#### ABSTRACT

The purpose of this research is to observe and analyze trends in Canada's metropolitan and non-metropolitan age structure by comparing census years 1971 and 1981. In an effort to identify salient temporal and spatial trends, two types of analyses will be conducted: the index of age diversity and the cluster analysis. These analyses will be applied to age data taken from the 1971 and 1981 censuses. Twenty-five metropolitan areas and non-metropolitan areas were used and aggregated ten provincially. The age structure was divided into seven age groups. The research shows that variations in conditions over space and time affect age composition to some extent. Although diversity may be similar, the internal degree of the age be different. The research will also invalidate composition may the claim that city size is correlated with their index of age diversity. Factors such as fertility, changes in the role of women, increases in life expectancy, sex ratios, marital status, migration, and cultural practices are offered as determinants of age composition and change.

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Development of Canidis metropolitan non-metropolitan age studien: a companion of census years 1971 and 1981.

1990

HAMILTON, ONTARIO

#### ACKNOWLEDGEMENTS

I would like to take this opportunity to thank all those who have offered their help in one way or another to complete this research. Firstly I would like to thank God for his many graces and periods of inspiration. My deepest thanks to my advisor, Dr. Yorgos Papageorgiou for his extensive support, guidance and time. In a very special way Yorgos has inspired me with his ingenious suggestions, patience and concern. Thanks Yorgos. I would also like to thank Rosanne Valeri who took the time to assist me with the SPSSx software. My appreciation also extends to Dr. McCann and Dr. Taylor for their questions and comments. Last but not least I would like to thank Ken Jobity for his utmost patience and kindness throughout these trying times.

TO JESUS AND MARY

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#### CHAPTER ONE INTRODUCTION

Factors relating to the nature of the Canadian age structure have always been a political concern. Continual monitoring of inter-provincial migration, concerns over senior citizen's health care services and the need to produce efficient immigration policies exemplify the extent of age related differences within Canada. Challenges facing the nature of Canada's economic, social and cultural well being are perpetuated by the uneven spatial distribution of the age structure. The complex interplay of variables on the age structure creates a demand for continual monitoring of its changing nature. In an effort to provide efficient social services, it is therefore necessary to conduct studies that will address these challenges.

The continued significance of the age structure is the underlying force behind this study. The purpose of this study is to observe and analyze trends in the Canadian metropolitan and non-metropolitan age structure by comparing census years 1971 and 1981. Specific statistical tests will be conducted in an effort to analyze changes in the specified period. Consequently, an effort will be made to explain the reasons for the observed changes.

Several research questions will construct the basis of the paper. One important research question would be to determine how the age structure varies over time and space. Differences among metropolitan areas in Eastern. Central and Western Canada would allow one to expect variations in the age structure among such

areas as PEI., Toronto and Vancouver respectively. In addition to this, variations are expected to exist between 1971 and 1981. Another important research question would be to determine the degree of homogeneity among metropolitan areas across Canada. This in turn will help to categorise metropolitan areas based on their similarities. The question of the relationship between age composition and city size is also valid. One would expect a larger working class cohort in larger cities such as Toronto than in ST. Johns Newfoundland. Such a speculation can be confirmed by testing the correlation of city size to the Index of Age Diversity. The researcher shall also attempt to determine the degree of homogeneity among non-metropolitan areas and whether they are more homogeneous than metropolitan areas.

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The next section will discuss literature relevant to the study of the age structure. It will also attempt to place the present study in its appropriate literery context. The review will be followed by an examination of the data source, organization and research methodology that was employed. The completion of this task will be followed by the results obtained from the various analyses. In addition, some comments will be made as to why certain conditions emerged.

#### CHAPTER 2 LITERATURE REVIEW

#### 2.1 INTRODUCTION

The study of the Canadian age structure draws information from a wide range of variables and disciplines. Research may be attempted from a geographical, sociological, historical, or political perspective, thereby including virtually all of the humanities and social sciences. The age structure may also be studied with respect to a number of variables such as mortality, life expectancy, sex, immigration, fertility, education and occupation. In addition to this, the researcher may choose to examine many characteristics of one age composition or one characteristic of many age compositions over time and space. The choice of geographical scale may be national or regional or may be confined to an urban or rural level. As a result of the many variables, disciplines, methods of approach, geographical scales and variety of age compositions, it can be seen that the Canadian age literature is varied and extensive.

For our purposes it is necessary to identify specific topic areas because of their importance to the present study. Six such areas include population projections; age relations; demographic analyses of fertility; social policies; social implications of the elderly; and age compositions. The current study addresses the final category as it will examine the changing nature of the Canadian age structure of selected metropolitan and nonmetropolitan areas between 1971 and 1981. Selected literary works

from this category will be addressed in an effort to illustrate the types of studies done in relation to the age structure and the results obtained. In an effort to obtain a complete analysis and understanding of the age structure, it is necessary to examine all of these categories.

#### 2.2 THE MEANING OF THE AGE STRUCTURE

It ÍS important to understand the meaning of the age structure before attempting any research on the topic. According to Havens (1981) , the meaning of the age structure is a function mortality, fertility and migration. The difficulty of Оf predicting fertility rates creates problems for projecting future population structures. However, this difficulty is lessened for those who are already born and are aging. Mortality rates project less difficulties than fertility rates because they a tendency to more constant than fertility rates. In contrast, migration be estimates are extremely variable due to its constant changing nature to satisfy social and economic needs. Clark (1977) stating that the elaborates on these three variables by proportion of the adult population in any country vary greatly. The adult population is inversely related to the levels of fertility and mortality. The only exception being changes in migration. Clark argues that the age structure is also determined by quantitative aspects such as sex ratios, marital status, the size and composition of familles and households, economic

activities, language, religion and the changing role of women. A significant contribution is the belief historical but that salient factors of the age composition is related to population "checks" (Malthus 1830). Malthus believed that the nature of the is determined by favorable or unfavorable age structure various times. Being one circumstances at the first of demographers, Malthus set the stage for indept research on the age structure. All of these studies have contributed to an intrinsic understanding of the age structure and are therefore significant to the current research.

#### 2.3 AGE RELATIONS

Literature relating to age relations was also reviewed. Understanding the nature of age relations allows the researcher to explain the Canadian age structure more efficiently. Extensive research on such relations was done by Frederick Hill (1976) in which he examined metropolitan differences in age structure and age structure and housing characteristics; family size; segregation of age groups and the spatial pattern of age groups. differences In metropolitan age to Hill, the According distributions are due to age-sex selectivity, in-migrant and outmigrant streams and differences in fertility rates. He noted that cities with high rates of net in-migration tend to be predominantly composed of young adults and hence young children in their age profile. In addition to this, Hill showed that the

nature of housing demand is directly related to household characteristics such as mature families, young singles and childless couples.

Hill's study is particularly relevant due to the use of an index of age diversity, also being used in the present study. The index was used to determine the segregation of age groups. Hill found that larger cities were more segregated than smaller ones. Also, Hill noted that the zonal arrangement of age groups was strongest in cities with a rapidly growing mobile population. A detailed explanation of the index will be given in the chapter on methods of analysis.

#### 2.4 DEMOGRAPHIC ANALYSES OF FERTILITY AND SOCIAL POLICIES

Studies concerned with the demographic analysis of fertility age compositions have been reviewed because of the direct and impact that fertility has on the age structure. Grindstaff (1975) has produced a study on the baby bust in Canada. He noted that fertility rates are at a historic low in Canada and this trend is expected to continue. The increasing rate of childlessness for women at all age levels will contribute to this trend. Grindstaff indicates that fertility in terms of the number of children per family is decreasing, but that the number of families without is also increasing substantially. Bumpass (1972) adds children further that low fertility rates with minor fluctuations will be the norm for the future. From the contributions made by

Grindstaff and Bumpass, one can assume that future age pyramids will become narrower at the 0-14 age cohort.

In contrast, a study by Blake (1973) indicates that current low levels may simply be due to recent changes in the timing and spacing of children. Such insights into the nature of Canadian fertility will have an impact on the age structure. It is therefore imperative that the researcher be aware of such trends.

In exploring studies concerned with social policies and the age structure, the researcher is better able to observe impacts that the age structure has on social policies and vice versa. Myles (1981) suggests that the problems imputed to an aging society are both political and economic. Increased costs of supporting an older population and productivity effects generate inter-generational "class struggles". The issue is not the level of wealth available to support the elderly but its distribution. Myles also notes that the growing lack of fit between social institutions and "the population structure generates pressure for institutional adaptation. Health needs of an aging population would require extensive preventative and prosthetic care.

In a similar vein, Martin (1981) foresees an increase in the burden of retirement income and other public programs especially if early retirement reduces the number of workers. Such important contributions by Martin and Myles would obviously enhance the present research.

#### 2.5 SOCIAL IMPLICATIONS OF THE ELDERLY

A review of studies dealing with the spatial distribution of the elderly was also done. It must be realised that changes in any age group affects the entire age structure. Rosenberg, Moore and Ball (1989) conducted an intensive study on the spatial distribution of the elderly in Ontario. They noted that although the elderly population is increasing rapidly, the pattern of change is not uniform. The study made the important observation that the relative importance of net migration is less for the elderly than for other age groups. Rosenberg et al indicates that the structure of the age pyramid at higher ages is important in terms of economic and social implications of aging. The decline of the elderly in certain areas implies a degree of vulnerability of communities to policy changes that would sustain effective levels of service. It is clear therefore that these findings are directly related to trends in the age structure over space and time.

#### 2.6 AGE COMPOSITIONS

One can appreciate the significance of studies dealed especially with Canada's age composition. A review of such studies provide the researcher with the opportunity to analyze various approaches and techniques used in age research and to observe past results and trends. Eilen Gee (1981) contributed

greatly to the understanding of Canada's age structure by looking at it's social implications. Like Myles (1981), Gee agrees that the key issue of the future for an aging population is its than the actua! changing age composition rather size of the dependent population. Gee strongly believes that demography is not destiny but that demographic forces in relation to economic, political, ideological, historical and cultural forces will be responsible for the shape of the Canadian age structure. Another interesting point made by Gee, is that population aging is the unplanned byproduct of planned parenthood. Gee shares the view of demographers that cohort fertility is steadily many other declining. However, Gee feels that period fertility is unsteadily declining. Cohort fertility refers to the average number of children that a woman bears and period fertility to the number of babies at a given time. As a result, family sizes will remain low, but period fertility will fluctuate.

In addition, the consequences of small families will include a change in the roles of women; and intergenerational conflict. With regard to fluctuations in period fertility, frequent changes in immigration policies is inevitable. Intergenerational conflict will also occur due to the fact that ethnic/racial stratification is superimposed by age stratification. Such information proves to be very useful in determining the spatial and temporal trends of the age structure.

Statistics Canada is clearly a source for studies on age compositions. Profile studies can be found for a number of topics

including the age structure. The 1971 volume considers how the age structure has changed from the previous census in addition to regional variation and urban-rural differences. Such factors as demography, culture and economic situations are reviewed to determine the effect on the total population. Findings by Statistics Canada provide valuable insights into the nature of trends that should be identified when reviewing age structures.

#### 2.7 CONCLUSION

It can be seen that literature on the Canadian age structure is very diverse and categorical. However, the relationship between these categories is intrinsic. This review has shown that knowledge from various age related topics is required for a full understanding of any aspect of the age structure. The review has also provided salient background information of the past approaches used in the study of the age structure and the nature of results obtained.

#### CHAPTER 3: DATA SOURCE AND RESEARCH METHODOLOGY

#### 3.1 INTRODUCTION

This chapter provides information concerning the source of the data and organization, methods of analysis employed and their design. The two analyses to be discussed are: the index of age diversity and the cluster analysis. Each analysis has been used to address one or more of the research questions defined previously.

#### 3.2 THE DATA: SOURCE AND ORGANIZATION

The data to be used in this study comes from the 1971 and 1981 Canadian census and is organised on a metropolitan and nonmetropolitan basis. Twenty-five Census Metropolitan Areas have been selected in addition to ten non-metropolitan areas which have been aggregated provincially. Seven age cohorts have been used for each of these areas in an effort to categorise the population. The areas and categories are listed in Appendix A. These age cohorts have been directly adopted from the census. The number of people in each age cohort, in a particular place and at a particular time is expressed as a percentage of the total population.

#### 3.3 METHODS OF ANALYSIS

#### 3.3.1 THE INDEX OD AGE DIVERSITY.

In an effort to draw some conclusions concerning Canada's changing age composition, two tests will be applied to the data base. The first test to be conducted is the index of age diversity. The index is given by;

 $|-\xi P|^2$ where Pi is the proportion of an urban area's population in the ith age group. The index reveals a value of zero when everyone in the urban area is within the same age group (Hill, p. 258). Conversely, the index yields a maximum value of .8889 if each of the seven age cohorts being considered accounts for one-seventh of the metropolitan population. This index will be calculated for the years 1971 and 1981 for the twenty-five metropolitan and ten non-metropolitan areas selected across Canada. It will be used to determine how age compositions vary between metropolitan areas. whether there exists a correlation between age diversity and clty size and whether or not metropolltan areas are becoming more diverse in nature. In addition to this, the index will be applied to non-metropolitan areas. This application will attempt to determine whether non-metropolitan areas are becoming more diverse or homogeneous and to see how they compare with metropolitan areas.

#### 3.3.2 THE CLUSTER ANALYSIS

The second test to be carried out is a cluster analysis. The cluster analysis provides a good visual demonstration of spatial similarities and dissimilarities between metropolitan and nonmetropolitan areas. The aim of this test is to produce a metropolitan regionalization based on age composition.

In this research, the CLUSTER feature available on SPSS<sup>X</sup> was applied. The cluster feature uses an agglomerative process which computes the proximities between individual cases and combines the two nearest clusters to form a new cluster. It then recomputes the proximities between existing clusters and the new cluster. Nearest clusters are then recombined until all cases have been combined in one cluster (SPSS<sup>X</sup> INC., 1986). This entire process yields a hierarchy of cluster solutions ranging from one overall cluster to as many clusters as there are cases.

With regard to the present research, clustering will be applied to all twenty five CMAs and ten non-metropolitan areas incorporating all seven age cohorts of the age structure for 1971 and 1981. Although seven clustering methods are available, the single linkage or nearest neighbour method was selected because it clusters those cities that are closest in proximity or "most similar". A certain number of clusters are expected in this distribution. Each cluster will represent those metropolitan areas that are similar in terms of age structure. The number of clusters range from one to twenty-four which gives a complete

hierarchy of spatial associations and age similarities and dissimilarities. It is expected that cities with similar age structures will be evident when the cluster analysis of age groups are considered together. The output is in the form of a vertical icicle plot and agglomeration schedule which will be further described in the discussion of the results.

#### CHAPTER 4 THE RESULTS

#### 4.1 INTRODUCTION

The results of the two analyses reveal some interesting observations with respect to the Canadian age distribution. In general, the observations appear to be spatial, economic and temporal in nature and will be used to address the initial research questions. The results of each test will now be examined.

#### 4.2 THE INDEX OF AGE DIVERSITY

The index of age diversity provided a useful summary measure of the age composition in metropolitan and non-metropolitan areas. Table 4.2.1 illustrates the 1971 and 1981 age index calculated for each area in addition to a list of the differences in these indices over time.

| PLACE   | Table | 4.2.1 | SUMMARY OF L<br>METROPOL<br>1971   | NDEX OF  | AGE DIVERS   | ITY |
|---|-------|-------|--|--|--|-----|
| 1<br>7<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>8<br>9<br>0<br>1<br>2<br>3<br>4<br>5<br>8<br>9<br>0<br>1<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2<br>2 |       |       | .804<br>.816<br>.827<br>.827<br>.793<br>.824<br>.824<br>.821<br>.824<br>.821<br>.824<br>.821<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.827<br>.824<br>.824<br>.827<br>.824<br>.824<br>.824<br>.824<br>.824<br>.824<br>.824<br>.824 | 43684583562227233344213570<br>888888888888888888888888888888888888   | - 320<br>- 016<br>- 013<br>- 030<br>- 016<br>- 025<br>- 015<br>- 015<br>- 014<br>- 015<br>- 014<br>- 019<br>- 034<br>- 019<br>- 034<br>- 015<br>- 014<br>- 015<br>- 017<br>- 019<br>- 016<br>- 015<br>- 015<br>- 015<br>- 017<br>- 019<br>- 016<br>- 015<br>- 015<br>- 017<br>- 019<br>- 016<br>- 015<br>- 017<br>- 019<br>- 016<br>- 017<br>- 019<br>- 016<br>- 017<br>- 019<br>- 017<br>- 019<br>- 018<br>- 017<br>- 019<br>- 016<br>- 017<br>- 019<br>- 017<br>- 019<br>- 017<br>- 019<br>- 019<br>- 019<br>- 019<br>- 010<br>- 009<br>- 008<br>- 008<br>- 008 |     |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9<br>10   |       |       | NON-METROP<br>.773<br>.817<br>.808<br>.845<br>.807<br>.822<br>.815<br>.822<br>.815<br>.821<br>.811<br>.313   | DLITAN<br>•811<br>•839<br>•835<br>•835<br>•842<br>•836<br>•836<br>•836<br>•836<br>•836<br>•836<br>•836<br>•836<br>•836<br>•836 | • 0 37<br>• 0 22<br>• 0 24<br>• 00 9<br>• 0 20<br>• 0 19<br>• 0 14<br>• 0 12<br>• 0 21   |     |



Figures 4.2.1 and 4.2.4 have been included in an attempt to illustrate spatial clustering. numerical IS any The code figure explained in Appendix B. As seen from 4.2.1, a spatlal distinction сап be made. Metropolitan areas in Eastern Canada

ISDEX

appear to be less diverse than those in Ontario and especially the West. That is, in general there is a greater age hamageneity in Eastern Canada than Ontario and the West. Strong historical forces and cultural practices of the Atlantic provinces and Quebec may directly or indirectly account for their homogeneity. With the exceptions of Montreal and Quebec city, this area experiences comparatively less migration flows which can also be a determining factor in age group homogeneity. The overall high diversity in Western Canada may be the result of continued movement to Canada's "western frontier" in the 1970's. More specific forces that share some of the responsibility for certain diversities could be economic growth, cultural policy and climate.

The most diverse metropolitan areas for 1971 were Victoria. Vancouver and Winnipeg. For 1981 the most diverse were Victoria, Vancouver and St. Catherines. Interestingly enough, the data shows that most of these increases in Victoria, Vancouver and Winnipeg occurred in the 25-34 age group rather than the 65+ age group as expected. In addition to this, the 0-14 age group experienced a substantial decrease in all of these areas. Employment opportunities in the 1970's and changes in attitudes toward fertility are clearly evident here. With regard to homogeneity, the most homogeneous cities for the same years were Chicoutimi and Calgary. Again, economic, cultural and historic forces may be responsible for the above individual extreme cases. l n the case of Calgary however, migration forces may have

stabilised by the year 1981 to account for its homogeneity.

Sudbury experienced the most substantial increase i n diversity from .79 in 1971 to .83 in 1981 which constitutes a difference of .03. Comparative graphs indicate a substantial decrease in the 0-14 age group and a surprising increase in the 65+ age group. Like most areas, the decrease in fertility is expected. More in-dept analysis indicates that the increase in the 65+ age group is a result of the ageing of a particular age cohort. It must be noted that all of the twenty-five areas increased in age diversity between 1971 and 1981. These increases ranged from .03 in Sudbury to .008 in Victoria. It is clear there is a tendency for cities to become more therefore that diverse over time. Diversity therefore, indicates a general flattening of the age structure which in this case, is indicative of an ageing population. On average, the Canadian city changed very little in age diversity between 1971 and 1981 with a mean of .017. Comparisons can be made at this point between the present research and Hill's study on age compositions. Like Hill, the research found that age diversity tends to be highest in cities with high rates of in-migration. Such as the cases in Victoria and Vancouver. However, the minimal increase in age diversity between 1971 and 1981 is not surprising in light of the more reserved immigration policy imposed by the Green Paper in the mid 1970's.

In a similar vein, casual empiricism suggests that some correlation may exist between city size and age diversity. Very

large citles such as Vancouver and Toronto with indices greater than .84 support this view. However, cities such as Sudbury and Hull suaaest that not the only factor influencing size IS diversity. These two cities have indices in the .83 and .84 range structure. Yet, the population of reflecting their diverse age these two Census Metropolitan Areas (CMAs) in the 100,000 are range. So, the hypothesis that city size is correlated with age diversity cannot be drawn. Figures 4.2.2 and 4.2.3 illustrate clearly that the two are not positively related.







non-metropolitan ١n areas which were also aggregated provincially, the east-west distinction is not as clear. As can be seen i n figure 4.2.4, Prince Edward Island was the most diverse in 1971 whereas Newfoundland of the same area was the

21

FIG. 4.2.3

most homogeneous.



Both British Columbia and Nova Scotia shared similar indic. (.81). This reinforces the claim that high age diversities in Western metropolitan areas were fueled mainly by in-migration due

to economic growth. In 1981, non-metropolitan Ontario was the diverse and Newfoundland the least. All non-metropolitan most areas increased in diversity with the exception of Prince Edward Island. This area experienced an increase in the 0-14 age group from 18% to 25%. Prince Edward Island is a rural area with rural tendencies toward fertility which may account for this unique feature. Although the increases in diversity for the nonmetropolitan areas were small, with a mean of .012, it is interesting to note the similarity between metropolitan regions non-metropolitan regions in terms of overall increases. and Surprisingly high indices of .83 and .84 occurred in some nonmetropolitan areas. These areas were expected to be more homogeneous than the CMAs. Since smaller cities within the urban hierarchy have been considered "non-metropolitan", this trend is not very odd. It must be noted that the inclusion of smaller urban centres greatly contributes to the diversity of this non-metropolitan category. Non-metropolitan

in this case is not synonymous with non-urban.Comparatively, nonmetropolitan areas appear to be more homogeneous than metropolitan areas.

It must be noted that although the index of age diversity is a summary measure of age diversity, it does not actually reveal specific changes in proportions between age groups in a particular city, but rather indicates overall change. The index however, does highlight many salient features of Canada's age composition.

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#### 4.3 THE CLUSTER ANALYSIS

The cluster analysis was used in an effort to group cities into relatively homogeneous clusters based on age distribution. From this, a metropolitan and non-metropolitan age regionalization was produced. By conducting the analysis for 1971 and 1981, temporal and spatial changes in clustering could be observed.

|   | 15:19:22                                     | Computing                             | Information   | n Servicos IBM<br>• • + H I E R   | 4381-3<br>A R C H I  | VH/S<br>CALC  | PREL 4.<br>LUSTE                       | R A   | N A | LY | s | 15 |
|---|--|---------------------------------------|---|---|----------------------|---|--|---|-----|----|---|----|
|   | Aggi omer<br>Stage                           | ration Sched<br>Clusters<br>Cluster 1 | Combined<br>Cluster 2   | Coefficient   | Stage Clu<br>Cluster | uster 1st<br>r 1 Clu  | Appears<br>ster Z                      | Next<br>Stage                                     |     |    |   |    |
| 1 | 123456789011123<br>9011123<br>11671890221234 | 52408794734935522222222               | 17<br>23<br>12<br>18<br>14<br>15<br>10<br>16<br>11<br>20<br>3<br>19<br>22<br>24<br>24<br>25 | $\begin{array}{c} 1,235600\\ 1,310996\\ 1,517723\\ 1,940585\\ 2,9540585\\ 2,9540585\\ 2,9544043\\ 2,174705\\ 2,352166\\ 3,352166\\ 3,40735166\\ 3,407352665\\ 3,407352665\\ 3,407352665\\ 3,407352665\\ 3,407352665\\ 3,620486\\ 3,760386\\ 3,760391\\ 42,7603$ | 1                    | 0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0<br>0 | 00000530000000000000000000000000000000 | 197569214323756789012340<br>111112211156789012222 |     |    |   | )  |

Table 4.3.1 shows an agglomeration schedule for the twentymetropolitan areas. This aggiomeration illustrates the five 1971 stages of clustering and the corresponding proximity values at which items and clusters combined to form new clusters. At each stage, the schedule also shows the prior cluster levels at which the combining clusters were formed , and the following stage at which the cluster combines with another. A zero value indicates no subsequent stage. Each cluster no prior stage or is represented by a single number or item, that is, cluster one of items clustered. Therefore, the cluster of five and the two seventeen in stage one will be represented by а five in subsequent stages.

Figure 4.3.1 shows a vertical icicle plot used to complement the agglomeration schedule. This is a visual representation of the clustering process described in the schedule. The vertical icicle plot uses the single or approximate neighbour linkage method and is a complete plot of all cluster levels. Groups that are clustered together in the early stages of the plot (or schedule) are most similar while those grouped together in the latter stages are less similar. This point is reinforced by the magnitude of the proximity values which increases as the clustering progresses from many independent clusters to one overall cluster. The number of clusters or the cluster stage is shown on the vertical axis while the case label for the CMA or non-metropolitan area is shown on the horizontal axis.

DATA DEFINITION FILE 19-Jan-90 VM/SP REL 4. Computing Information Services IBM 4381-3 15:19:23 • • • • • • • • • • • • • • • • HIERARCHICAL CLUSTER ANALYSIS \* Vertical Icicle Plot using Single Linkage (Down) Number of Clusters (Across) Case Label and number ŝ  $\begin{array}{c} 2 & 2 & 1 & 1 \\ 1 & 0 & 0 & 3 \\ x x x x x x x x x x x x x x x x x \end{array}$ 17 19 1 16 1 18 6 7 24 122 23 .9. 3. 123456789012345678901234 : \*\*\*\*\*\*\*\*\*\* ł \*\*\*\*\* \*\*\*\* \*\*\*\*\* ١ .

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FIG. 4.3.1

Specific spatial trends emerge in the 1971 data for the twenty-five census metropolitan areas. In stage one, the first metropolitan areas to cluster were Montreal (5) and Toronto (17). These two cities though spatially separated share some similarity in age distribution. In stage two, the cluster changes to include Calgary (22) and Edmonton (23). This clustering appears to be spatially oriented with both cities being within close proximity to each other. The clustering of these cities in the first two stages is indicative of economic and spatial similarities.

In stage three, St.Catherines (14) and Thunderbay (16) cluster together. These two metropolitan areas show rather strong similarities despite the distance between them. This situation is repeated within some clusters to follow. In stage four, Regina (20) and Saskatoon (21) cluster showing a strong spatial age similarity as illustrated in stage two. A strong Quebec regional cluster emerges in stages five and six, between Trois Rivieres (8), Ottawa (13) and Quebec City (7). Thus, these CMAs are highly similar in terms of their age distributions which is logical in light of their spatial proximity.

In stages seven through fourteen, evidence of Ontario and Atlantic clusters emerge. Hamilton (9) joins the St.Catherines (14) cluster, and Chicoutimi (4) and Sudbury (14) create a group. By stages twelve and thirteen, a clear Ontario regional cluster emerges as London (11) joins Thunderbay (16) and Hamilton (9) joins Windsor (18) in age similarity. Despite the size difference

between London and Thunderbay, their age distributions are fairly similar. This result is again supportive of the fact that age diversity is not necessarily correlated with city size alone as was also suggested by the index of age diversity.

Up to stage fourteen, the linkages have been for the most part between intra-regional areas. One would expect CMAs that are closely located to have higher levels of similarity in terms of their age structure because they are more likely to share populations with similar age compositions. The individual Quebec clusters for example, were expected because of their similar demographic experiences, and the Ontario cases by virtue of economic changes encouraging intra-regional migration.

By stage fifteen, inter-regional linkages begin to occur. Kitchener (10) and Regina (20) cluster while Saskatoon (21) and St. John (3) both from spatially distant areas are clustered. It is interesting to note that inter-regional linkages occur between some CMAs before certain intra-regional linkages. Hull (6) and Chicoutimi (4) prove to be more similar to Ontario CMAs than to Montreal (5). This trend can be explained by Montreal's disproportionate share of the working class age cohort. Similarly, London (11) joins the Western cluster because of its unique attraction to the professional working class. The area may therefore be attractive to professional immigrant populations.

Ontario, Quebec and Atlantic CMAs continue to cluster and by stage eighteen, a high degree of cohesiveness occurs among them suggesting that the degree of similarity between the clusters is

beginning to diminish. With this fact in mind, one realizes that those CMAs joining clusters in the later stages of the analysis tend to be quite diverse and age unique. It is here that Quebec and Ontario CMAs cluster with Western CMAs. Oshawa (12) and Chicoutimi (4) cluster with Edmonton(23) and Vancouver (24) respectively. The only two Western CMAs that appear to be similar are Winnipeg (19) and Calgary (22) at stage nineteen. While these CMAS do form a cluster, the strength of their similarity is not very great due to the late stages in which they appear. St Johns (1) and Halifax (2) join the Atlantic cluster in stage twenty four. While they are spatially close to each other, they are significantly different as well, as indicated by the lateness of their inclusion in the cluster. Economic differences in these two CMAs may account for their dissimilarity in age structure. In the final stage Hull (6) joins Victoria (25). These CMAs join last because they are most homogeneous and most diverse respectively. These trends described for 1971 are consistent with similarities in the age diversity indices.

After examining the cluster process for metropolitan areas in 1971, it is clear that an absence of age similarity among metropolitan areas of the same region exist. There appears to be an economic and spatial clustering among certain CMAs. Montreal and Toronto for instance revealed the strongest age similarity in 1971 which appear to be economic in nature. Individual spatial clusterings occurred in the Quebec, Western and Ontarlo regions. These intra-regional clusterings however, do not develop into and

aggregate trend. For instance, in stages five and six, a Quebec clustering develops. This is followed by an Ontario clustering. The next Ontario cluster does not appear until stage twelve and Thunderbay. This individualistic between Intra-London regional clustering occurs throughout the analysis. In general, Ontario had the greatest intra-regional differentiation in terms of age composition. This proves that most CMAs are unique in terms of the factors that determine the nature of their age structure resulting in no observable spatial trend in age similarity.

Consider the relations between regions. While individual inter-regional clusters occurred, other intra-regions showed some degree of similarity. Quebec proved to have some semblance with Ontario as Chicoutomi and Kitchener joined with Sudbury and Ottawa respectively. Ontario and Quebec showed some similarity with the West as Oshawa and Chicoutimi joined with Edmonton and Vancouver respectively. The strength of these similarities was less than the intra-regional ones since they occurred in the later stages of the analysis. They do however, convey something about the likeness of the regions.

For 1981, the metropolitan observations were very much the same as 1971 with a few notable changes. Table 4.3.2 along with figure 4.3.2 capture these observations.

A spatial factor is introduced into the first cluster where Montreal (5) and Trois Rivieres (8) Join. Toronto (17) Joins this cluster in stage two. The first eight clusters appear to be among

Ontario, Quebec and the Atlantic CMAs, excluding a complete

TABLE 4.3.2 22-Jan-60 DATA DEFINITION FILE VM/SP REL 4. 18:40:58 Computing Information Services IBM 4381-3 \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* H ] E R A R C H 1 C A L C L U S T E P A N A L Y S I S \* \* \* Agglomeration Schedule using Single Linkage Stage Cluster Cluster 1 Clusters Cluster 1 Combined Cluster 2 1st Appears Cluster 2 Next Stage Coefficient Stage  $\begin{array}{c} 678\,809\\ \cdot\,949\,786\\ \cdot\,914\,962\\ \cdot\,914\,962\\ \cdot\,914\,962\\ \cdot\,9754\,565\\ \cdot\,9745\,855\\ \cdot\,9745\,85\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,855\\ \cdot\,155\,85\\ \cdot\,155\,85\,85\\ \cdot\,155\,85$  \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155\,85 \cdot\,155 010240068050004507890103 2465188919760568890122340 5565591992504333222222211 B78376914392601053245425 123456789012345678901234 534512895534 FIG.4-3-2 22-Jan-40 UATA DEFINITION FILE Computing Information Services IBM 4381-3 VM/SP REL 4. 18:40:58 • • • • • • • • • • • • • • • • • HIERARCHICAL CLUSTER ANALYSIS\*\* Vertical Icicle Plot using Single Linkage (Down) Number of Clusters (Across) Case Label and number 

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inter-regional Western cluster until stage ten. This again is indicative of the comparatively high degree of age diversity in the West. The cluster between Calgary (22) and Edmonton (23) occurred much earlier (stage two ) in 1971. This observation suggests that their age compositions although most similar when compared to other CMAs have experienced changes since 1971 that are making them comparatively different. This point is supported by evidence from the age diversity indices.

Within Ontario, certain CMAs still show inter-regional linkages with the West. Such as St.Catherines (14) and Kitchener (10). Hamilton (9) and Thunderbay (16) have become more alike while London (11), Winnipeg (10) and Windsor (18) show a strong likeness. Victoria remains a spatial anomaly. A great degree of intra-regional differentiation based on age can be seen in CMAs of Ontario and the Atlantic provinces. As seen in 1971 therefore, age structures tend to be generally a function of certain factors specific to the area. The absence of distinct regional clustering may be the result of a growing diversity among certain CMAs and the growing homogeneity of others.

Tables 4.3.3 and 4.3.4 , and figures 4.3.3 and 4.3.4 show patterns for non-metropolitan areas aggregated provincially in 1971 and 1981 respectively.

For non-metropolitan areas in 1971, a similar individualism within and across regional clusterings occur. However, in this case, the West reveals the most similarity as Manitoba (6) and

Alberta (80) cluster first. This Western clustering is seen to be DATA DEFINITION FILE 19-Jan-90 13:25:51 Computing Information Services 18H 4361-3 VM/SP REL 4. ANALYSIS TABLE 4.3.3 Agglomeration Schedule using Single Linkage Clusters Combined Cluster 1 Cluster 2 Stage Cluster 1st Appears Cluster 1 Cluster 2 Next Stane Coefficient 3.302189 4.299624 5.505869 6.640011 7.299526 9.239941 7.601334 1.560150 6.995880 12345 635553211 ę 000342008 001005670 36456789 6975320 6789 ñ 19-Jan-90 DATA DEFINITION FILE 13:25:51 Computing Information Services IBM 4381-3 VH/SP REL 4. A N A L Y S 1 S . FIG. 4.3.3 Vertical Icicle Plot using Single Linkage (Down) Number of Clusters (Across) Case Label and number \*\*\*\*\*\* \*\*\*\* 23-Jan-90 DATA DEFINITION FILE Computing Information Services JBM 4381-3 10:36:59 VM/SP REL 4. \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* \* HIERARCHICAL CLUSTER ANALYSIS TABLE 4.3.4 Agglomeration Schedule using Single Linkage Clusters Cluster 1 Stage Cluster 1st Appears Cluster 1 Cluster 2 Combined Cluster 2 Next Stage Coefficient 2.099585 2.291427 3.535442 5.144940 5.418309 6.003167 6.120396 8.393833 16.740082 1 52 0000000000 10 00004150 3 134567 2432221 6577890 6382 8 23-Jan-90 DATA DEFINITION FILE 10:36:59 Computing Information Services IBM 4381-3 VM/SP REL 4. • • • • • • • • • • • • • • • • • HIERARCHICAL CLUSTER ANALYSIS FIG. 4.3.4 Vertical Icicle Plot using Single Linkage (Down) Number of Clusters (Across) Case Label and number 0

strong in stages four and five also. Similarities exist between Ontario (5) and Manitoba (6) in stage three. The Atlantic provinces show strong clustering very late in stages seven and eight. P.E.I. (10) is the least similar, clustering with Saskachewan (7) at the final stage. Again, this is due to their substantial age diversity and homogeneity respectively. In terms of regional associations, the West is most closely associated with Ontario and Ontario with Quebec.

In 1981, the non-metropolitan observations appear to be virtually the same as 1971. That is, there is a high degree of area individualism in age composition. However, some notable changes occur between 1971 and 1981. P.E.I has become substantially less diverse. In 1981, P.E.I clusters at the second stage as compared to the final stage in 1971. The dramatic increase in the 0-14 age group accounts for this increase in homogeneity. Also, Quebec and Manitoba have become less similar and cluster later in 1981 than in 1971.

#### 4.4 SOME DETERMINANTS OF AGE COMPOSITION AND CHANGE

The ageing nature of Canada's age composition as we have seen is a function of many factors which shall now bw addressed. Population demographics has a definite impact on the age structure both at a micro and macro level. A definite decrease in fertility in all areas but P.E.I has shown an overall increase in age diversity. This fact can be explained by the increasing rate

of childlessness for women at all levels (Grindstaff, 1975). Not only is the number of children per family decreasing, but the number of families without children is also decreasing.

Other salient demographic explanations include life expectancy, sex ratios, marital status and the changing role of women. Medical advancement and an increase in physical awareness has led to an increase in life expectancy by at least seven years in both men and women over the last ten years. Not only has there been an increase in the divorce rate, but there are more women choosing to remain single or getting married at a later age. The number of women being educated and entering the workforce is also increasing. The overall result is a significant decrease in fertility.

In addition, socio-economic and immigration factors account for the patterns of age composition. Internal migrants and immigrants will settle in those cities whose economy can provide employment. This is clearly evident in the West during the 1970's, where the economic boom resulted in significant migration to this area. The ability of citles to attract migrants from other parts of Canada is significant in determining the modern are structure. Victoria for example derived its high age diversity not only from its decrease in fertility but from significant influx from the working age cohort and the retired age cohort. Similar explanations can also be drawn from Hill's study on age relations (1976). He argues that the differences in metropolitan age distributions are due to in-migrant and out-

migrant streams. He noted that cities with high rates of net inmigration tend to be predominantly composed of young adults. Evidence of this is seen mainly in Victoria, Vancouver and Alberta.

In a similar vein, the Green Paper on Immigration and Population in 1978 was passed as Bill-C24 imposing a much more reserved and ambivalent policy on international migration. From the results shown in this paper, one observes that in all cases but one, age diversity has increased between 1971 to 1981. The Green Paper in addition to other factors may have contributed to this increase in age diversity.

To a certain extent, cultural and ethnic factors contribute to the nature of the age composition. Language barriers can act deterrent for in-migration. As in the case of Quebec where as a there is a high out-migration flow mainly because of its French language laws. This is an incentive for Anglophones to migrate elsewhere. An atmosphere conducive to the traditions of а particular culture will be sought. Particular ethnic groups will move toward areas where institutions and services of their persuasion are established. Vancouver for instance will attract Scandinavians, while Toronto at that time will attract Jews and Italians (Hill, 1976).

#### 5 CONCLUSION

This research has attempted to describe recent trends in Canada's metropolitan and non-metropolitan age structure between

1971 and 1981. The use of the Index of Age Diversity and the Cluster Analysis helped to identify spatial and temporal trends. age composition does vary between shows that The study metropolitan and non-metropolitan areas due to variations in the conditions specific to those areas; whether such variations are due to demographic, economic, cultural or other factors. The Index of Age Diversity indicated that Eastern Canada appeared to be more homogeneous in age composition than Ontario and Western Canada. Changes were observed between 1971 and 1981 due to variations over space and time. These changes were more in terms of internal age composition than in overall diversity. The Cluster Analysis showed that minimal aggregate changes occurred between 1971 and 1981. Individual intra-regional and interregional changes occurred in 1971 and continued to occur in 1981. Ontario proved to have the greatest internal differentiation in an inter-regional sense and Quebec the greatest intra-regional clustering. It was clear that the size of cities is not necessarily correlated with their degree of diversity. Some very diverse cities proved to be quite small compared to others.

The research also attempted to provide some explanation for the age compositions and changes observed. It was noted that demographic factors such as a decrease in fertility, changes in the role of women, increases in life expectancy, sex ratios and marital status might have played a decisive role in the overall flattening of the age compositions. Socio-economic and immigration decisions, particularly those of an internal nature

determined the route age compositions took between 1971 and 1981. Cultural and ethnic components are also important influences on age composition.

This study has provided an age profile of Canada which can be useful to other studies of a more specific nature. A complete understanding of the Canadian age structure requires the identification of demographic, immigration, economic, and social policies. This research has contributed to that understanding, and will in the long term prove to be helpful towards efficient planning for a healthy Canadian age structure.

APPENDIX

25 CENSUS METROPOLITAN AREAS

The following list indicates at what scale the data are available for the census years:

1971 CENSUS

CMA

Α

CA

Oshawa

NOTE:

CA

Trois Rivieres

CMA - Census Metropolitan

Census

Area

St. John's Halifax St.John Montreal Quebec Hamilton Kitchener London Ottawa Sudbury Thunder Bay Agglomeration Toronto Windsor Winnipeg Calgary Edmonton Vancouver Victoria Chicoutimi-Jonguiere St. Catherines- Niagara Hull Regina Saskatoon 1981 CENSUS

ALL 25 CMAs present

AGE COHORTS

0-14 15-24 25-34 35-44 45-54 55-64 65+

## B METROPOLITAN AND NON-METROPOLITAN CODE NUMBERS FOR GRAPHS AND TABLES

### METROPOLITAN

| PLACE              | PROVINCE             | CODE |
|--------------------|----------------------|------|
| ST.JOHN'S          | NEWFOUNDLAND         | 1    |
| HALIFAX            | NOVA SCOTIA          | 2    |
| ST.JOHN            | NEW BRUNSWICK        | З    |
| CHICOUTIMI         | QUEBEC               | 4    |
| MONTREAL           | QUEBEC               | 5    |
| HULL               | QUEBEC               | 6    |
| QUEBEC CITY        | QUEBEC               | 7    |
| TROIS RIVIERES     | QUEBEC               | 8    |
| HAMILTON           | ONTARIO              | 9    |
| KITCHENER          | ONTARIO              | 10   |
| LONDON             | ONTARIO              | 11   |
| OSHAWA             | ONTARIO              | 12   |
| ΟΤΤΑΨΑ             | ONTARIO              | 13   |
| ST. CATHERINES     | ONTARIO              | 14   |
| SUDBURY            | ONTARIO              | 15   |
| THUNDER BAY        | ONTARIO              | 16   |
| TORONTO            | ONTARIO              | 17   |
| WINDSOR            | ONTARIO              | 18   |
| WINNIPEG           | MANITOBA             | 19   |
| REGINA             | SASKATCHEWAN         | 20   |
| SASKATOON          | SASKATCHEWAN         | 21   |
| CALGARY            | ALBERTA              | 22   |
| EDMONTON           | ALBERTA              | 23   |
| VANCOUVER          | BRITISH COLUMBIA     | 24   |
| VICTORIA           | BRITISH COLUMBIA     | 25   |
|                    | NON-METROPOL I TAN   |      |
| NON-METROPOL I TAN | NEWFOUNDLAND         | 1    |
|                    | PRINCE EDWARD ISLAND | 2    |
| NON-METROPOLITAN   | NOVA SCOTIA          | 3    |
| NON-METROPOLITAN   | NEW BRUNSWICK        | 4    |
| NON-METROPOLITAN   | QUEBEC               | 5    |
| NON-METROPOLITAN   | ONTARIO              | 6    |
| NON-METROPOLITAN   | MANITOBA             | 7    |
| NON-METROPOLITAN   | SASKATCHEWAN         | 8    |
| NON-METROPOLITAN   | ALBERTA              | g    |
| NON-METROPOLITAN   | BRITISH COLUMPIA     | 10   |

BRITISH COLUMBIA 10

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| REGION  | YEAR   | SINGLE  | MARR IED   | WID/DIV  | MF_RATIO  | MEANAGE   |
|---|--|---|--|--|---|---|
| ST_JOHNS NEDLAND  | 1971   | 71600   | 54640  | 5570   | .9769   | 28  |
| HALIFAX NOVSCOT   | 1971<br>1971   | 59300<br>111960   | 46100<br>99865   | 6300<br>10820  | 1.0144<br>.9767   | 35<br>28  |
| ST_JOHN NEWBRUN   | 1971   | 53610   | 46505  | 6620   | .9663   | 30  |
| CHICOUTIMQUEBEC<br>MONTREAL QUEBEC<br>HULL QUEBEC<br>QUEBECIT QUEBEC<br>TRIVIERESQUEBEC   | 1971<br>1971<br>1971<br>1971<br>1971                         | 76660<br>1361765<br>78275<br>261125<br>51550  | 53350<br>1243930<br>65600<br>199540<br>42245   | 3695<br>137510<br>5355<br>19835<br>4135  | 1.0052<br>.9624<br>1.0008<br>.9376<br>.9527   | 26<br>30<br>26<br>29<br>29  |
| HAMILTON ONTARIO<br>KITCHENERONTARIO<br>LONDON ONTARIO<br>OSHAWA ONTARIO<br>OTTAWA ONTARIO<br>ST_CATH ONTARIO<br>SUDBURY ONTARIO<br>THUNDERBAONTARIO<br>TORONTO ONTARIO<br>WINDSOR ONTARIO  | 1971<br>1971<br>1971<br>1971<br>1971<br>1971<br>1971<br>1971 | 228120<br>105585<br>56410<br>224270<br>139295<br>79830<br>53395<br>1207395<br>121485  | 242670<br>110065<br>136870<br>58255<br>204770<br>146605<br>70370<br>52005<br>1271965<br>120950   | 27735<br>11195<br>17275<br>5650<br>24235<br>17535<br>5225<br>6693<br>148680<br>16210   | 9885<br>9864<br>9551<br>9889<br>9570<br>9848<br>1.0726<br>1.0195<br>9797<br>9919  | 30<br>29<br>30<br>31<br>26<br>31<br>30<br>30  |
| WINNIPEG MANITOB  | 1971   | 251240  | 253700   | 35320  | •9539   | 31  |
| REGINA SASKIWN<br>SASKATOONSASKIWN  | 1971<br>1971   | 68570<br>60965  | 64 210<br>58 05 0  | 7950<br>7435   | •9601<br>•9488  | 29<br>29  |
| CALGARY ALBERTA<br>Edmonton Alberta   | 1971<br>1971   | 194480<br>244140  | 186660<br>226150   | 2 21 8 5<br>2 54 05  | •9937<br>1•0062   | 28<br>28  |
| VANCOUVERBCOLUMB<br>VICTORIA BCOLUMB  | 1971<br>1971   | 482175<br>82040   | 520495<br>96635  | 79680<br>17125   | •9845<br>•9236  | 32<br>35  |
| ST_JOHNS NFDLAND<br>NM NFDLAND<br>PEI<br>HALIFAX NOVSCOT<br>NM NOVSCOT<br>ST_JOHN NEWBRUN<br>NM NEWBRUN<br>CHICOUTIMOUEBEC<br>OUEBECIT OUEBEC<br>HULL OUEBEC<br>OUEBECIT OUEBEC<br>HULL OUEBEC<br>NM OUEBEC<br>TRIVIERESOUEBEC<br>NM OUEBEC<br>NM OUEBEC<br>NM OUEBEC<br>NM OUEBEC<br>STICATH ONTARIO<br>STICATH ONTARIO<br>STICATH ONTARIO<br>STICATH ONTARIO<br>SUDBURY ONTARIO<br>THUNDERBAONTARIO<br>NM ONTARIO | 1981<br>1981<br>1981<br>1981<br>1981<br>1981<br>1981<br>1981 | $\begin{array}{r} 77115\\ 209685\\ 56000\\ 127220\\ 255780\\ 52555\\ 270445\\ 64340\\ 1243370\\ 78585\\ 271950\\ 1243370\\ 12950\\ 1212965\\ 224360\\ 123520\\ 120030\\ 65375\\ 241980\\ 123650\\ 123650\\ 123520\\ 12965\\ 241980\\ 123520\\ 1266180\end{array}$ | $\begin{array}{r} 69175\\ 185125\\ 56400\\ 131735\\ 270765\\ 52830\\ 277070\\ 64150\\ 1370190\\ 81915\\ 267615\\ 53370\\ 1254160\\ 278285\\ 146365\\ 142840\\ 79825\\ 267275\\ 156900\\ 59975\\ 1491790\\ 119855\\ 1519900\end{array}$ | $\begin{array}{r} 8530\\ 18070\\ 80000\\ 18770\\ 43230\\ 34840\\ 34840\\ 6675\\ 214785\\ 10080\\ 36510\\ 36510\\ 36510\\ 39455\\ 17920\\ 20800\\ 381505\\ 23800\\ 90200\\ 381505\\ 238760\\ 9155\\ 213540\\ 20995\\ 202700\end{array}$ | .9562<br>1.0353<br>.9886<br>.9595<br>.9910<br>.9457<br>.9958<br>.99457<br>.9958<br>.99457<br>.99312<br>.9295<br>1.0112<br>.9295<br>1.0112<br>.9664<br>.93324<br>.9551<br>.99551<br>.99519<br>1.0676 | 30<br>328<br>331<br>332<br>339<br>339<br>339<br>331<br>331<br>331<br>331<br>331<br>331<br>331 |

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|   | 101225  |  | . 9202951   |  |  |   | Page: 2  |
|---|---|--|---|--|--|---|--|
| WINNIPE(<br>NM<br>REGINA<br>SASKATO(<br>NM<br>CALGARY<br>EDMONTON<br>NM<br>VANCOUVE<br>VICTORIA<br>NM | G MANITOB<br>MANITOB<br>SASKTWN<br>SASKTWN<br>SASKTWN<br>ALBERTA<br>ALBERTA<br>ALBERTA<br>ERBCOLUMB<br>BCOLUMB<br>BCOLUMB | 1981<br>1981<br>1981<br>1981<br>1981<br>1981<br>1981<br>1981 | 252315<br>201285<br>74665<br>70695<br>288740<br>267910<br>300210<br>450680<br>524000<br>87255<br>525345 | 285485<br>213015<br>78370<br>72635<br>319195<br>285005<br>314160<br>483735<br>631025<br>121460<br>643615 | 47040<br>27060<br>11275<br>10880<br>41645<br>39830<br>42690<br>52780<br>113160<br>24770<br>73670 | .9333<br>1.0321<br>.9510<br>.9309<br>1.0426<br>1.0346<br>1.0247<br>1.0639<br>.9636<br>.9051<br>1.0343 | 33<br>32<br>31<br>32<br>29<br>30<br>30<br>34<br>37<br>31 |
| NON-METE<br>NM<br>NM<br>NM<br>NM<br>NM<br>NM<br>NM<br>NM<br>NM  | NFDLAND<br>NOVASCOT<br>NEWBRUN<br>GUEBEC<br>ONTARID<br>MANITOB<br>SASKTWN<br>ALBERTA<br>BCOLUMB                           | 1971<br>1971<br>1971<br>1971<br>1971<br>1971<br>1971<br>1971 | 224000<br>287640<br>280190<br>1346225<br>1281250<br>227760<br>327965<br>369180<br>439285                | 153060<br>244935<br>222895<br>988835<br>1231275<br>195500<br>295340<br>333280<br>425370                  | 13230<br>33780<br>24880<br>88070<br>147870<br>21780<br>35715<br>35010<br>41895                   | 1.0617<br>1.0237<br>1.0453<br>1.0260<br>1.0184<br>1.0637<br>1.0637<br>1.0671<br>1.0776<br>1.0740      | 25<br>30<br>29<br>30<br>30<br>31<br>29<br>29             |

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COLUMN TWO

| 2(0-14)  | %(15-24)   | %(25-34)   | %(35-44)   | 2(45-54)   | %(55-64)  | %(65+)   | x                     |
|--|--|--|--|--|---|--|-----------------------|
| 32.54685   | 20.91268   | 13.36393   | 9.942341   | 9.267127   | 7.366664  | 6.60041  |                       |
| 18.4435<br>29.3716   | 22.28145<br>20.71823   | 12.89979<br>14.73072   | 11.51386<br>11.31923   | 11.30064<br>10.15586   | 10.34115<br>7.353007  | 13.21962<br>5.351345   |                       |
| 29.67162   | 18.92069   | 11.91268   | 10.29653   | 10.90551   | 8.877126  | 9.415843   |                       |
| 32.47569<br>27.38611<br>33.32775<br>27.8405<br>27.86258  | 22.13164<br>18.23827<br>20.04825<br>19.58981<br>19.83766   | 13.9454<br>15.24142<br>15.37379<br>15.83126<br>14.55409  | 11.82498<br>13.04364<br>11.68448<br>12.13723<br>12.72653   | 9.569933<br>11.04744<br>9.114365<br>10.43485<br>10.39869   | 5.863874<br>8.060797<br>5.793653<br>7.571096<br>7.774772  | 4.188482<br>6.982318<br>4.557709<br>6.49525<br>6.845679  | 1<br>1<br>1           |
| 28.38788<br>28.91622<br>27.71931<br>31.11157<br>27.95623<br>28.68089<br>33.09098<br>28.12667<br>26.91536<br>29.19228   | 17.6598<br>19.37226<br>18.70214<br>17.12445<br>19.32801<br>17.89075<br>20.83387<br>18.67529<br>17.62458<br>18.51293  | 13.30077<br>14.55979<br>13.97504<br>14.77665<br>14.26712<br>12.17764<br>14.17128<br>11.90455<br>15.2732<br>12.76341  | 12.68994<br>11.93987<br>11.67617<br>13.17681<br>12.21761<br>12.0557<br>11.68447<br>11.54773<br>13.50267<br>11.39079  | 11.68393<br>10.40578<br>11.23212<br>10.36775<br>11.58335<br>12.0145<br>9.960108<br>11.87333<br>11.30617<br>10.89007  | 8.093199<br>7.280302<br>8.031188<br>6.656971<br>7.645385<br>8.489742<br>6.225069<br>5.867083<br>7.839888<br>7.86065   | 8 • 184472<br>7 • 425775<br>8 • 664033<br>6 • 785788<br>7 • 302294<br>8 • 69078<br>4 • 03423<br>9 • 005352<br>7 • 538142<br>9 • 389852   |                       |
| 26.46752   | 19.22924   | 13.30693   | 11.22639   | 11.30135   | 8.98111   | 9.487362   | 2                     |
| 29.44186<br>29.15958   | 19.8316<br>20.39945  | 13.25896<br>13.63259   | 11.32625<br>10.9472  | 10.21779<br>9.64999  | 7.773475<br>7.249357  | 8.150069<br>8.961835   | 2                     |
| 30.51165<br>30.75628   | 19.16788<br>19.98063   | 15.12999<br>14.79408   | 12.85132<br>12.29865   | 9.815152<br>9.761854   | 5.224775<br>6.446374  | 5.952129   |                       |
| 25.39844   | 17.56779<br>17.42039   | 13.9927<br>10.78879  | 12.07049<br>10.19126   | 11.73973<br>12.11665   | 9.185105<br>10.30617  | 10.04573<br>15.11963   |                       |
| 26.00523<br>30.75886<br>24.79608<br>22.297671<br>22.297671<br>22.297671<br>22.3.99009<br>12.3.99009<br>12.3.99009<br>12.3.99009<br>12.3.99009<br>12.3.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.99009<br>11.9.8356<br>23.9009<br>11.9.8356<br>23.9009<br>12.2.2.2366<br>23.99009<br>12.2.2366<br>23.99009<br>12.2.2366<br>23.99009<br>12.2.2366<br>23.99009<br>12.2.2366<br>23.99009<br>12.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.2366<br>23.2.23666<br>23.2.23666<br>23.2.23666<br>23.2.23666<br>23.2.23666<br>23.2.236666<br>23.2.236666<br>23.2.236666<br>23.2.236666<br>23.2.2366666<br>23.2.236666666666 | 20.68598<br>19.8542<br>19.8542<br>20.6935<br>18.72193<br>19.59228<br>19.59228<br>19.59228<br>19.572556<br>19.075558<br>19.52894<br>20.17405<br>18.55429<br>19.55894<br>20.17405<br>18.85962<br>18.86688<br>20.23744<br>18.35996<br>18.359739<br>18.43777 | 17.93754<br>16.16.16907<br>15.35223<br>15.02508<br>16.82157<br>16.6748<br>17.64907<br>18.06748<br>17.64907<br>19.57439<br>17.4428<br>17.21325<br>16.16259<br>17.75079<br>17.824953<br>16.1607<br>15.868466<br>16.85636<br>15.82765<br>15.61646 | 11.64616<br>10.43148<br>10.84829<br>12.38298<br>10.96513<br>11.0434<br>11.12628<br>12.58139<br>13.465703<br>13.45703<br>13.58539<br>13.23912<br>12.02279<br>12.02369<br>13.23971<br>13.23371<br>11.77282<br>12.32657<br>11.2528<br>13.278<br>11.612222<br>11.72304 | 8.413267<br>8.083365<br>9.972268<br>9.441164<br>9.381139<br>9.237177<br>8.921796<br>10.13618<br>10.13618<br>10.30188<br>11.36833<br>9.731504<br>10.30188<br>11.36833<br>9.692127<br>11.49635<br>10.69722<br>11.35516<br>10.6588<br>11.5594<br>10.67569<br>10.23092 | 7 • 185995<br>7 • 138792<br>8 • 564437<br>7 • 921648<br>9 • 54252<br>8 • 842613<br>8 • 466821<br>7 • 890648<br>9 • 8222178<br>5 • 873608<br>8 • 320314<br>8 • 905339<br>8 • 3205339<br>8 • 3205518<br>8 • 320552<br>8 • 320552 | $8 \cdot 125828 \\7 \cdot 561428 \\12 \cdot 15334 \\7 \cdot 910845 \\12 \cdot 38949 \\10 \cdot 44279 \\10 \cdot 0764 \\5 \cdot 963303 \\9 \cdot 194953 \\5 \cdot 572166 \\8 \cdot 340277 \\9 \cdot 1476 \\8 \cdot 942284 \\10 \cdot 14894 \\7 \cdot 466848 \\8 \cdot 942284 \\10 \cdot 14894 \\7 \cdot 466848 \\8 \cdot 915033 \\11 \cdot 46725 \\7 \cdot 073773 \\10 \cdot 67542 \\9 \cdot 117873 \\11 \cdot 02308 \\11 \cdot 36864 \\$ |                       |
|  |  |  |  |  |   |  | Page:                 |
| 20.89015<br>26.31698<br>23.59099<br>22.16206<br>25.90908<br>21.41748<br>22.36689<br>2.7.16689<br>2.7.1677  | 19.03068<br>17.90348<br>20.91601<br>22.64842<br>17.92918<br>22.7933<br>22.66975<br>19.61278  | 17.39863<br>14.40097<br>17.94583<br>18.59538<br>14.12015<br>21.96579<br>20.32447<br>17.33429   | 11.38934<br>10.44521<br>10.78819<br>10.47956<br>9.854879<br>12.02804<br>11.87097<br>11.1398  | 10.03086<br>9.254286<br>9.385271<br>8.86158<br>9.911769<br>9.262071<br>9.403179<br>8.801764<br>10.76748  | 9.736768<br>9.349469<br>3.186245<br>7.736455<br>10.31893<br>5.399939<br>6.787761<br>7.368645<br>9.71247   | 11.52357<br>12.32961<br>9.187462<br>9.516553<br>11.94601<br>5.133381<br>6.576975<br>8.47903<br>11.50871  | 5<br>6<br>6<br>6<br>6 |

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|  |  |   |   | 45   |  |   |  |
|--|--|---|---|--|--|---|--|
| 05572<br>70185   | 17.1628<br>18.28095  | 16.4368<br>17.61664   | 10.78297<br>12.13647  | 9.967019<br>9.639  | 11.56037<br>8.581591   | 17.03431<br>9.043503  | 68<br>69<br>70   |
|  |  |   |   |  |  |   | 71<br>72<br>73<br>74<br>75   |
| 38846<br>42282<br>47611<br>19094<br>11801<br>67634<br>78067<br>76842 | 19.64547<br>22.22101<br>20.11973<br>20.52395<br>17.86186<br>17.37892<br>16.80978<br>17.40317<br>17.88604 | 11.45505<br>10.51797<br>11.59103<br>12.67725<br>11.90672<br>11.12439<br>9.786237<br>11.5717<br>13.28395 | 9.252993<br>9.426841<br>9.833954<br>10.63732<br>11.11445<br>10.12831<br>10.50156<br>11.01744<br>11.6045 | 8.327565<br>7.728376<br>9.672928<br>9.571338<br>10.58377<br>10.37286<br>11.42701<br>10.23817<br>10.20468 | 6.431847<br>8.710603<br>7.84765<br>7.338265<br>8.616635<br>8.973657<br>9.875747<br>8.220719<br>7.89867 | 5.998616<br>9.77238<br>8.458602<br>7.060938<br>9.656954<br>9.903854<br>10.92332<br>8.768127<br>7.353744 | 76<br>77<br>78<br>79<br>80<br>81<br>82<br>83<br>84<br>85<br>85<br>86<br>87 |

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