes are often quite unwieldy, some family ethnographers now generate specific geospatial data files in spreadsheets. Indeed, in current work on low-income families we are using encrypted Web forms to collect and organize data on "locations," "routes," and "boundaries" and specific attributes about these location vis-à-vis our families. The locational data can be either direct or indirect geo-codes, depending on the specificity of the information requested (i.e., we may collect street addresses, cross-streets, ZIP code fields, place names, or some other geographic descriptor). Data from the forms are organized into a database file (including numerical and text string data fields) that can be easily converted to a format usable in a GIS system. A quick scan of the data by an ethnographer can reveal holes in the data.

It should be stressed that site visits to the three cities benefit the GIS team too. Our understanding of families is significantly enhanced through one-on-one discussions with field ethnographers and visits to the families' homes and neighbourhoods. In each city, we drive and walk through study neighbourhoods, visit anchor institutions and recruitment sites, and meet study families. These neighbourhood tours are invaluable, and we hope that by better knowing and understanding our families' study sites we can represent them more appropriately in mapped form.

There have been some encouraging developments regarding the coupling of ethnography and GIS. First, a number of research scientists and data coders (graduate students from a diverse set of social and health sciences) have already taken formal GIS courses, or have plans to do so. That is, team members are beginning to understand better how geospatial data and attribute data (of various kinds) can be integrated and then queried within a GIS. Second, the research scientists and data coders (including those who have not used GIS) are increasingly sensitive to an array of issues relating to the nature and quality of the geospatial data they encounter in field notes. The data coders have seen how other team members use the data and thus increasingly recognize when the data may be incomplete or inaccurate. In these instances, a query to a family or neighbourhood ethnographer at the specific site can help complete or correct information.

Summary

This article has focused on the coupling of geographic information system (GIS) technologies with ethnographic data gathered in an ongoing, multi-site study of low-income families and their children, Welfare Reform, Children and Families: A Three City Study. Our goals have been to think creatively about how GIS can be used in welfare research, to stretch the technology, and to revise the methodologies we currently use. Combining ethnographic data and GIS methods enables researchers to see spatial context as well as content, helping them to identify important spatial dimensions of a problem. The coupling of ethnography and GIS techniques (i.e., geo-ethnography) has much to offer to the study of low-income women and children in community contexts. We can situate families in broader geographic contexts and visualize the different strategies they employ in their use of neighbourhood resources, anchor institutions, and social networks. Moreover, we can compare and contrast the use of neighbourhood resources and social networks among families residing in the same neighbourhoods. By studying the use of resources and social networks, we hope to shed light on the complex and reciprocal relationships between families and neighbourhoods. The integration of data on neighbourhoods and how families use spaces and places necessitates critical discussion of how neighbourhoods are operationalized in conventional social science research. The ethnography reveals the activity spaces and boundaries of a family's lived experiences, which often extend well beyond the fixed spatial contexts of census tracts or "neighbourhoods" used in more traditional quantitative approaches to the study of welfare research found in demography, sociology, and urban geography.

In the Welfare Project, the emphasis is squarely on non-spatial areas of inquiry. However, as has been shown here, and as noted by Michael Goodchild and others (2000, 154), "even in non-spatial areas of inquiry an increased awareness of the concepts and tools of spatial analysis may lead to novel insights." In closing, we strongly echo the comment made by Steve Herbert (2000, 564): "If sociality and spatiality are intertwined, and if the exploration of this connection is a goal of geography, then more ethnography is necessary."

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Notes

1. For an excellent review of the history of the welfare state in the United States, see Katz (2001).

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