## QUESCREN

# Exploring the English-Speaking Landscape:

A typology of vulnerability associated with employment in Quebec's English-speaking population

QUESCREN Working Paper no. 11 March 2024

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This working paper was produced for the Quebec English-Speaking Communities Research Network (QUESCREN) by Jan Warnke and Laura-Lee Bolger.

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The Secrétariat aux relations avec les Québécois d'expression anglaise funded this working paper.



The Government of Canada, the Canadian Institute for Research on Linguistic Minorities, and Concordia University also provide funding for QUESCREN.

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## Table of contents

Abstract / Résumé	1
Related StoryMap	1
Introduction	2
Background	4
General and Specific Objectives	5
Clustering Analysis Results	6
General observations Detailed remarks	7 7
Conclusion	25
References	26
Appendix 1 The Importance of Geographic Scale	28
Appendix 2 FOI S-English Population by Réseau Territorial de Service (RTS) and	
Combined Census Tract and Census Subdivision (CTCSD)	29
Appendix 3 Research Method	30
Appendix 4 Importance of FOLS-English by Administrative Region	32
Appendix 5 Twenty-two Variables Used for Ward's Cluster Analysis Method	33
Appendix 6 Cluster Group Percentage Share of Regional FOLS-English Population	34

## Abstract / Résumé

This exploratory study uses geodemographic analytical methods to investigate the English-speaking population of Quebec, with a specific focus on vulnerability indicators associated with employment and their spatial distribution within the province. Using Ward's cluster analysis method, eight distinct groups were identified and mapped, each showcasing unique characteristics that warrant tailored policy measures to effectively tackle regional employment challenges. Future research should delve into the differential impacts of various variables across clusters, particularly those related to mobility and aboriginal identity, thereby facilitating the derivation of targeted policy interventions.

Cette étude exploratoire utilise des méthodes d'analyse géodémographiques afin d'examiner la population d'expression anglaise du Québec, en mettant spécifiquement l'accent sur les indicateurs de vulnérabilité liés à l'emploi et leur répartition spatiale dans la province. En utilisant la méthode d'analyse par grappes de Ward, huit groupes distincts ont été identifiés et cartographiés, chacun présentant des caractéristiques uniques justifiant des mesures politiques adaptées pour relever efficacement les défis liés à l'employabilité. Les recherches futures devraient explorer les impacts différentiels de variables à travers les grappes, notamment ceux liés à la mobilité et à l'identité autochtone, facilitant ainsi l'élaboration d'interventions politiques ciblées.

## **Related StoryMap**

Please note that an interactive StoryMap allows a closer examination of the geographic distribution of each of the eight cluster groups. Click here to access the online StoryMap.

## Introduction

Who are the minority English speakers across the regions of Quebec's majority French-speaking territory? Where are they, and how can we effectively study their needs and respond to issues of high unemployment, access to education, income gaps, levels of mobility, family structure, and housing?

The exploratory research results we present here help unravel issues within the English-speaking population in the province of Quebec. The results emanate from an exploratory multivariate research design using 2016 census data related to the population's employment issues. We applied geodemographic analytical techniques to provide insight into the societal context of the issue of English speakers' employment in Quebec. Twentytwo variables were selected and grouped under the following ten themes: employment, highest educational attainment, income level,<sup>1</sup> first official language spoken-English (FOLS-English)<sup>2</sup> age group, visible minority status, living in a home that requires major repairs, immigrant status, family status, Aboriginal identity<sup>3</sup> status, and mobility status (within the past five years) (Figure 1).

- 1 This theme also includes people living in a family with revenue less than the low-income cut-off after taxes.
- 2 The linguistic concept used in this research is the derived variable first official language spoken (FOLS). This measure assesses the population size of the official language minority communities in Canada (English in Quebec and French outside of Quebec). The FOLS measure in this research was proportionally adjusted for the population reporting both English and French as their FOLS. Further information is available here: https://www23.statcan.gc.ca/imdb/p3Var.pl?Function=DEC&Id=34004.
- 3 The Statistics Canada Reference Dictionary (2016) defines this as follows: "Aboriginal identity' refers to whether the person identified with the Aboriginal peoples of Canada. This includes those who are First Nations (North American Indian), Métis or Inuk (Inuit) and/or those who are Registered or Treaty Indians (that is, registered under the Indian Act of Canada), and/or those who have membership in a First Nation or Indian band." Retrieved from https://www12.statcan.gc.ca/census-recensement/2016/ ref/dict/pop001-eng.cfm.

#### Figure 1: Twenty-two core census variables grouped into ten themes that served as the basis for the development of eight distinct population cluster classes



These multiple themes and their representative variables cover a variety of situations associated with English-speaking Quebecers' employment. Our analysis and mapping identified eight significant groupings, also called clusters (Ward Jr 1963, Ward Jr and Hook 1963), which are discussed further on in this text.

## Background

Our research data and methods were developed through the Geodata project funded by Health Canada from 2018 to 2023 and administered by Jeffery Hale Community Services in English, an entity within the Quebec City region's integrated health and social services centre (or *Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale*). Geodemographic profiles of Quebec's FOLS-English population were developed in the Geodata project to identify the population's sociodemographic context. These profiles grouped employment status and associated vulnerability indicators, which were then associated with health service user information to provide insight into the numerous dimensions of English language health service use. The same methods and workflows can be used to understand issues in other domains like education, housing, and employment.

## **General and Specific Objectives**

Our research is designed to explore the societal context associated with employment. The study of the effect of societal context on population issues has been documented extensively (Stockdale, Wells et al. 2007, Catherine E. Ross 2008, Parenteau, Sawada et al. 2008, Siegel 2011, Amstislavski, Matthews et al. 2012). Studying the societal context means understanding the differences and similarities among people in a particular area. Addressing issues around these specific localized characteristics in policies and programs may in turn contribute to the development of local well-being (Sellström and Bremberg 2006) and community vitality (Dale et al. 2010, Scott 2010).

We use a procedure called geodemographic analysis (Petersen, Gibin et al. 2011, Singleton and Spielman 2014, Harris and Feng 2016, Burns, See et al. 2018, Grekousis, Wang et al. 2021) to analyze the demographic composition of a population at a specific location. This procedure identifies the characteristics of the population within small geographical areas<sup>4</sup> to answer the "who are we" question. The scale of the territorial units of analysis is extremely important in geodemographic analysis and is explained in Appendix 1. In these small areas, the "who are we" question can be analyzed in terms of its interdependence with its societal setting, which is the "where are we" question.

We use geodemographics to characterize neighbourhoods and larger areas where English speakers live by using the distinctive characteristics associated with the important issue of employment. The analysis provides insight into the ecosystem of factors that may contribute to employment issues. In the short term, the results provide information for managing regional employment issues through changes in policy. In the long term, it is hoped that this research will further the development of more insightful tools and methods for the study of minority populations and their community vitality.

To highlight the significant variations in Quebec's English-speaking populations in different regions, we used a special geodemographic procedure called Ward's cluster analysis method. The grouping of census variables into clusters with similar values through the cluster analysis method allowed us to identify eight subgroups within the English-speaking community. The eight subgroups or clusters are discussed in the following section. More details on the cluster analysis research method are included Appendix 2.

It should be noted that our exploratory assessment is not intended to be comprehensive. It does not include environmental and social factors that may influence activity, nor does it include service use.

<sup>4</sup> A synthetic, analytical surface of 2 507 areas was generated for all of Quebec by combining census tracts (urban neighbourhoods with an average population of 5 000) in large urban areas and census subdivisions (municipalities) outside of large urban areas.

## **Clustering Analysis Results**

#### Table 1: Most important FOLS-English vulnerability characteristics by cluster group

Cluster Group	The most important cluster group characteristics
Each cluste	er group represents a FOLS-English population characterized (in order of importance) by:
1	Intraprovincial mobility, Aboriginal identity, major home repairs, and interprovincial mobility
2	Aboriginal identity, interprovincial mobility, intraprovincial mobility, and no secondary school or equivalent certificate or diploma
3	Aboriginal Identity, interprovincial mobility, visible minority, and income below LICO
4	Aboriginal identity, interprovincial mobility, intraprovincial mobility, and major home repairs required
5	FOLS-English 45-64 years of age, no secondary school or equivalent certificate or diploma, income \$20K-\$59.9K, and employed population
6	Interprovincial mobility, below LICO (after taxes), major home repairs required, and FOLS-English 25-44 years of age
7	Immigrant and visible minority population, lone parent families, and income \$20K -\$59.9K
8	Income \$60K plus, intraprovincial mobility, secondary school or higher diploma, and family size of three or more

It is worth noting that only the four most dominant variables (in order of importance) in each cluster group are listed in Table 1, above. For instance, if "Aboriginal identity" is a dominant variable within a certain cluster, this does not necessarily imply that everyone in that cluster is Aboriginal, but rather that it is a defining characteristic of a significant proportion of the cluster members in correlation with the other variables. The section "Analysis of Each of the Cluster Groups" below identifies the absolute number of FOLS-English people in each cluster group in Quebec's 17 administrative regions and their share of the total FOLS-English population in the region.

#### **General observations**

We make the following general observations about the clustering procedure's results.

We noted that Aboriginal identity is strongly present in four of eight cluster groups. In cluster 1, Aboriginal identity is strongly associated with interprovincial mobility and major home repairs. In cluster 2, it is associated with intraprovincial mobility and low educational attainment. In cluster 3, Aboriginal identity is associated with interprovincial mobility, visible minority status and income levels below the "low-income cutoff" (LICO). In contrast, in cluster 4, Aboriginal identity is associated with interprovincial and intraprovincial mobility and major home repairs required. In more simplified terms, Quebec's English speakers who self-identify as Indigenous people and live outside reserves tend to be mobile, have low education and low levels of income, and live in homes requiring major repairs.

We also note that mobility is strongly represented in six of the eight clusters. Mobility is present in the top four variables in cluster groups 1, 2, 3, 4, 6, and 8. Mobility is identified in two forms: movement between Quebec and another province (interprovincial mobility) or within the confines of the province of Quebec (intraprovincial mobility). High levels of mobility characterize the English-speaking population in Quebec.

The cluster group 5 profile groups the FOLS-English population of working age (45-64 years of age) with low educational attainment, mid-level income (\$20K-\$59.9K) and employed population.

On the other hand, cluster group 7 is strongly representative of immigrants, visible minorities, lone-parent families, and mid-income levels (\$20K-\$59.9K).

Cluster group 8 is a very specific profile focusing on a higher-income population (\$60K plus) associated with intraprovincial mobility, higher level of education, and large family sizes.

#### **Detailed remarks**

The eight cluster groupings were mapped across 2 507 areas, of which 2 265 contain one of the cluster groups. The 2 507 areas exclude Indigenous reserves (see Appendix 3 for details). The eight cluster groups revealed regional variations even in areas with sparse FOLS-English populations, as shown in the maps in the analysis of each of the cluster groups ("Analysis of Each of the Cluster Groups").

#### General description of the FOLS-English population

The FOLS-English population in 2265 out of 2507 total locations (census tracts and census subdivisions) representing 1082235 people not living in designated Indigenous reserves was clustered using 22 variables. The FOLS-English population of 1082235 found in the eight cluster groups is not equally distributed across the 2265 locations shown in Table 2. Most (80.3%) of the locations are in cluster groups 3, 4, 1 and 2 (ranked according to location count). These four cluster groups contain only 290320 FOLS-English people, or 26.5% of the total FOLS-English population, indicating that these cluster groups identify areas with sparse FOLS-English populations. Overall, the FOLS-English population in the eight cluster groups exhibits large variations in mean (average) and in other indicators of central tendency of the values of FOLS-English population numbers.

Cluster ID	Location count	FOLS-English population	Mean	Rank of location count	Rank of FOLS-English population
1	347	93120	268.3573	3	6
2	246	136 260	553.9024	4	5
3	791	16630	21.02402	1	8
4	436	44 310	101.6284	2	7
5	219	238025	1 086.872	5	1
6	108	189220	1 752.037	6	3
7	80	224 390	2 804.875	7	2
8	38	140 280	3 691.579	8	4
No FOLS-English	80	1250	15.625	0	0
TOTAL	2 345	1083485	462.0405		

#### Table 2: Rank of FOLS-English adjusted population (2016) by cluster groups 1 to 8

#### Analysis of each of the cluster groups

The eight cluster groups exhibit a variety of characteristics that we will break down by the 17 administrative regions in Quebec. We focus on four descriptive dimensions that may have an impact on provincial, regional, and local policy parameters: the composition (the variable indicators that compose and characterize the cluster group), the geographic distribution, the size of the FOLS-English population in the cluster group, and the share of the regional FOLS-English population by cluster group.

Please note that an interactive StoryMap allows a closer examination of the geographic distribution of each of the eight cluster groups. Click here to access the online StoryMap.

#### Cluster group 1

#### **Composition:**

Cluster group 1 represents a FOLS-English population characterized (in order of importance) by intraprovincial mobility, Aboriginal identity, major home repairs, and interprovincial mobility.

#### **Distribution:**

The FOLS-English population in cluster group 1 is found in 13 regions and has a location count of 347 out of 2 265 locations (Table 2). The mapping indicates a scattering of this cluster group across the regions of Quebec, with a strong presence centred on the Montreal metropolitan area (Figure 2).

#### Figure 2: Cluster 1, Province of Quebec by CTCSD (2016)



ESRI, CGIAR, USGS; Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada; Ville de Montréal, Esri Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, EPS, NPS, NRCan, Parks Canada; Esri, USGS

Clustering Analysis Results

#### Size:

The FOLS-English population in cluster group 1 is mostly concentrated in the following seven regions: Montreal, Montérégie, Laurentides, Estrie, Lanaudière, Outaouais, and Capitale-Nationale (Table 3).

#### Share or proportion of regional FOLS-English population:

Cluster group 1 has its largest regional share of FOLS-English population in the administrative regions of Lanaudière (36.8%), Laurentides (35.3%), Abitibi-Témiscamingue (32.9%) and Estrie (32.4%).

#### Table 3: FOLS-English population by administrative region and by cluster group 1

High cluster population (red)			Low cluster population (green)			
Admin Regions	FOLS-E	Cluster 1	Admin Regions	FOLS-E	Cluster 1	
Montreal	628060	29 570 (4.7%)	Laval	88950	1695 (1.9%)	
Montérégie	169410	24840 (14.7%)	Gaspésie–Îles- de-la-Madeleine	7045	1620 (23%)	
Laurentides	37655	13280 (35.3%)	Chaudière- Appalaches	4040	645 (16%)	
Estrie	23 360	7560 (32.4%)	Abitibi- Témiscamingue	4210	615 (32.9%)	
Lanaudière	13425	4945 (36.8%)	Bas-Saint- Laurent	1230	405 (14.5%)	
Outaouais	69840	4480 (6.4%)	Centre-du- Québec	2750	400 (14.5%)	
Capitale- Nationale	14810	3065 (20.7%)				

#### Cluster group 2

#### **Composition:**

Cluster group 2 represents a FOLS-English population characterized (in order of importance) by Aboriginal identity, interprovincial mobility, intraprovincial mobility, and no secondary school or equivalent certificate or diploma.

#### **Distribution:**

The population in cluster group 2 is broadly distributed and dispersed across 14 administrative regions (Figure 3, Figure 4). It has a location count of 246 out of 2265 locations (Table 2).

#### Figure 3: Cluster 2, Southern Quebec by CTCSD (2016)



ESRI, CGIAR, USGS; Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada; Ville de Montréal, Esri Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, NRCan, Parks Canada; Esri, USGS

Clustering Analysis Results

#### Figure 4: Cluster 2, Northern Quebec by CTCSD (2016)





zgroup\_id8a Aboriginal identity, inter and intra prov mobility and no diploma - Cluster 2 (Count = 246)

Esri, N. Robinson, NCEAS, USGS; Esri, CGIAR, N. Robinson, NCEAS, USGS; Esri Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCanada; Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada; Esri Canada, Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NRCan, Parks Canada; Esri, USGS; Esri Canada, Esri, HERE, Garmin, SafeGraph, METI/NASA, USGS, EPA, USDA, NRCan, Parks Canada; Esri Esri, HERE, Garmin, SafeGraph, FAO, METI/NASA, USGS, NRCan, Parks Canada

#### Size:

The highest populations in cluster 2 are found in Montreal, Montérégie, Outaouais, Laval, and Laurentides (Table 4).

Share or proportion of regional FOLS-English population: The administrative regions with the largest share of cluster 2 in their local FOLS-English population are Côte-Nord (88.3%), Gaspésie-Îles-de-la-Madeleine (56.8%), Abitibi-Témiscamingue (45.7%), and Nord-du-Québec (42.7%).

Table 4: FOLS-English	population	by administrative	region an	nd by cluster	group 2
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High cluster population (red)			Low cluster population (green)		
Admin Regions	FOLS-E	Cluster 2	Admin Regions	FOLS-E	Cluster 2
Montreal	628060	38090 (6.1%)	Estrie	23 360	2 770 (11.9%)
Montérégie	169410	26155 (15.4%)	Abitibi- Témiscamingue	4210	1925 (45.7%)
Outaouais	69840	25 510 (36.5%)	Lanaudière	13425	1650 (12.3%)
Laval	88950	18085 (20.3%)	Capitale- Nationale	14810	670 (4.5%)
Laurentides	37655	8 905 (23.6%)	Mauricie	3250	570 (17.5%)
Gaspésie–Îles- de-la-Madeleine	7045	4005 (56.8%)	Saguenay– Lac-Saint-Jean	1985	230 (11.6%)
Nord-du-Québec	9205	3935 (42.7%)			
Côte-Nord	4260	3760 (88.3%)			

#### Cluster group 3

#### **Composition:**

Cluster group 3 represents a FOLS-English population characterized (in order of importance) by Aboriginal identity, interprovincial mobility, visible minority, and income below LICO.

#### **Distribution:**

The FOLS-English population in cluster 3 is distributed across 14 administrative regions (Figure 5) and has the highest location count (791) of the eight cluster groups. It also has the lowest average of FOLS-English people (21.02) per location (Table 2).

#### Figure 5: Cluster 3 province of Quebec by CTCSD (2016)



ESRI, CGIAR, USGS; Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada; Ville de Montréal, Esri Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, NRCan, Parks Canada; Esri, USGS

#### Size :

The highest regional concentrations of cluster group 3 are in Montérégie, Capitale-Nationale, Chaudière-Appalaches, Mauricie, Centre-du-Québec, and Estrie (Table 5).

#### Share or proportion of regional FOLS-English population:

Cluster group 3 has an important share of the regional FOLS-English population in the Chaudière-Appalaches (55%), Saguenay–Lac-Saint-Jean (52.9%), Centre-du-Québec (46.5%), and Bas-Saint-Laurent (46.3%) regions.

High cluster population (red)			Low cluster population (green)		
Admin Regions	FOLS-E	Cluster 3	Admin Regions	FOLS-E	Cluster 3
Montérégie	169410	2 870 (1.7%)	Outaouais	69840	610 (0.9%)
Capitale- Nationale	14810	2 650 (17.9%)	Laurentides	37655	600 (1.6%)
Chaudière- Appalaches	4040	2 2 2 2 0 (55%)	Bas-Saint-Lau- rent	1230	570 (46.3%)
Mauricie	3250	1 495 (46%)	Abitibi-Témis- camingue	4210	420 (10%)
Centre-du- Québec	2750	1 280 (46.5%)	Gaspésie–Îles- de-la-Madeleine	7045	295 (4.2%)
Lanaudière	13425	1100 (8.2%)	Montreal	628060	185 (0%)
Saguenay– Lac-Saint-Jean	1985	1050 (52.9%)	Côte-Nord	4260	130 (3.1%)
Estrie	23 360	1030 (4.4%)	Nord-du-Québec	9205	125 (1.4%)

#### Table 5: FOLS-English population by administrative region and by cluster group 3

#### Cluster group 4

#### **Composition:**

Cluster group 4 represents a FOLS-English population characterized (in order of importance) by Aboriginal identity, interprovincial mobility, intraprovincial mobility, and major home repairs required.

#### **Distribution:**

The population of FOLS-English in cluster group 4 covers all 17 administrative regions but is mostly distributed outside large urban metropolitan areas across southern Quebec (Figure 6). It has a location count of 436 out of 2 265 locations (Table 2).



#### Figure 6: Cluster 4 province of Quebec by CTCSD (2016)

ESRI, CGIAR, USGS; Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada; Ville de Montréal, Esri Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, NRCan, Parks Canada; Esri, USGS

#### Size:

The FOLS-English population is concentrated in five regions: Montérégie, Capitale-Nationale, Montreal, Estrie, Laurentides, and Lanaudière (Table 6).

#### Share or proportion of regional FOLS-English population:

Regions where cluster group 4 has an important share of the FOLS-English population are Capitale-Nationale (56.8%), Centre-du-Québec (38.7%), Mauricie (36.3%), Saguenay-Lac-Saint-Jean (35%), and Lanaudière (32.8%).

Fable 6: FOLS-English	population b	y administrative	region ar	nd by cluster	group 4
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High cluster population (red)			Low cluster population (green)			
Admin Regions	FOLS-E	Cluster 4	Admin Regions	FOLS-E	Cluster 4	
Montérégie	169410	9430 (5.6%)	Centre-du- Québec	2750	1065 (38.7%)	
Capitale- Nationale	14810	8 405 (56.8%)	Gaspésie–Îles- de-la-Madeleine	7045	1040 (14.8%)	
Montreal	628060	5 2 5 5 (0.8%)	Saguenay– Lac-Saint-Jean	1985	695 (35%)	
Estrie	23360	5025 (21.5%)	Côte-Nord	4260	300 (7%)	
Lanaudière	13425	4410 (32.8%)	Bas-Saint- Laurent	1230	225 (18.3%)	
Laurentides	37655	4010 (10.6%)	Laval	88950	170 (0.2%)	
Outaouais	69840	1760 (2.5%)	Abitibi- Témiscamingue	4210	145 (3.4%)	
Mauricie	3250	1180 (36.3%)	Nord-du-Québec	9 2 0 5	30 (0.3%)	
Chaudière- Appalaches	4040	1165 (28.8%)				

**Clustering Analysis Results** 

#### Cluster group 5

#### **Composition:**

Cluster group 5 represents a FOLS-English population characterized (in order of importance) by a FOLS-English 45-64 years of age, no secondary school or equivalent certificate or diploma, income \$20K-\$59.9K, and employed population.

#### **Distribution:**

Cluster group 5 is found in eight regions in metropolitan areas in Southern Quebec, as well as in Abitibi-Témiscamingue (Figure 7). It has a location count of 219 out of 2 265 locations (Table 2).

#### Figure 7: Cluster 5 province of Quebec by CTCSD (2016)



ESRI, CGIAR, USGS; Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada; Ville de Montréal, Esri Canada, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NPS, NRCan, Parks Canada; Esri, USGS

#### Size:

The highest concentration is by far in Montreal, followed by Montérégie, Laval, and Laurentides (Table 7).

#### Share or proportion of regional FOLS-English population:

Regions where cluster group 5 has an important share of the regional FOLS-English population are Montreal (25.5%), Laval (24%), Abitibi-Témiscamingue (22.8%), and Montérégie (21.3%).

Table 7.1 OLD English population by administrative region and by cluster group	Table	7: FOLS-English	population b	y administrative req	gion and b	y cluster grou	ip 5
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High cluster population (red)			Low cluster population (green)		
Admin Regions	FOLS-E	Cluster 5	Admin Regions	FOLS-E	Cluster 5
Montreal	628060	156 995 (25%)	Outaouais	69840	4435 (6.4%)
Montérégie	169410	30705 (21.3%)	Estrie	23360	4 305 (18.4%)
Laval	88950	30 465 (24%)	Lanaudière	13425	1 315 (9.8%)
Laurentides	37655	8845 (8.8%)	Abitibi-Témis- camingue	4210	960 (22.8%)

#### Cluster group 6

#### **Composition:**

Cluster group 6 represents a FOLS-English population characterized (in order of importance) by interprovincial mobility, below LICO (after taxes), major home repairs required, and FOLS-English 25-44 years of age.

#### **Distribution:**

Cluster group 6 is found in seven administrative regions. It has a location count of 108 out of 2 265 locations (Table 2). Cluster group 6 has two poles: one in Southern Quebec (the urban areas of Montreal, Outaouais and Montérégie) (Figure 8) and the other in the Far North, Nord-du-Québec (Figure 9).



#### Figure 8: Cluster 6, Southern Quebec by CTCSD (2016)

Clustering Analysis Results

#### Figure 9: Cluster 6, Northern communities by CTCSD (2016)



#### Size:

The FOLS-English population in cluster 6 is concentrated in Montreal, Montérégie, Outaouais, and Laval (Table 8).

#### Share or proportion of regional FOLS-English population:

Regions where cluster group 6 has an important share of the FOLS-English population are the Northern communities in Nord-du-Québec (54%), Outaouais (24%), Montérégie (21.3%), and Montreal (19%).

High clu	ster population	(red)	Low cluster population (green)				
Admin Regions	FOLS-E	Cluster 6	Admin Regions	FOLS-E	Cluster 6		
Montreal	628060	119 040 (19%)	Nord-du-Québec	9205	4 975 (54%)		
Montérégie	169410	36020 (21.3%)	Estrie	23360	2 640 (11.3%)		
Outaouais	69840	16790 (24%)	Laurentides	37655	1925 (5.1%)		
Laval	88950	7830 (8.8%)					

#### Table 8: FOLS-English population by administrative region and by cluster group 6

#### Cluster group 7

#### **Composition:**

Cluster group 7 represents a FOLS-English population characterized (in order of importance) by the immigrant and visible minority population, lone parent families, and income \$20K-\$59.9K.

#### **Distribution:**

Cluster group 7 is found in three administrative regions. It is a highly urban cluster group found in Montreal, Laval, and Montérégie (Figure 10). It has a location count of 80 out of 2 265 locations (Table 2).





#### Size:

The FOLS-English population in cluster 7 is concentrated in Montreal, Laval, and Montérégie (Table 9).

#### Share or proportion of regional FOLS-English population:

Cluster 7 has the largest share of the total FOLS-English population in Montreal (30.2%), followed by Laval (29.8%).

#### Table 9: FOLS-English population by administrative region and by cluster group 7

High clu	ster population	(red)	Low cluster population (green)				
Admin Regions	FOLS-E	Cluster 7	Admin Regions	FOLS-E	Cluster 7		
Montreal	628060	189 550 (30.2%)	Montérégie	169410	8 290 (4.9%)		
Laval	88950	26 550 (29.8%)					

#### Cluster group 8

#### **Composition:**

Cluster group 8 represents a FOLS-English population characterized (in order of importance) by income \$60K and over, intraprovincial mobility, secondary school or higher diploma, and family size of three or more.

#### **Distribution:**

Cluster 8 is distinctive because it is only found in two metropolitan areas (Figure 11): Montreal and the Quebec part of the Ottawa-Gatineau metropolitan area. These two areas overlap four administrative regions: Montreal, Montérégie, Outaouais, and Laval. It has a very low location count of 38 out of 2 265 locations (Table 2).



#### Figure 11: Cluster 8 Montreal and Outaouais regions by CTCSD (2016)

#### Size:

The Montreal region has the largest concentration, followed by Montérégie (Table 10).

#### Share or proportion of regional FOLS-population:

Cluster 8 has the largest share of the total FOLS-English regional population in Outaouais (22.5%), followed by Montérégie (18.3%).

#### Table 10: FOLS-English population by administrative region and by cluster group 8

High clus	ster population	(red)	Low cluster population (green)				
Admin Regions	FOLS-E	Cluster 8	Admin Regions	FOLS-E	Cluster 8		
Montreal	628060	89375 (14.2%)	Outaouais	69840	15 705 (22.5%)		
Montérégie	169410	31045 (18.3%)	Laval	88950	4155 (4.7%)		

#### Regional analysis

#### Communities in the Far North

The communities in the Far North outside of Indigenous reserves<sup>5</sup> have a strong presence of FOLS-English population found in cluster group 2 and cluster group 6 (Table 11). Cluster group 2 is found in nine Northern communities: Kangiqsualujjuaq, Tasiujuaq, Kangirsuk, Quaqtaq, Kangiqsujuaq, Ivujivik, Akulivik, Umiujuaq, and Kuujjuarapik (Figure 4), whereas cluster 6 characterizes the four Northern communities of Kuujjuaq, Salluit, Puvirnituq, and Inukjuak (Figure 9).

#### Table 11: FOLS-English population in Nord-du-Québec administrative region by cluster group

Administrative Regions	FOLS-E	1	2	3	4	5	6	7	8	(blank)
Nord-du-Québec	9205		3935	125	30		4975			140
Percentage (%)			42.7%	1.4%	0.3%		54%			1.5%

#### Other communities

Table 12 indicates the FOLS-English population in each of the cluster groups for each administrative region. We note for example that Montreal is dominated by clusters 7, 5, and 6 (in order of importance). On the other hand, clusters 5, 7, and 2 have the highest share of the population in Laval. Cluster groups 4, 3, and 1 dominate the FOLS-English population in the Capitale-Nationale region, and clusters 2, 6, and 8 are dominant in the Outaouais region.

<sup>5</sup> Inuit communities do not fall under the federally administered reserve system. The Inuit system is municipal and falls entirely under Quebec's jurisdiction.

## Conclusion

This paper successfully identifies clusters of the FOLS-English population by the vulnerability indicators associated with employment, and identifies their geographic distribution. The combination of associated characteristics significantly differentiates the eight cluster groups and their geographic distribution, indicating that regional employment issues may require adapted policy measures in the regions identified. The initial profiles indicate that policies that affect the employment status of the FOLS-English population should consider the various situations in which employment conditions evolve. One employment policy will not fit all situations across Quebec.

There is still much work to be done to elucidate the possible effects of the combinations of the identified variables on employment status. The strong presence of FOLS-English populations with Aboriginal identity associated with specific vulnerability indicators indicates that more in-depth analysis is warranted to identify the most strongly associated indicators and their locations.

The effect of mobility, which is present in six out of eight clusters, should be examined more closely in its association with specific social conditions like single parent status, visible minority status, and low educational attainment, among others, to target specific issues in cluster groups with a strong presence of mobility.

The next step could be to identify the degree to which the variable indicators significantly differ between any two pairs of cluster groups so that individual target variables can be derived for further regional and local policy development. Once each variable has been tested across the cluster groups, and significant differences in the presence of variables have been identified, then a predictive analytical testing procedure can isolate areas where specific variable indicators or groups of variable indicators can be targeted for policy orientation. Ideally, this should be done at the same scale using the same variables with more recent data from the 2021 census.

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#### **APPENDIX 1** The Importance of Geographic Scale

The analysis of Quebec's English-speaking population characteristics is very sensitive to geographic scale. Our research design uses various geographic scales to best capture local variation in employment status and other associated characteristics. Our information is found in several layers, allowing us to identify relationships between characteristics in each layer. We can thus study neighbourhoods that are vulnerable in regions that are otherwise not considered vulnerable because the scale of the representation averages out those small areas that are in need.

We first note from the maps in Appendix 2 (Figure 12, Figure 13) that the English-speaking community (ESC) is mostly concentrated in large urban settings in the Montreal metropolitan area. According to Statistics Canada, in 2016, approximately 888 280, or 80.5%, of English speakers <sup>6</sup> of a total Quebec FOLS-English population of 1103 045 lived in the Montreal metropolitan area, compared with 45% of the French-speaking majority.<sup>7</sup> The remaining 215 195 English speakers are scattered in clusters of varying concentration across the regions of Quebec (Figure 13).

<sup>6</sup> The linguistic concept used in this research is first official language spoken-English (FOLS-English) adjusted for multiple responses.

<sup>7</sup> Statistics Canada, CO-1748, Table 1 - Total Population excluding institutional residents by First official language spoken (7), Age groups (21) and Sex (3) for selected geographies, 2016 Census -100% Data, custom dataset created for CHSSN by Statistics Canada.

FOLS-English Population by Réseau Territorial de Service (RTS) and Combined Census Tract and Census Subdivision (CTCSD)

Figure 12: FOLS-English population by health region (RTS) (2016)



Ville de Montréal, Esri Canada, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, NRCan, Parks Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Esri, CGIAR, USGS, Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, NRCam, Parks Canada, Esri, USGS



Figure 13: FOLS-English population by CTCSD (2016) Appendix 3

Ville de Montréal, Esri Canada, Esri, TomTom, Garmin, SafeGraph, FAO, METI/NASA, USGS, EPA, NPS, NRCan, Parks Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NRCan, Parks Canada, Esri, CGIAR, USGS, Esri Canada, Esri, TomTom, Garmin, FAO, NOAA, USGS, NRCam, Parks Canada, Esri, USGS

### APPENDIX 3 Research Method

#### Census database and census tracts

Our main census database contains 336 population characteristics for 2 507 geographic areas across Quebec. To measure the spatial or geographic variation of population characteristics in their social context, we developed a composite coverage of census tracts in densely populated urban areas and census subdivisions outside densely populated urban areas. We selected census tracts and census subdivisions to represent neighbourhoods with an average concentration of at least 15 English speakers. The choice of geographic territorial unit is not arbitrary, since census tracts and census subdivisions are geographic units commonly used to show variations in the socioeconomic space where human activities occur (De Koninck, Disant et al. 2006, De Koninck and Pampalon 2007, Pampalon, Hamel et al. 2007, Pampalon, Hamel et al. 2007). Other units, like dissemination areas or block faces, are too small, and MRCs and census divisions or counties are too large. Choosing to focus on the 2 507 small census tracts and census subdivisions appeared to be the best method to reflect social interaction and everyday activities in the human living space (habitable area). This geographic activity space where people carry out most of their daily activities has many related concepts and has often been cited as the context within which any model of human behaviour should be assessed (Pickett and Pearl 2001, Cummins, Macintyre et al. 2003, Lebel, Pampalon et al. 2005, Sellström and Bremberg 2006, Chiu and West 2007, Cummins, Curtis et al. 2007, Lebel, Pampalon et al. 2007, Pampalon, Hamel et al. 2007, Riva, Apparicio et al. 2008, Carson, Kuhle et al. 2010, Roos, Magoon et al. 2010).

#### **Cluster analysis**

The geographic division of the human living space of Quebec's Englishspeaking population across 2 507 geographic units allows us to see if we can identify groupings of populations with similar characteristics by using a classification method called cluster analysis. Cluster analysis is a data exploration tool for grouping or dividing a dataset into natural clusters or groups based on their similarity. It is used when there is a strong belief that the sample units, in our case, the English-speaking population in each census tract or census subdivision, come from several populations or subgroups. The presence of subgroups is, in turn, an indication of high dimensionality or variation in the characteristic parameters of the population. There is no a priori definition of the populations or subpopulations. Essentially, we strive to describe these populations with the observed data. Our research uses a data clustering method called Ward's linkage (Ward Jr 1963, Ward Jr and Hook 1963). The method is particularly suited to census data and relies on analysis of the variance within each cluster in comparison with the total variance (Ward Jr and Hook 1963, Murtagh and Legendre 2014, Thompson, Aspinall et al. 2014, Majerova and Nevima 2017, Setyawan, Dwi Bekti et al. 2020). Ward's method does not directly define a measure of distance between two points or clusters. Any two clusters are hierarchically merged (agglomerated) at any stage if they provide the smallest increase in the dataset's combined error sum of squares.

The data composed of 22 variables (see Figure 1 in Introduction) was first standardized because of the large differences in values across the selected variables. The data distribution of each of the variables was described, and in all cases was found to be non-normal with high skewness and large variations in kurtosis (very peaked distribution of values).

The present analysis excludes all Indigenous lands. However, it includes Northern settlements ("villages nordiques"), which are considered Inuit settlement areas but do not have the status of Indigenous land reserves. Populations on Indigenous lands were excluded from the analysis for two major reasons. First of all, Indigenous populations living on Indigenous reserves or in other designated settlement areas did not produce reliable and valid census results that could be integrated into the analysis. Secondly, these populations do not fall under provincial jurisdiction and are not subject to provincial policies.

Ward's linkage analysis was used to analyze the 2 507 geographic locations and to generate a hierarchical agglomerative structure of clusters that can be visualized in a dendrogram, a tree-like structure that reflects the grouping of similar values into clusters. Several cluster groupings (4, 6, 8, and 10) were created and mapped. The eight-cluster group was selected for interpretation, since it showed cluster variations in sparsely populated areas outside of the Montreal region. The statistical significance of the eight clusters is an indication of the extent to which each cluster represents a unique combination of variables in a population. The statistical significance of the clusters was validated by a Kruskal-Wallis test (Kruskal and Wallis 1952, Liu 2015) of the ranks of values in eight unique clusters at the 95% significance level.

#### Importance of FOLS-English by Administrative Region

#### Table 12: Importance of FOLS-English by administrative region in each cluster group

Administrative Regions FOLS-E	1	2	3	4	5	6	7	8	N/I	TOT FOLS-E
Abitibi-Témis- camingue	615	1925	420	145	960	0	0	0	145	4210
Bas-Saint-Laurent	405	0	570	225	0	0	0	0	30	1 2 3 0
Capitale-Nationale	3065	670	2650	8 405	0	0	0	0	20	14810
Centre-du-Québec	400	0	1 280	1065	0	0	0	0	5	2750
Chaudière-Appalaches	645	0	2 2 2 0	1165	0	0	0	0	10	4040
Côte-Nord	0	3760	130	300	0	0	0	0	70	4260
Estrie	7 560	2770	1030	5025	4 3 0 5	2 6 4 0	0	0	30	23360
Gaspésie – Îles-de-la-Madeleine	1620	4005	295	1040	0	0	0	0	85	7045
Lanaudière	4945	1650	1100	4410	1315	0	0	0	5	13425
Laurentides	13280	8 905	600	4010	8845	1925	0	0	90	37655
Laval	1695	18085	0	170	30465	7830	26550	4155		88950
Mauricie	0	570	1495	1 180	0	0	0	0	5	3 2 5 0
Montérégie	24840	26155	2870	9430	30705	36020	8 2 9 0	31045	55	169410
Montreal	29570	38090	185	5255	156995	119040	189550	89375	0	628060
Nord-du-Québec	0	3935	125	30	0	4975	0	0	140	9 205
Outaouais	4480	25 510	610	1760	4435	16790	0	15705	550	69840
Saguenay– Lac-Saint-Jean	0	230	1050	695	0	0	0	0	10	1985
Grand Total	93120	136260	16630	44 310	238 025	189220	224 390	140280	1 250	1083485

Note:

Red colours for any administrative region indicate high FOLS-English presence. N/I : Population not included in the cluster analysis due to low numbers

Twenty-two Variables Used for Ward's Cluster Analysis Method

Universe	2016 Census	Mnemonic Code
Population, 2016	First official language spoken-English	FOLS_Eng
Population, 2016	0 to 24 years	FOLS_Eng_0_24
Population, 2016	25 to 44 years	FOLS_Eng_25_44
Population, 2016	45 to 64 years	FOLS_Eng_45_64
Population, 2016	65 to 84 years	FOLS_Eng_65_84
In low income based on the low-income cut-offs, after tax (LICO-AT)	In low income based on the low-income cut- offs, after tax (LICO-AT)	LICOat
Total - Employment income groups in 2015 for the population aged 15 years and over in private households - 100% data	Under \$20000 (including loss)	IncLss20K
Total - Employment income groups in 2015 for the population aged 15 years and over in private households - 100% data	\$20 000 to \$59 999	Inc20K_59K
Total - Employment income groups in 2015 for the population aged 15 years and over in private households - 100% data	\$60 000 and over	Inc60KPls
Total - Immigrant status and period of immigration for the population in private households - 25% sample data	Immigrants	Immig
Total - Aboriginal identity for the population in private households - 25% sample data	Aboriginal identity	AborID
Total - Visible minority for the population in private households - 25% sample data	Total visible minority population	VisMin
Total - Occupied private dwellings by dwelling condition - 25% sample data	Major repairs needed	HomeMjrRprs
Total - Highest certificate, diploma or degree for the population aged 15 years and over in private households - 25% sample data	No certificate, diploma, or degree	NoDplma_equiv
Total - Highest certificate, diploma or degree for the population aged 15 years and over in private households - 25% sample data	Secondary school diploma or higher	HSDplma_pls
Total - Highest certificate, diploma or degree for the population aged 15 years and over in private households - 25% sample data	Post-secondary	PostS
Total - Population aged 15 years and over by labour force status, 25% sample data	Employed	Employ
Total - Population aged 15 years and over by labour force status, 25%	Unemployed	Unemploy
sample data		onemptoy
Total - Mobility status 5 years ago - 25% sample data	Intraprovincial migrants	IntraprvMgrnts
Total - Mobility status 5 years ago - 25% sample data	Interprovincial migrants	InterprvMgrnts
Total - Lone-parent census families in private households - 100% data	Total - Lone-parent census families in private households - 100% data	LonePar
Total - Census families in private households by family size - 100% data	3 persons or more	Fam3pls

Cluster Group Percentage Share of Regional FOLS-English Population Jan Warnke (M.A. Geography – Université Laval)

Administrative Regions FOLS-E	1	2	3	4	5	6	7	8	N/I
Abitibi- Témiscamingue	14.6%	45.7%	10.0%	3.4%	22.8%	0.0%	0.0%	0.0%	3.4%
Bas-Saint-Laurent	32.9%	0.0%	46.3%	18.3%	0.0%	0.0%	0.0%	0.0%	2.4%
Capitale-Nationale	20.7%	4.5%	17.9%	56.8%	0.0%	0.0%	0.0%	0.0%	0.1%
Centre-du-Québec	14.5%	0.0%	46.5%	38.7%	0.0%	0.0%	0.0%	0.0%	0.2%
Chaudière-Appalaches	16.0%	0.0%		28.8%	0.0%	0.0%	0.0%	0.0%	0.2%
Côte-Nord	0.0%	88.3%	3.1%	7.0%	0.0%	0.0%	0.0%	0.0%	1.6%
Estrie	32.4%	11.9%	4.4%	21.5%	18.4%	11.3%	0.0%	0.0%	0.1%
Gaspésie – Îles-de-la-Madeleine	23.0%	56.8%	4.2%	14.8%	0.0%	0.0%	0.0%	0.0%	1.2%
Lanaudière	36.8%	12.3%	8.2%	32.8%	9.8%	0.0%	0.0%	0.0%	0.0%
Laurentides	35.3%	23.6%	1.6%	10.6%	23.5%	5.1%	0.0%	0.0%	0.2%
Laval	1.9%	20.3%	0.0%	0.2%	34.2%	8.8%	29.8%	4.7%	0.0%
Mauricie	0.0%	17.5%	46.0%	36.3%	0.0%	0.0%	0.0%	0.0%	0.2%
Montérégie	14.7%	15.4%	1.7%	5.6%	18.1%	21.3%	4.9%	18.3%	0.0%
Montreal	4.7%	6.1%	0.0%	0.8%	25.0%	19.0%	30.2%	14.2%	0.0%
Nord-du-Québec	0.0%	42.7%	1.4%	0.3%	0.0%	54.0%	0.0%	0.0%	1.5%
Outaouais	6.4%	36.5%	0.9%	2.5%	6.4%	24.0%	0.0%	22.5%	0.8%
Saguenay– Lac-Saint-Jean	0.0%	11.6%	52.9%	35.0%	0.0%	0.0%	0.0%	0.0%	0.5%
Grand Total	8.6%	12.6%	1.5%	4.1%	22.0%	17.5%	20.7%	12.9%	0.1%

N/I : Population not included in the cluster analysis due to low numbers



Jan Warnke, a doctoral candidate in geography at Université Laval, has dedicated over two decades to spatial analysis and the online visualization of health care access for linguistic minorities in Ouebec and the rest of Canada. Warnke is the lead of the Geodata project at Jeffery Hale Community Services in English, and his work revolves around the innovative use of health and service data, employing geospatial analytics to identify factors influencing service use among minority language speakers. His research has yielded a comprehensive database instrumental beyond health care, advancing methods for data anonymization, georeferencing, and online visualization. These techniques have been pivotal in assessing the needs of English- and French-speaking communities, now extending to regional development focuses like employment, income, and education.



Laura-Lee Bolger, M.Sc. in Geography from Université Laval, is a seasoned geographer and GIS/HGIS expert with over 20 years of experience. Specializing in historical geography, she excels in spatio-temporal analysis using historical maps to track changes over time. Laura-Lee's expertise includes developing dynamic online mapping applications using ESRI web products. Her career highlights include consulting roles in GIS and spatial analysis for various organizations, where her insights into landscape evolution through HGIS methodologies have been invaluable. Laura-Lee's extensive experience enriches her contributions to diverse, collaborative projects. She is fluent in both English and French, and her extensive experience enriches her contributions to diverse, collaborative projects.



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