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Mapping Deprivation for the Small City, Rural Context: a Kamloops–Thompson Case Study

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Deprivation Indices are tools of value to social service agencies planning for the effective delivery of community social programs. Social and economic factors are aggregated and mapped to determine which areas are more deprived. Deprivation differs from poverty in that it is based on social conditions rather than income; to be deprived is to live below socially accepted standards of living. The geography of this study is defined by census dissemination areas within the Kamloops – Thompson School District 73. Reflecting on the Canadian small city and rural context, this study adapted deprivation index formulas from other indices in current literature. It is anticipated that this methodology will be transferable to other Canadian communities. The maps created are intended to support decision making on program delivery by local social service and sustainability groups. This study is an outcome of a research partnership comprised of university, community organizations, and government agencies.

INTRODUCTION

Deprivation differs from poverty in that it is based on social conditions rather than income; to be deprived is to live below socially accepted standards of living. The concept of deprivation refers to "specific conditions such as the lack of clothing, housing, household facilities, education, and social activities, rather than resources and is thus distinguished from poverty" (Broadway, Jesty, 1998). Deprivation is more flexible than poverty and varies according to geographic location.

This research is unique in that it was developed for the urban rural context. Unlike most deprivation indices which are focused on urban areas, the geography for this research is the Kamloops-Thompson School District 73 (SD73). The school district is comprised of five municipalities and many rural communities with a total population of 103,000. The largest of the municipalities is Kamloops with approximately 88,000 people. The deprivation index was developed with this context in mind and was advised through community input.

The priority for this project was to focus on the needs and factors that influence deprivation in our community. Community partners were identified and a workshop was held to

assist in the identification of the appropriate variables for the defined area. The partnership included social service providers who focus their efforts on assisting our population in need. A follow-up meeting was also held to discuss the results after analysis and obtain feedback. This community participatory process was critical in the development of the methodology for the index.

A deprivation index is the aggregation of social and material deprivation indicators. Several methodologies have been used to create deprivation indices. Some deprivations indices use survey methods to obtain indicators. For this study, 2006 Statistics Canada Census data was utilised. In addition, most studies have an urban geographical bias and thus the indicators tend to reflect urban populations. Indicators for this research were chosen carefully in order to provide an adequate description of the Kamloops-Thompson area.

The results of most deprivation studies have not been represented spatially. Mapping the results through the use of a geographic information system provides a user-friendly outcome for the research. The purpose of this study is to develop, analyse, and map deprivation for Kamloops-Thompson School District 73 geography through a detailed community consultation process.

LITERATURE REVIEW

Deprivation is divided into two categories - material and social deprivation. Material deprivation is when "people lack the material goods of modern life such as an adequate diet or basic household amenities" (Broadway, Jesty, 1998). Social Deprivation is "the condition whereby people do not participate in or have access to employment, occupation, recreation and family and social activities which are commonly experienced or accepted" (Broadway, Jesty, 1998). This study is composed mostly of social deprivation indicators.

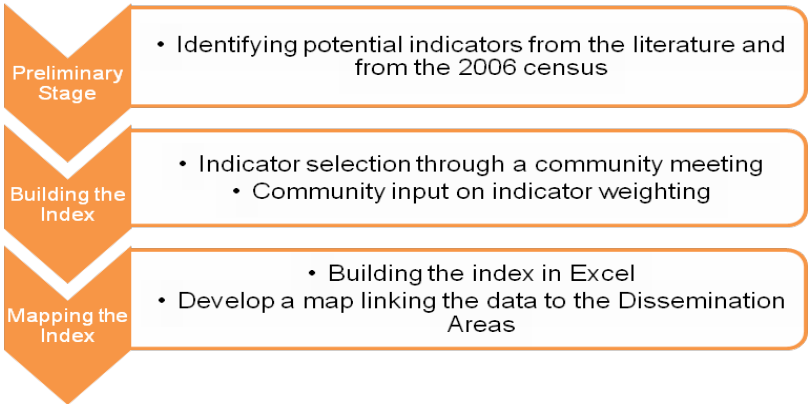
In a large number of deprivation indices studies, the most common way to display the results is in a table together with a listing of names of locations within the region studied. These results do not easily elicit geographic patterns if one is unfamiliar with the region. Using geographic information systems (GIS) to map the results provides visual, user-friendly results and has a broader appeal than tables. The following deprivation studies have been mapped: Broadway, 1992; Coxon, 2008; Langlois & Kitchen, 2001; Bell, et al., 2007; Havard, et al., 2008. The community-based development of this deprivation index made it essential to represent the results spatially. The community organizations that will use the data to make decisions in the community will benefit from the use of visual interpretation

An urban bias is present in nearly every study on deprivation. Most studies are of large urban centres and the social context is different from rural areas and small cities. For example, renting a home in a densely, populated city is not as significant an indicator as renting a home in a smaller community where home ownership is a characteristic of the socially accepted standard of living. This makes it a challenge to adapt our index to the unique geography of our district. A new index was created to better represent our rural, small town, and small city geography. The only rural areas that are represented in the literature are in Quebec (Pampalon & Raymond, 2000), New Zealand (Salmond, Crampton & Sutton, 1998), and France (Havard, et al., 2008). The Canadian studies (Bell, et al., 2007; Broadway, 1992; Broadway & Jesty, 1998; Langlois & Kitchen, 2001; Pampalon & Raymond, 2000) have focused on Canada's major cities, with the exception of rural areas in Quebec (Pampalon & Raymond, 2000). This index is the first to be created to represent rural areas, small towns, and a small city in Western Canada. For more information please see Appendix 1.

METHODOLOGY

Figure 1 summarizes the steps taken to develop and map the deprivation index. Three stages were identified: preliminary stage, building the index, and mapping the index. This section outlines the details of each stage in the creation of the deprivation index.

Figure 1: Project Summary



PRELIMINARY STAGE

A list of potential indicators was derived through a comprehensive literature review (refer to Appendix 1). These indicators were cross-listed with the 2006 Census Canada data to eliminate indicators that were not supported with available census data. These indicators were categorized under seven main headings that were used in the Vancouver Area Neighbourhood Deprivation Index (VANDIX) (Bell et al., 2007): Demographics, Education, Employment, Ethnicity and Language, Housing, Material Wealth, and Mobility.

BUILDING THE INDEX

The list of twenty-five potential indicators that were indentified from the literature was presented to a group of social service professionals at a community workshop (see Appendix 3). The purpose of the workshop was to include the community in the development of the deprivation index through educating the group on the meaning of deprivation, listening to their viewpoints on what deprivation meant to their organization, soliciting their input on the indicators to narrow the list, and having them weight the indicators based on importance.

At the start of the meeting a roundtable discussion assisted in educating the group on what their understanding of deprivation was. A PowerPoint presentation outlined the literature definitions and the group demonstrated through local examples what they perceived deprivation to be. After the presentation and an introduction to the list of potential indicators, some of the comments received reflected the absence of some indicators addressing literacy and homelessness rates that contribute to deprivation in the community. After a brief discussion it was agreed that

for the purpose of this research and the time available this index would be a base with the potential for future development to include local social data.

The list of indicators was narrowed to fifteen from twenty-five. Workshop participants drew on their professional judgement to vote on which indicators contributed to deprivation and were the most relevant to the Kamloops-Thompson school district. Fifteen indicators were chosen to represent baseline deprivation in the Kamloops-Thompson school district. The rationale for this variable selection was based on the overarching theme of how a family might be deprived. The demographic category focused on the inclusion of family populations but was not limited to just this population target (see Table 1 for confirmed list of indicators).

As a final step the group was asked to weight each indicator that fell under each category in terms of their overall significance within that specific category (refer to Table 1). The weighting of the indicators was done through a voting dot session (see Figure 2). Dots were then added up and a percent was created based on the number of people in attendance. For example, the difference between whether someone has a high school diploma or not can influence the level of deprivation. The community group felt that the absence of a high school education was a higher indicator of deprivation and thus attributed a higher weight to that indicator (see Table 1 for a detailed breakdown). Each of the seven categories, noted above, contained the 15 indicators identified by the community group. As per the literature, it is common practice to remain unbiased when weighting all the categories; therefore, the seven categories were weighted equally during analysis.

Figure 2: Community workshop discussion on the weighting of indicators

The table below shows the seven categories of indicators – each category given an equal (one seventh) weight of the index. The table also shows the breakdown of each category reflecting the input by the local professionals at the community workshop.

Table 1: Weightings of Deprivation Indicators

Indicator	Total Votes	Number of Votes	Percent of Indicator Votes	Contribution of Indicator to Index	Contribution to Index
Demographics					14.29%
Size of census family: 5 or more persons	27	6	22.20%	3.17%	
Total lone-parent families by sex of parent and number of children	27	11	40.70%	5.82%	
Female parent families	27	10	37%	5.29%	
Education					14.29%
No certificate, diploma or degree	24	18	75%	10.72%	
High school certificate or equivalent	18	6	25%	3.57%	
Employment					14.29%
Unemployed with children at home	26	26	100%	14.29%	
Ethnicity and Language					14.29%
Total Aboriginal ancestry population	28	17	60.70%	8.67%	
Not Canadian citizens	28	6	21.40%	3.06%	
No Knowledge of English nor French	28	4	14.30%	2.04%	
Housing					14.29%
Rented Housing	21	12	57.10%	8.16%	
Multiple-family households	21	9	42.90%	6.13%	
Material Wealth					14.29%
Median income	26	9	34.60%	4.94%	
Female Lone Parent Median family income	26	17	65.40%	9.35%	
Mobility					14.29%
Non-migrants	24	15	62.50%	8.93%	
Migrants	24	9	37.50%	5.36%	
Total				**100%**	**100%**

MAPPING THE INDEX

The geography for this research is the Kamloops-Thompson School District 73, together with the 183 dissemination areas as defined by Statistics Canada that are located within the district boundaries. The school district extends over a distance of 300km north to south in South Central British Columbia. Dissemination areas are geographic areas that contain populations of 400 to 700 per area. In urban areas, such as the city of Kamloops, they are small in size (a few city blocks) while in rural areas they contain thousands of square kilometres. Approximately 103,000 people live in the study area.

Mapping the index involved several comprehensive steps resulting in a map displaying deprivation in the Kamloops-Thompson School District. The steps involved compiling the Census variables into one spreadsheet, calculating their z-score value, weighting each score according to a weighted indices approach, applying a formula creating a single index value to each dissemination area, linking the index to the spatial data, and mapping the index using a choropleth mapping theme. This process was influenced by the input received during the community workshop.

The deprivation index for each dissemination area was developed using Microsoft Excel by applying statistical and mathematical functions to the 15 deprivation indicators. The deprivation index's purpose was to combine all indictors into one indicator. All the data (15 indicators multiplied by 183 Dissemination Areas) were converted into z-scores by subtracting the mean from the raw score and dividing it by the standard deviation, as seen below.

$$z = \frac{x - \mu}{\sigma},$$

In order to calculate the weights, a weighted indices approach formula was used. The number of variables represented in the index was referenced by N. Z_i is the z-score for the variable. The variable 'i' is the indicator being calculated. W_i is the weighting for the indicator. Please see the formula below.

$$\text{Index} = \sum_{i=1}^{n} w_i z_i$$

Folwell, K. (1995).

The formula was applied to each of the fifteen indicators creating a score for each. These were then added together by dissemination area producing one number for each area and therefore the deprivation index. The resulting indices illustrated the relative deprivation among the 183 dissemination areas within the school district.

As part of presenting the index in map form, the data was linked to the spatial information through the use of geographic information system software, ArcGIS 9.2. The results were displayed in four categories: highest, moderate, low, and lowest deprivation levels. The areas shown "not applicable" were either not statistically significant or the deprivation methodology did not accommodate the unique circumstances of the dissemination area.

The index was mapped using a diverging choropleth theme. Category breaks were defined by the natural breaks in the data. As the geography was quite large two maps were developed to better define the multiple dissemination areas within the Kamloops city limits.

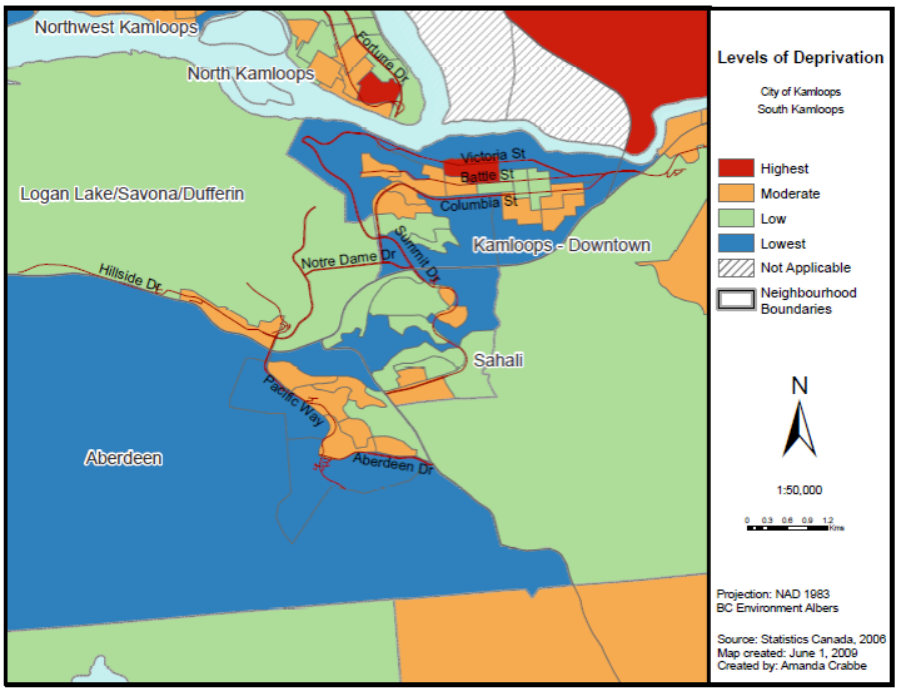
RESULTS

This quantitative analysis presented the trends and anomalies of deprivation within the Kamloops-Thompson School District. Mapping the index provides a unique approach to analysing the results. The table below details the breakdown of dissemination areas by level of deprivation. The two maps below detail the trends and anomalies of deprivation.

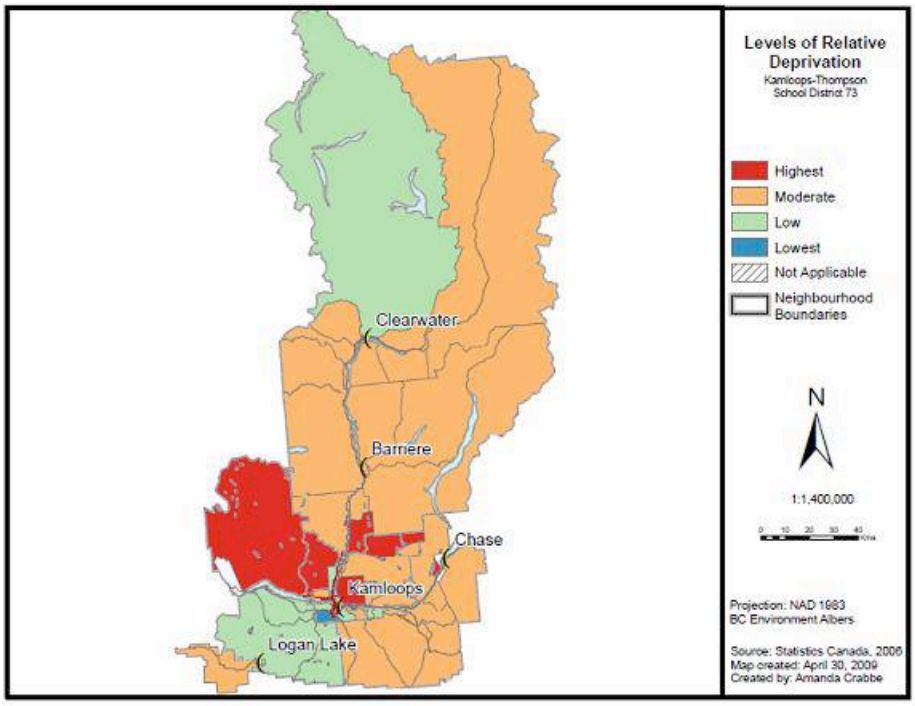
Table 2: Dissemination areas by level of deprivation

Level of Deprivation	Number of Dissemination Areas
Highest	8
Moderate	101
Low	48
Lowest	18

Map 1: Levels of Deprivation: South Kamloops



Map 2: Levels of Deprivation: Kamloops Thompson School District 73



DISCUSSION

In a follow up meeting with the same community professionals as the first meeting, they were asked to identify neighbourhoods or rural communities they felt would have high levels of deprivation. The following areas were identified: Northshore corridor along Tranquille Road, the whole North Thompson, the area around South Sahali Elementary, surrounding Indian Reserves, the area north of Columbia Street downtown, east of Dallas (Pritchard), Heffley Creek/ Whitecroft, Logan Lake, and Chase. In most cases the results were consistent with the expectations of the group. Interpretation of the results also provided unique challenges and led to a discussion about what other factors influence deprivation.

Areas of Aberdeen, Westsyde, Sahali, and Juniper demonstrated the lowest levels of deprivation. This was confirmed by professionals who observed that the people accessing the services do not typically reside in these neighbourhoods. The neighbourhoods of Northshore, Northwest Kamloops, Brocklehurst, and parts of the North Thompson illustrate moderate to high levels of deprivation. Community service providers confirmed the clients accessing their services largely reside in these areas.

Neighbourhoods that represent some of the anomalies include the Northshore, Aberdeen, Valleyview, and Sahali. The Northshore has a number of dissemination areas with low deprivations along the Schubert Drive corridor and can be attributed to a number of different factors. In the past this neighbourhood was recognized as one of the more undesirable places to live, but the peak in our economy in recent years resulted in gentrification, given the lower

property values in this area. The other neighbourhoods of Aberdeen, Valleyview, and Sahali have typically been viewed as having higher socio-economic status. These areas have evolved and have witnessed an increase in rental suites to accommodate university student populations who are often considered to be deprived.

The Kamloops Indian Band dissemination area was withdrawn from consideration because of potentially skewed results stemming from the Census indicators reflecting housing. As on-reserve First Nations neither own nor rent their housing, they were not identified in this indicator but will be considered in future research. First Nations in Chase were not identified, given the lack of data available from the Census for analysis.

Factors such as where someone decides to reside, what their accessibility is to resources, and what the economic conditions are during the Census year greatly affect the results of someone's level of deprivation. Interpretation requires careful consideration and knowledge of the area being analysed.

RESEARCH CHALLENGES

As noted by the community group, Canadian census data was of limited value. Other countries' census information covers data that would be interesting to include. Many indices were a combination of census data and survey results, and not solely census data, whereas, in this study potential indicators were disqualified for lack of time and available data. It would have been more comprehensive to conduct a survey and collect available local data for the Kamloops – Thompson region to indentify relevant indicators such as literacy and homelessness rates to reinforce the indicators that were chosen from Census data. Indicators such as parks per 1000 people and grocers per 1000 people (Eibner, Strum, 2006), would also have contributed to a more comprehensive examination of deprivation.

The use of Dissemination Areas skewed the visual interpretation of the results. It was noted by the community group that the size of particular dissemination areas made it appear that populations were greater in some areas than others. This affected the visual impact of the data. In future, consideration may need to be given to creating aggregations based on a common variable (e.g. income).

It was difficult to develop a the formula in order to create the index. Most reports on deprivation indices do not clearly describe the methodology that was used to create their own index. It was difficult process to find the method to weight the variables in a statistically correct way.

CONCLUSION

The value of this project was the opportunity for community organizations to use the deprivation maps to prove the identification of disadvantaged areas. This aids in the application for funding; the government is increasingly asking for more proof that areas are in need and therefore need resources. This research will benefit community organizations and as a result should positively impact the people who live in the most deprived areas.

Deprivation indices are an aggregation of social indicators combined into one number in order to create an index. The Kamloops-Thompson School District 73 area has a mix of rural, small town, and small city dynamics that make this research unique from other

deprivation indices; most have an urban bias. The methodology created and followed here, identified areas of deprivation that were anticipated to be deprived.

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Amanda Crabbe is a fourth year geography major at Thompson Rivers University and a CURA research assistant. She received a Comprehensive University Education Fund scholarship from Thompson Rivers University to pursue this research. She has worked as a research assistant for Small Cities CURA and the Walking Lab Research Centre at TRU.