Executive Summary

Defining the Suburbs: A Case Study of the Thunder Bay Census Metropolitan Area

Introduction

The purpose of this study is to determine if two previously suggested definitions of suburb proved accurate when tested on a smaller Census Metropolitan Area (CMA), namely Thunder Bay, Ontario. Upon formulating the best definition, the proportion of residents of the City of Thunder Bay will be calculated using GIS software in tandem with Statistics Canada Census data. The research questions to be examined are:

- Are either of the previously suggested definitions used on larger Canadian CMAs sufficient for a smaller CMA such as Thunder Bay?
- Is built form the only, or the best, determinant of suburban development? Can other characteristics be worked into the definition that result in a more accurate overall representation?
- What proportion of the population of Thunder Bay resides in the suburbs based on the tested definitions?

Method

To determine if the definitions being tested are accurate for Thunder Bay, 2006 Statistics Canada Census data will be used together with GIS to create maps of the results of the different definitions. An air photo interpretation will be undertaken based on Google Earth satellite imagery as well as personal knowledge of the CMA. The air photo interpretation will examine various characteristics of the Census Tracts: curvilinear street pattern with numerous T-intersections; homogeneous neighbourhood composition with similar uses grouped together in particular areas of the neighbourhood; predominantly single

family detached housing stock; and large setbacks and side/rear yards. Tracts will be ranked based on how they exhibit the aforementioned criteria. The rank system will be as follows:

1 = Criteria met in a few places across the tract
2 = Criteria met in some places across the tract
3 = Criteria met in many places across the tract
4 = Criteria met almost universally across the tract

Inclusion Criteria

The first definitions to be tested are two previously developed and tested on the CMAs of Montréal and Ottawa. The definition tested on Montréal (coined the Modified Statistics Canada method) was proposed by Statistics Canada Researcher Martin Turcotte and classifies a tract as suburban if 66 percent or more of the housing stock is single family detached. The definition tested on Ottawa was created in response to the first definition and was formulated by Queen's University's School of Urban and Regional Planning alumni Chris Vandyk (2009) for his master's report. This method, coined the Built Form Method, identifies a tract as suburban if 66 percent or more of the housing stock is single- or semi-detached or attached, 25 percent or more of the dwellings have been constructed since 1946, and the ownership ratio is 55 percent or more. The Built Form Method also defines inner city and rural tracts: inner city tracts being those where the ratio of homes constructed prior to 1946 is greater than the CMA average; rural tracts are those with a density of 105 people per square kilometre or fewer.

The two definitions developed for this report examine transportation modal splits as characteristics of suburban development. The two developed methods are the Initial Transportation Method and the Final Transportation Method. The definitions of inner city and rural used in the Built Form method were used in both of these methods.

The criteria for the Final Transportation Method can be seen in Table I. The Initial Transportation method used the same classification system but excluded the Auto-Dominant Suburbs category and instead left some tracts unclassified. The Final Transportation method was developed in response to this inadequacy.

Table I: Final Transportation Method Criteria

	Active Transport Ratio	Transit Ratio	Density
Inner City	>= 1.5 times the CMA average[1]	N/A	>= 105 people per square kilometre
Rural	N/A	N/A	< 105 people per square kilometre
Suburbs	< 1.5 times the CMA average[1]	>= 0.5 times the CMA average[2]	>= 105 people per square kilometre
Auto-Dominant Suburbs	< 1.5 times the CMA average[1]	< 0.5 times the CMA average[2]	>= 105 people per square kilometre

Note: [1] 1.5 times the CMA average active transport ratio is 11.3 percent.
[2] 0.5 times the CMA average transit ratio is 1.6 percent.

Results and Analysis

Examining the results of each of the methods tested against the air photo interpretation, and analyzing the output tables provide a great deal of insight as to the nature of suburban development in Thunder Bay, as well as the feasibility of creating a classification scheme to measure the suburbs and what characteristics need to be included in such a classification scheme to ensure its effectiveness.

Analysis

The Air Photo Interpretation provided a good basis for comparison with the output of each method. The results of each method can be seen in Table II. The first two methods

classified tracts as suburban based only on characteristics of built form, while the other two methods classified tracts based on characteristics of transportation.

Table II: Results Obtained from all Methods Tested, Thunder Bay 2006 Census

	Population	Attached Dwelling Ratio (%)	Tenure Ratio (%)	Post-1946 Construction Ratio (%)	Employees	Automobile Travel (%)	Transit Travel (%)	Active Travel (%)
CMA Statistics	122,907	67	67	74	56,535	88	3	8
Air Photo Interpretation Suburbs	65,089 (53%)	71	71	80	30,245 (53%)	89	3	6
Modified Statistics Canada Method Suburbs	89,507 (73%)	83	81	83	N/A	N/A	N/A	N/A
Built Form Method Suburbs	33,826 (28%)	80	81	91	N/A	N/A	N/A	N/A
Initial Transportation Method Suburbs	51,659 (42%)	74	74	80	24,410 (43%)	89	3	6
Final Transportation Method Suburbs	66,826 (54%)	77	76	83	31,695 (56%)	90	3	6

As evidenced in the table above, the Final Transportation Method produced results closest to the Air Photo Interpretation. It should also be noted that the Modified Statistics Canada Method highly over-estimates the suburbs, while the Built Form Method significantly underestimates the percentage of suburbs in the city; both methods left a number of tracts unclassified. Looking at the results of the methods focusing on characteristics of built form, it became apparent that alternate characteristics of suburbs needed to be examined. This is where the transportation methods developed. The Final Transportation Method (Figure I) was developed to address these unclassified tracts, and as such a new category was created to include those tracts where the automobile is dominant form of transportation. The results for each method tested can be seen in Table III.
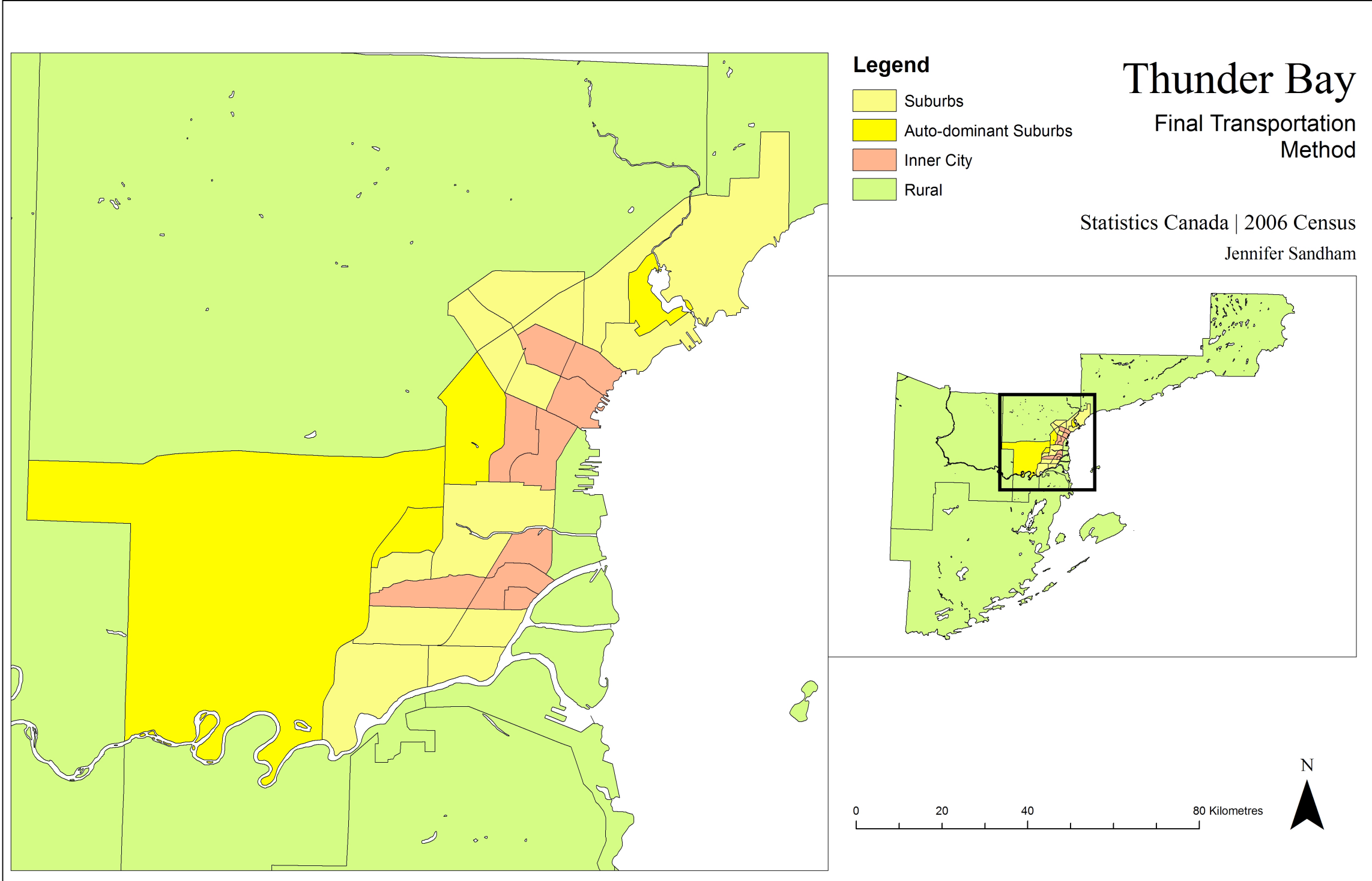
[iv]

Figure I: Final Transport Method Map

Legend
- Suburbs
- Auto-dominant Suburbs
- Inner City
- Rural

Thunder Bay

Final Transportation Method

Statistics Canada | 2006 Census

Jennifer Sandham

0   20   40   80 Kilometres

N

[v]

Table III: Classification Statistics for All Methods

	Inner City	Rural	Suburbs	Auto-Dominant Suburbs	Unclassified
Air Photo Interpretation	N/A	N/A	65,089 (53%)	N/A	57,818 (47%)
Modified Statistics Canada Method	N/A	N/A	89,565 (73%)	N/A	33,342 (27%)
Built Form Method	46,948 (38%)	25,035 (20%)	33,826 (28%)	N/A	17,098 (14%)
Initial Transportation Method	29,514 (24%)	37,289 (30%)	51,659 (42%)	N/A	4,445 (4%)
Final Transportation Method	29,514 (24%)	26,567 (22%)	51,659 (42%)	15,167 (12%)	N/A

The Final Transportation Method shows that 66,826 people in the Thunder Bay CMA live in suburban areas, which accounts for approximately 54 percent of the total population. The suburbs in this method are the combined categories of the suburbs and the auto-dominant suburbs. Of the suburban population identified by this method, 90 percent rely on the automobile as their primary mode of transportation for daily activities; six percent rely on modes of active transportation, and three percent on public transit. This is a significant point when one considers the implications of suburban development on urban areas, and how a city with over half of its population residing in suburban areas must deal with these implications.

Conclusions and Recommendations

Findings

The purpose of this study was to test two previously suggested methods (Turcotte, 2008; and VanDyk, 2009) on the City of Thunder Bay, and to devise a more fitting classification scheme if the other two proved inadequate. The study also sought to determine the proportion of Thunder Bay residents living in suburban neighbourhoods. The results from these methods were compared to the Air Photo Interpretation, and it was found that they did not accurately represent Thunder Bay's suburbs. From here it was decided that the focus should be shifted from characteristics of built form to transportation modal split for the journey to work.

The Initial Transportation Method, although more accurate than either the Modified Statistics Canada and the Built Form Method, still left a number of tracts unclassified. The Final Transportation Method was developed to address these unclassified tracts, and proved to most accurately mirror the air photo interpretation. The Final Transportation Method defined 54 percent of Thunder Bay's population as suburban, while the Air Photo Interpretation identified 53 percent of the population.

These findings are consistent with the literature, of which the general consensus is that the city's suburban area now constitutes the majority of the city. One of the unique characteristics of the City of Thunder Bay is that it has undergone little development in recent decades, but the development that has occurred has been largely single-detached homes (Canada Mortgage and Housing Corporation, 2009). This is typical suburban development that consumes vast areas of land and may be inherently unsustainable.

In comparing the results for the Thunder Bay CMA to other cities across Canada it becomes apparent that there are great differences in the amount of suburbanization experienced by different cities across the country. Smaller CMAs such as Thunder Bay and Kingston seem to have seen slower development and therefore less suburbanization than larger CMAs, such as Toronto, Vancouver, and Hamilton. This realization paints an interesting picture in considering the impact of development in these larger cities.

Conclusions

Suburban development in Thunder Bay does not follow either of the models focusing on built form. As these methods proved inadequate a method involving transportation modal split was devised which represented Thunder Bay's suburbs more accurately. The Final Transportation method distinguishes between suburbs and auto-dominated suburbs, as there is significant variation in the ratio of people using transit between suburban tracts. The difference between the two designations in the suburbs, the transit usage ratio is 0.5 times the CMA average or greater, and in the auto-dominant suburbs the transit usage ratio is less than 0.5 times the CMA average. Thus, using this method 54 percent of Thunder Bay's population reside in either a suburb or an auto-dominant suburb.

Recommendations

In order to determine the effectiveness of this definition for delineating the suburbs in other Canadian CMAs it needs to be tested on other cities by experts on the cities to ensure the tracts being defined as suburbs by the GIS are in fact suburbs on the ground. Once all the cities have been tested and a definition has been found that works for all CMAs, the number of Canadians residing in suburbs can be determined and the full extent of suburbs development in Canada can be understood. From here, researchers can begin to grasp the full

implications and effects of suburban development on the Canadian landscape. Policy makers can then begin to implement legislation to intensify cities and attempt to curb further sprawl around the country's larger centres.