

**Development of an Innovative
Population Health Measurement
Tool to Determine Eligibility for
the Fluoride Mouthrinse
Program**

**Nova Scotia Fluoride Mouthrinse Program
Ad Hoc Fluoride Mouthrinse Review Committee**

Report of the Criteria Subcommittee

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Executive Summary

The school-based fluoride mouthrinse program was mandated by Ministerial announcement in 1998. Over time, the recommended provincial protocol was adapted to regional and local preferences. A review initiated by an Ad Hoc Committee of the Public Health Enhancement Core Working Group in July 2001 was intended to determine the protocol variations, and then to provide a revised standardized protocol to be used across the province. Recommendations from a consensus conference included the investigation and development of a model of eligibility based on population health indicators, specifically those related to socioeconomic status. In Phase II of the review, a Criteria Subcommittee was struck to investigate the availability of appropriate socioeconomic data and their applicability as caries risk criteria for targeting of the provincial rinse program. By arrangement with the Statistics Division of the Nova Scotia Department of Finance, a new model was created. Through an iterative process of applying specific indicators of education, employment and income to school populations based on known catchment areas and then validating these with the Committee, three 2001 census indicators were selected: the percent of population 25 years and older who were employed; the percentage of population aged 20 and over with less than grade 12 graduation certificate; and, family census median income. The public health dental hygienists were instrumental in accurately delineating school catchment areas. The application of the census indicators to school catchment areas resulted in a ranked list of elementary schools in Nova Scotia. Eligibility was determined as any negative ranking. Nearly 40 percent of all elementary schools were included with 71 schools continuing in the program, 70 new schools added, and 34 schools retiring from the program. Further validation of the population indicators and model of eligibility can be undertaken by comparison of the school populations selected using those indicators with dental caries risk assessed by intraoral screening at program baseline.

Introduction

Public Health Services has offered the school based fluoride mouthrinse program (FMP) on a province wide basis since 1998. Weekly rinsing with a fluoride mouthrinse has been shown to prevent dental caries in school-age children. In Nova Scotia the weekly fluoride mouthrinse program is delivered in participating schools by trained volunteers, under the direction of Public Health Dental Hygienists, to all elementary students with consent.

The primary factor in determining the schools to be offered the fluoride mouthrinse was the decay rate, as demonstrated in recent screening data or from sample screenings conducted specifically for risk assessment. In practice, however, a variety of other local factors were also taken into consideration, including additional caries risk factors, receptivity of school personnel to the program, and human resource (dental hygienist) availability for program implementation. These local variables, in addition to variations in interpretation of the caries screening protocol, resulted in confusion and inconsistencies in implementation among health regions.

Fluoride Mouthrinse Program Review

A Review Committee was formed in 2001 to calibrate personnel and standardize all aspects of the program provincially.¹ The Committee identified a number of areas that required revision and standardization:

- Eligibility criteria for entry into the Fluoride Mouth Rinse Program
- Consent for participation in the program
- Volunteer recruitment and training
- Professional development for dental hygienists

- Program evaluation
- Community participation

As part of the review process, issues were identified, the literature was reviewed, experts were consulted, and a Consensus Conference was convened in March of 2002 to consult with stakeholders. The literature review and expert consultations reaffirmed efficacy. The 2001 Centers for Disease Control Summary Report: Recommendations for using Fluoride to Prevent and Control Dental Caries in the United States stated that “fluoride mouthrinsing is a reasonable procedure for groups and persons at high risk for dental caries”(page 23).²

An important task for the Consensus Conference was to identify a targeting strategy that could be used objectively and consistently across the province to ensure that as many as possible of the high risk groups could benefit from the program without local bias and without being resource prohibitive. It was noted at the Conference that some socioeconomic status (SES) measures are collected as part of census data collections, and would be available centrally, and that some of these ought to be usable, at least as a “focusing lens” for broad population risk assessment, perhaps in conjunction with some intraoral confirmation. A recommendation to this effect was among the final recommendations of the Conference. While there is supportive evidence for both risk assessment methods, it seemed appropriate to pursue identification of eligible schools using population health measures as a proxy for the more labour intensive intraoral screening. To this end, Public Health indicated a commitment to begin discussions with the Nova Scotia Statistics Agency.

In Phase II of the process, a Steering Committee was formed to implement the Conference recommendations. In turn, a Criteria Subcommittee was struck to investigate the availability of appropriate socioeconomic data and their applicability as caries risk criteria for targeting of the provincial rinse program. During this period, a Cochrane review of fluoride mouthrinsing supported earlier evidence regarding its effectiveness in preventing dental caries in children, particularly those at higher risk.³

Evidence for New Eligibility Criteria

Fluoride rinse is an effective intervention with low compliance requirements. Dental caries is a multifactorial disease with many contributors to risk. It is generally acknowledged that some risk factors are the same socioeconomic factors that are recognized as determinants of general health.

Recognition of the association between dental caries in child populations and socioeconomic status is consistent with what is known regarding population health in general. Population health recognizes that health is influenced by social, economic and physical environments, personal health practices, individual capacity and coping skills, human biology, early childhood development, and health services. Population health strategies intentionally address these key determinants of health within populations or communities. Several of these key determinants of health are based on social and economic status. The literature on social determinants of health shows that education, income and employment status are important contributors to health status and good predictors of health outcomes. Socioeconomic level has been identified as a precursor of many chronic diseases, infant morbidity and mortality, addictions, and dental diseases.⁴

Recognition of the impact of key health determinants including socioeconomic status has led to an increase in population based strategies that are targeted to specific groups with defined needs.

Overwhelming evidence points to the negative effects of low socioeconomic status on general and oral health. A recent Government of Nova Scotia report demonstrates in considerable detail the socioeconomic determinants of chronic disease.⁵ The widening gap between the wealthy and the poor, the high levels of poverty in single mothers, and disproportionate use of physician services among the poor and less educated are among the most unfavorable findings. The exclusion of these low socioeconomic groups from the larger society produces an even more critical set of consequences such as vulnerability, fear and a pervasive sense of powerlessness. Those at highest risk are single mothers and their children, aboriginal people, racial and cultural minorities, the disabled, the unemployed, and the homeless.

The Report also notes that conventional behavioural interventions aimed at healthier lifestyles have not been effective in alleviating the influences of poverty and social disadvantage.⁵ It is clear that the lifestyle interventions have been most successful in changing the behaviour of those with higher levels of education and income with the ultimate unintended effect of widening the gap between those with high and low income and deepening health inequalities. The more effective interventions for low income families are those such as healthy school food policies that provide only healthy food choices.

The strong association between oral health and socioeconomic status has been clearly described in two important and recent documents: the Surgeon General's Report on Oral Health in

America⁶ and a Canadian perspective on that Report.⁷ The Surgeon General's Report demonstrates that people in families with incomes below the poverty level experience twice as much dental decay as those who have higher incomes, and caries in the poor are also more likely to be untreated.⁶ Income has also been shown to be an important determinant of oral health status in Canada.⁷ Identification of risk is essential to targeting interventions appropriately. Children at high risk for extensive caries should be identified so that they may receive early intervention. Children at low risk must also be identified to reduce unnecessary care and expenditures.⁷

Although the determination of populations that might benefit most from fluoride mouthrinse has historically been based on indicators of oral health status, there is increasing evidence and concern for consideration of the socioeconomic status in program recommendations. The Nova Scotia Oral Health Survey of Children and Adolescents (NSOHS) had, for example, identified a correlation between caries rates and parental education levels. Moreover, the NSOHS found that about 30% of Nova Scotia children experienced up to 80% of total dental caries. A recommendation from the NSOHS was that enhanced preventive services be targeted toward this group.⁸ Further, one of the original researchers who developed and tested fluoride rinse programs recommended socioeconomic status as a reasonable criterion for eligibility in view of all that is known regarding the association between socioeconomic status and poor oral health including high levels of dental caries.⁹ There is a growing body of evidence supporting the use of socioeconomic indicators as a surrogate for clinical screening, particularly for dental caries in children.¹⁰⁻¹⁶

Methodology of Population Health Indicators

Initiated in July 2002, the Statistics Division of the Nova Scotia Department of Finance was requested to focus on developing a model for the eligibility criteria for entry into the program. A Nova Scotia approach to Newfoundland and Labrador's Community Accounts was being pursued at the time and the Nova Scotia Statistics Agency was willing to pursue development of a model using multiple indicators and to apply it to the Fluoride Mouthrinse Program. This was a mutually beneficial arrangement for Public Health and the Statistics Agency with the following outcomes:

- NS Statistics Agency had an opportunity to trial model development.
- It was an example of applying a Community Accounts approach to a program issue (moving from theory to practice).
- Public Health had provided funding to NS Statistics Agency to pursue the community accounts concept and this served a Public Health need.
- The Fluoride Mouthrinse program would have identified eligible schools without using valuable resources for intra oral screening.
- Learning for both Public Health and the NS Statistics Agency would serve their individual and collective work in the future.

Key Elements of Model Development

Four key elements were considered in the development of the model: the indicators to be used to provide a benchmark for program eligibility, school catchment areas, a data set to provide relevant data for the new model, and appropriate data analysis. While there are many indicators of socioeconomic status to choose from, it was felt that a small number of highly relevant

indicators would be best.¹⁷ Three indicators were chosen - income, education, and employment - to determine 'at risk' schools.

Initially, actual catchment areas were not available so an approximation was created. The catchment area of each elementary school was approximated using a radius for the school that resulted in the number of persons in the 2001 Census in the 5 to 9 age range approximating the enrolment for the same age group. Initially, as well, the 1996 Census data was used for social-economic characteristics as the 2001 data were not available at that time. Schools were assigned to quintiles for each of the three indicators with a value of -2 to +2 given to each quintile. When the three values were added, schools could have a result of -6 to +6.

A review of the results by dental hygienists living in the various areas in the province showed that the overall outcome was largely as might be expected, but not quite good enough for actual program delivery. The lack of catchment areas, use of 1996 Census data, and particular measures all contributed to apparent anomalies. In contrast, the following were recommended to offer strong potential for improvement of results: the use of actual school catchment areas, updating the data base to the 2001 Census Data, and a refinement of indicators.

The four dental hygienists who were part of the Ad Hoc Committee to Review Fluoride Mouthrinse undertook responsibility to obtain the actual catchment areas for the elementary schools in Nova Scotia. With the support of the Nova Scotia Department of Education and armed with a series of local maps, the dental hygienists talked to school board personnel, transportation supervisors, bus drivers and principals. Bus routes, pdf maps, electronic files,

crayon filled maps, and written descriptions were among the forms of input used to capture the catchment areas. A geographic information system facilitated development of the model.

Select Population Health Indicators for FMP

There are many population health indicators that could be chosen to inform decisions for FMP eligibility criteria. Several indicators for each of education, employment and income were selected and discussed among the Criteria Subcommittee and with Committee and other staff dental hygienists for suitability. The iterative process resulted in some changes over time with the final three indicators believed to be the most appropriate for this program.

The indicator used to represent *education* is the percentage of population aged 20 and over with less than grade 12 graduation certificate. The rationale is that those with lower education levels are less likely to be aware of the benefits of good oral health, to practice adequate homecare, and to seek treatment for oral illness or disease.

The indicator used to represent *income* is Family Census Median Income. The rationale is that those with lower incomes may not have access to professional dental services and may not be able to afford purchase of basic oral hygiene products. Initially Average Household income was used. A review of the methodology showed that median income (the point at which half the population makes more than the median and half earn less than the median) is a fairer comparative measure because a small number of individuals with very high income in an area can distort average income as a measure for comparison purposes. Census Families were shown to be the most representative of the target group for this program, that is, those families with children. The household category, initially considered as an indicator, includes Census Families

but also includes many other family arrangements and individuals with no children present in the household.

The *employment* indicator used is the percent of population 25 years and older. Employment is strongly correlated with many aspects of well-being and good health. Unemployment rate is often used as an indicator for many policy and administrative reviews. Most persons at risk, however, are included in neither the numerator nor the denominator of this measure, and therefore they are excluded from this measure. The employment rate as a percent of population includes all persons in the denominator and, therefore, persons at risk that otherwise would be excluded are a part of this measure. Initially, full-time employment for the population 15 and over was used. The full-time employment number was not readily available for this work. It may have been made available as part of a custom request at additional cost. Part-time work is deemed to represent a large portion of underemployment and therefore has a potential impact on this indicator. The age range was increased to 25 and over because a review of some schools, especially those in areas with high concentrations of university students, showed that a large number of persons in the 15 to 24 years of age range were still in school. This change provided better comparability of this measure for different geographic areas.

Further refinements of the model required additional trips to schools to determine the difference between the official catchment area and the areas from which students actually are drawn. Of eight schools examined in detail, three resulted in changes to the catchment areas for use in the model. These changes were made because of real socioeconomic differences in the excluded and included areas. In only one of these three did the resulting score change from +3 to +1.

The results of each of the indicators by Provincial Electoral District are shown in Appendices B, C and D. There are 52 Provincial Electoral Districts in Nova Scotia. Most of these districts are approximately the same size with boundaries established through an extensive consultation and formal review mechanism. For these reasons, looking at each of the indicators separately show how they contribute to the results in the overall provincial context. Clearly the metro Halifax and central regions of the province tend to be at the higher end of each of the indicators.

The overall results for Elementary and Acadian Schools are shown in Appendices E and F. As a result of the application of the model,

- 71 schools were deemed eligible to continue in the program
- 70 new schools were to be added
- 34 schools were to be retired from the program

Potential Model Refinements

The following refinements are recommended for future development and updating of the model:

- Use a custom Census target profile that includes only families with children under the age of 12.
- Explore the use of full-time employment as a measure.
- Update and refine the school catchment areas.

Implementation of the New Eligibility Criteria

In the summer of 2003 the Fluoride Mouth Rinse Steering Committee completed the work of Phase II of the program review including updating manuals and resources to support the program changes that had been made to standardize the program throughout Nova Scotia. This also involved orienting the Public Health Staff to the changes to the program.

Transition Year Considerations

It became apparent after the revisions to the fluoride mouthrinse program were identified and support materials completed that time was needed to prepare the volunteers and schools for change. Following discussions with the Department of Education and Public Health Directors in the Shared Service Areas, a decision was made to use the following year as a year of transition to the newly revised program. This third stage, the Transition Phase, became Phase III of the Fluoride Mouth Rinse Review Process. The Mandate of the Fluoride Mouth Rinse Committee was to oversee and guide the work required in this transition process.

The most critical revision to the program was the way in which schools became eligible for the program. The following transition issues were identified as specifically related to the changes in the eligibility criteria.

- Communication regarding the program modifications to all those affected by the changes would require agreement and standardized messages. Those included are public health staff, (Public Health Services staff DOH, Public Health Dental Hygienists, Directors of Public Health, VPs of Community) education staff (DOE, School Board paid staff,

school principals, teachers), volunteers that administer the program, and community partners.

- Identification of processes used to retire ineligible schools from the program, and to add eligible schools not currently on the program, would need to be sensitive to local circumstances.
- Orientation of volunteers to the program changes and revised support materials would require more lead time.
- Recognition by authorities that, in some areas, the resources required to offer the program in schools deemed eligible would require additional resources as many more schools were identified than had previously been eligible for the program.
- Recognition by all that in those schools no longer eligible for the program, volunteers were to be thanked and acknowledged for the support they had provided to the program in the past, and they would be given an opportunity to use their skills in other ways to benefit the school they served.

To facilitate the communication process and understanding of the impacts of the changes to the Fluoride Mouth Rinse program, presentations were given by Heather Christian, Chair of the FMR Committee, and Dennis Pilkey, Director of the Statistics Division, Department of Finance, to a wide range of groups over the period June, 2003 to July 2004 including the following: Public Health Working Group, Program Directors of the Department of Health, Office of Health Promotion Staff, Health Enhancement Committee, Vice Presidents of Community Health, District Health Authorities, Department of Education, and Program Directors for School Boards in Nova Scotia, the Canadian Association of Public Health Dentistry, and the Canadian Public

Health Association. To further enhance communication and acceptance, Heather Christian, Chair of the FMR Steering Committee, sent a letter in February 2004 to the Superintendents of School Boards requesting their assistance in facilitating the transition to the revised program within their school board area. The local Dental Hygienist in the shared service area followed up with the superintendent or their designate to discuss the transition to the revised program.

Several tools were developed by the Committee in Phases I and II to assist in the transition process. A question and answer sheet related to the program changes including the eligibility criteria was prepared for use by Dental Hygienists. Fact sheets related to the Fluoride Mouth Rinse Program were distributed with much of the communication. A template was created for Dental Hygienists to use in meeting with the Superintendents of schools (or their designates) to ensure that the information shared was standardized and the major issues were addressed across the province.

Resources were developed by the FMR Committee to assist with the orientation of volunteers and the delivery of the revised Fluoride Mouth Rinse Program. Revised orientation materials and a set of overheads were created for use by Dental Hygienists in training volunteers and describing the program. The volunteer and dental hygienists procedure manuals for the delivery of the Fluoride Mouth Rinse Program were revised and updated with a new image for ready identification. Toothbrushes were added as a means of supporting home care by promoting the FMP program. Posters featuring Nova Scotia children who participate in the program were created to promote the program school wide and across the province.

The overall communication plan for the roll out of the revised program is one that engaged the Provincial OHP, DOE communications staff and local communications staff from District Health Authorities and the Schools Boards. The communications staff were briefed on the highlights of the program and significant changes.

Considerations Regarding the Use of Population Based Criteria and Data

The development of the model and its application resulted in a process for decision-making that is based on evidence. The model was one part of a larger, participative review that embodied an exemplary community development approach engaging many people from various areas including provincial government, health authorities, education staff and the university community. Program modifications are being implemented based on a population health framework supported by the use of indicators of key determinants of health.

The use of any model must be applied with caution. The model is one way of using evidence to inform decisions. In looking at the final comparative scores (-6 to +6) in this model, it is possible for two schools with very similar characteristics to have a score difference as high as 3 points. If two schools are close on each of the three indicators and each consistently falls on either side of a quintile break, then there will be a three point differential. The significance of this difference, and other issues regarding data interpretation, requires a level of skill in interpreting and using quantitative data.

The Census data synthesized for use in this project, and the outputs generated by the model, are only applicable to this project. To preclude misinterpretation and inappropriate use, the

processes and final outputs are not circulated. Lists of schools that are eligible and ineligible for the fluoride mouthrinse program are provided to District Health Authorities.

Any application of a similar approach to other initiatives must be done with a careful review of the needs of each situation. The indicators, weights, and approach used must be tailored to fit the purpose and context of the program being reviewed.

Completion of Standards for the Fluoride Mouthrinse Program

Under Bill #34, the Department of Health is responsible for the standards, policies, monitoring and evaluation of programs, and the District Health Authorities are responsible for the delivery of services. In accordance with this Bill, and the standards setting process formally developed by the Department of Health Systems Quality Committee (HSQC), the review of the Fluoride Mouthrinse Program is required to include the development of standards for the program. The key elements outlined in the Dental Hygienists' manual for the FMP outline the requirements and provide the basis for much of the development of standard statements. The standards are crucial to the program and allow for an impact analysis to be done which would address some of the human resources issues often raised during the FMP review.¹⁸ The following is an example.

Category: Access¹⁸

Goal Statement

1. Children who attend schools that are eligible to participate in the Fluoride Mouthrinse Program receive a fluoride mouthrinse weekly.

Standard Statements

- 1.1. District Health Authorities have an identified mechanism for planning, allocation of resources and delivery of the Fluoride Mouthrinse Program based on the findings of the program evaluation and population health indicators as outlined in the provincial Fluoride Mouthrinse Program Manual.

Evaluation of Population Health Indicators

Plans are underway to develop an evaluative process to validate the newly developed eligibility model. The process will build capacity in public health staff to provide ongoing oral health surveillance. The validated model developed for use in the Fluoride Mouth Rinse Program will be of even greater significance as a model that can be used in other population based targeted programs.

The eligibility criteria using population indicators can be validated by comparison of the school populations selected using those indicators with dental caries risk assessed by intraoral screening at program baseline. The timing was originally believed to be spring of 2005 when the transition to the new criteria was to be completed. A 4 to 5 year follow-up screening for comparison with the baseline will assess the durability of the new eligibility criteria as well as evaluate the oral health outcome of the program intervention. Public health dental hygienists can provide the oral screening, and the administration of a questionnaire to determine demographic and behavioural variables that have an impact on oral health status. The training and calibration required for the screening is acquired through an intensive day-long workshop.

The validation of the new criteria model, along with the longer term oral health outcome evaluation, would advance the FMP towards the completion of a cycle of evidence-based health protection on the basis of population assessment and advocacy on behalf of the most vulnerable with evaluation of the intervention and ongoing surveillance to continue to direct program efforts to those most in need. The skills acquired for oral health risk assessment are directly transferable to the implementation of oral health *surveillance* by public health dental hygienists, an integral

public health role and the foundation for future program planning. The process and associated skill development are clearly linked to a population health approach, and would serve as an example to other programs.

Conclusion

As a result of the overall review process and application of the model, the Nova Scotia Fluoride Mouth Rinse Program has a much stronger foundation and support systems. The implementation of the new model for eligibility has resulted in more students - those most at risk for dental caries - receiving a proven preventive program at a key stage in their lives.

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Appendix A

Technical Resources used in Model Development

Software

Microsoft Word 2000/XP

Microsoft Excel 2000/XP

MapInfo 7.1

PCensus 7.06 for MapInfo

Adobe Acrobat 6.0

Geographic Resources

Geomatics Centre- full range of map datasets

DMTI Spatial- CanMap Streets, Water, Extended Points of Interest (EPOI), Multiple Enhanced Postal Codes (MEP), Forward Sortation Areas (FSA)

Statistics Canada full Census geographic products (1991, 1996, & 2001), District Health Zones (DHZ) Postal Code Conversion File (PCCF) 1996 & 2001

Department of Health- District Health Authorities (DHA),

Department of Education- School Board boundaries and school locations

Department of Finance - School Catchment Areas. Collected and created in co-operation with DHA Dental Hygienists, and school board officials with the support of the Department of Education.

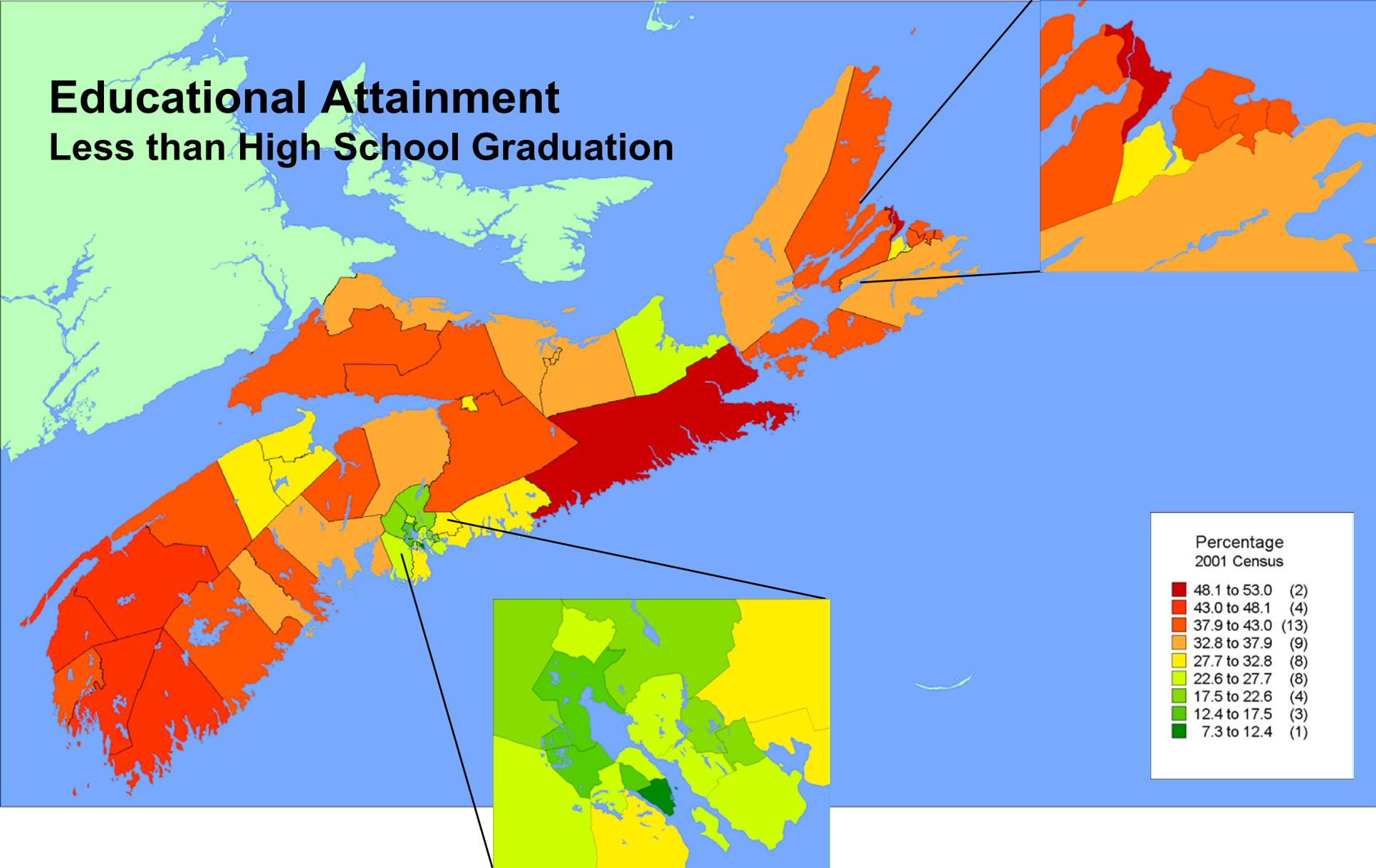
Data Resources

Statistics Canada - Census of Population data – Profile series and GeoSuite for 1996 and 2001 to lowest level of detail available

Department of Education – school enrolments for September 2001 & 2002

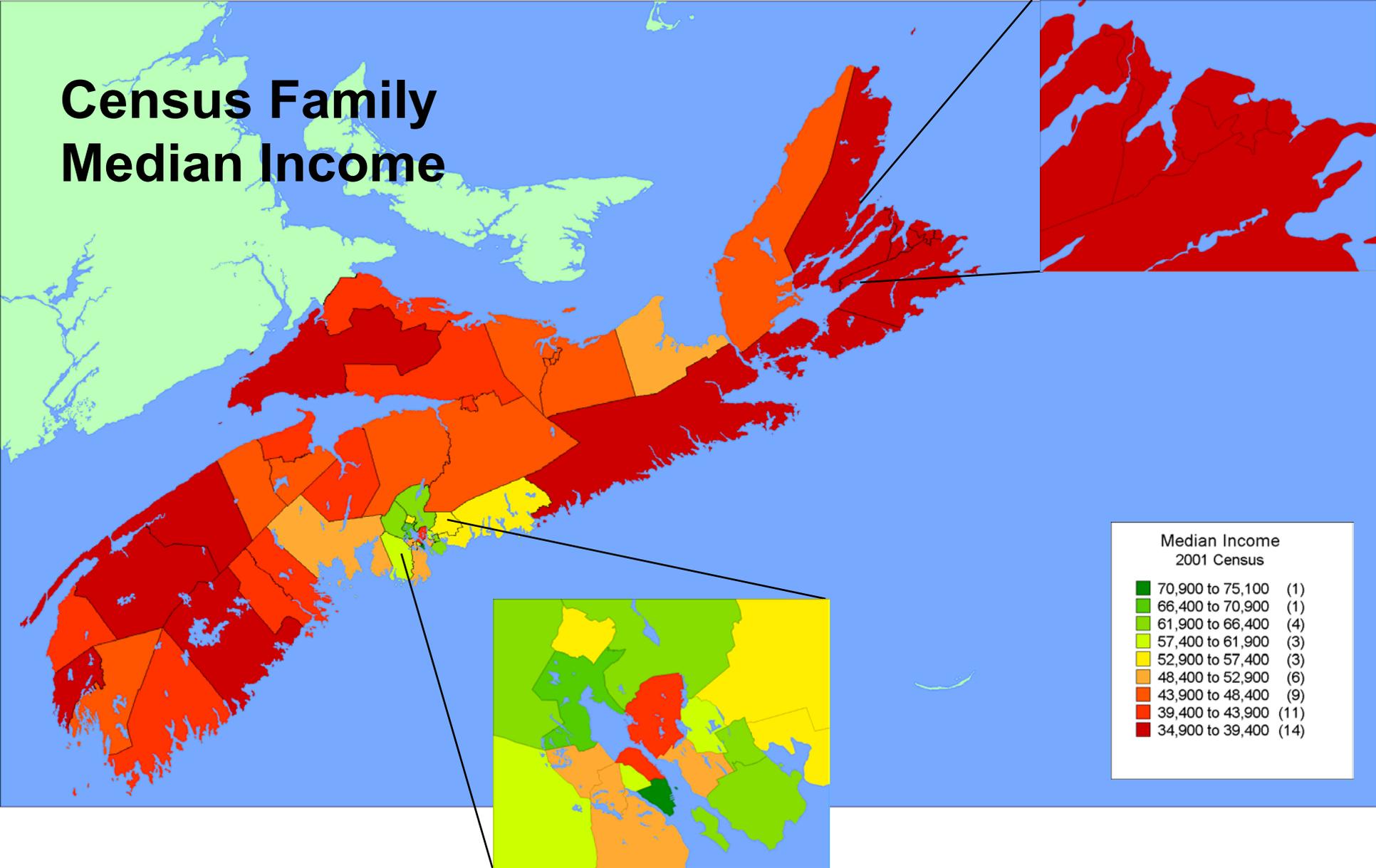
Statistics Division, Department of Finance - data modeling

Educational Attainment Less than High School Graduation



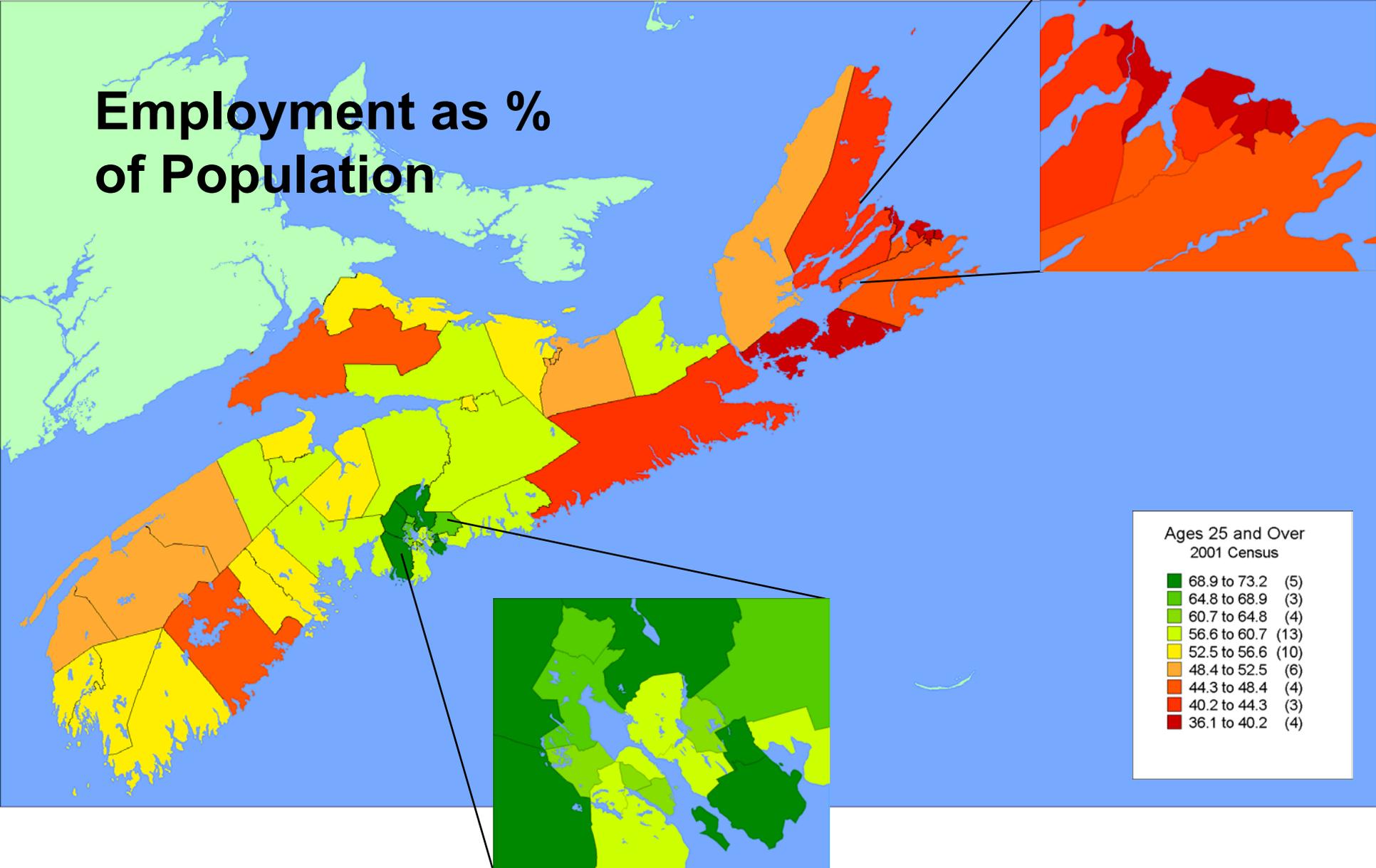
Appendix B
Education by Provincial Electoral District

Census Family Median Income



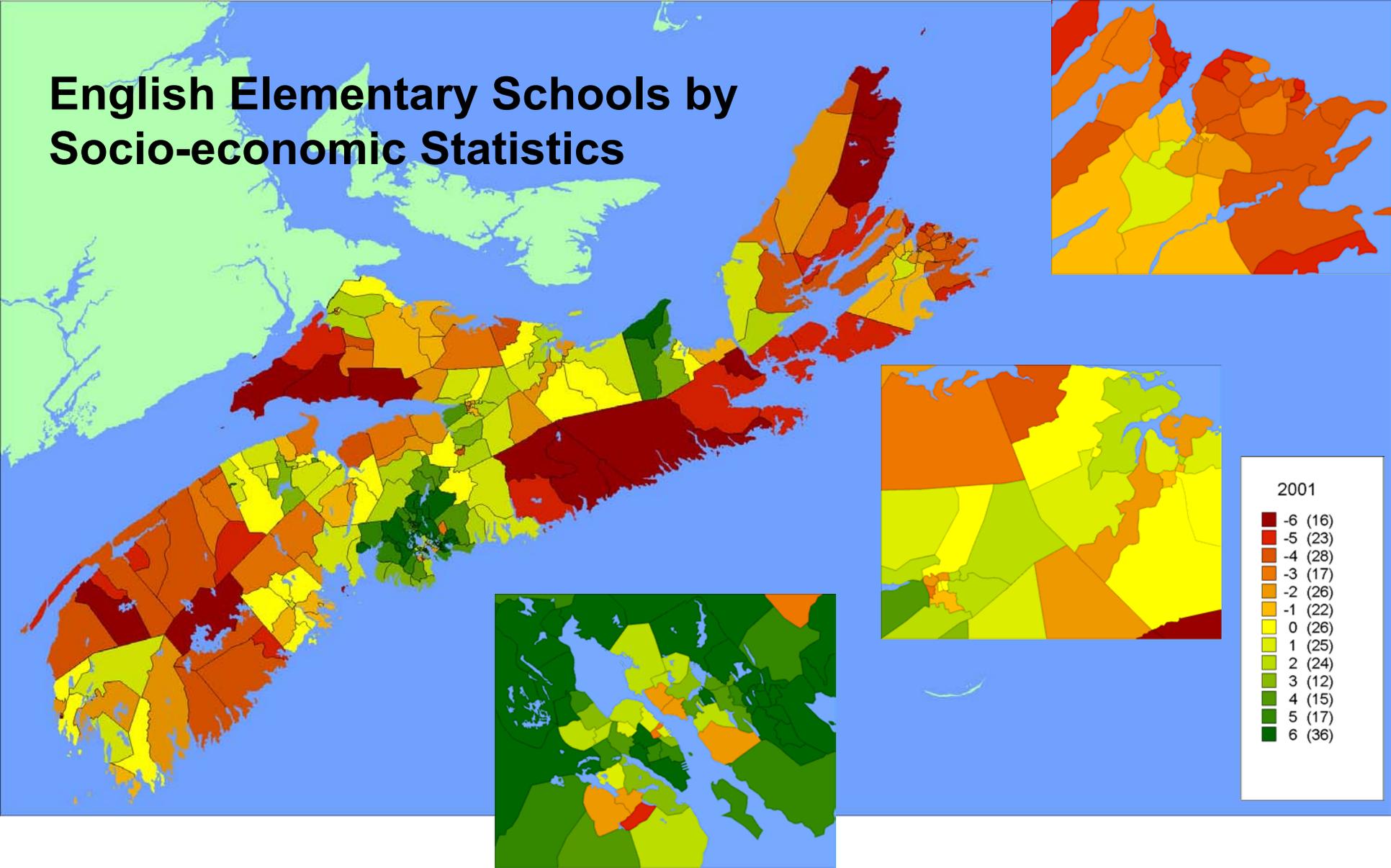
Appendix C
Income by Provincial Electoral District

Employment as % of Population



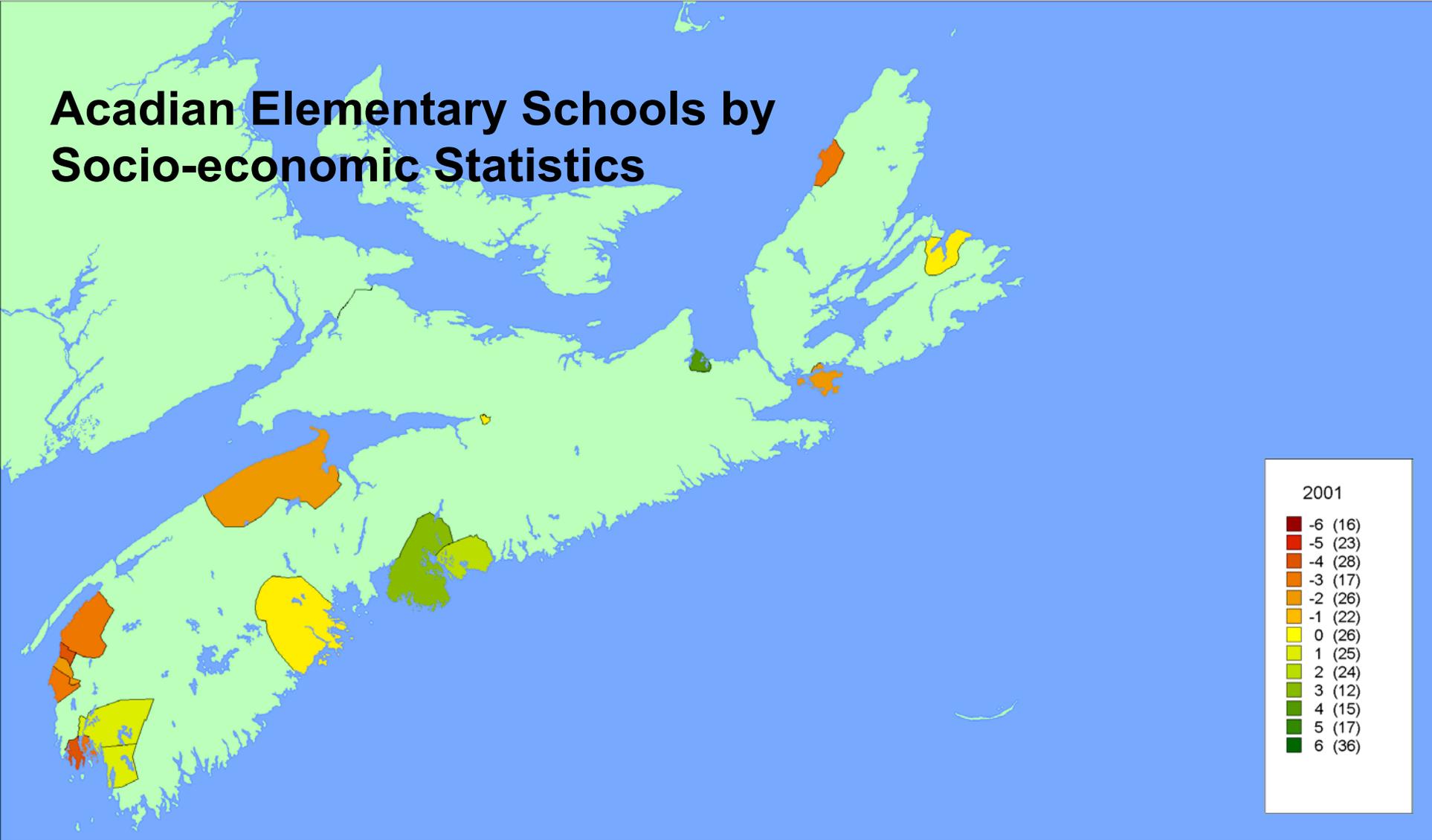
Appendix D
Employment by Provincial Electoral District

English Elementary Schools by Socio-economic Statistics



Appendix E
English Elementary Schools

Acadian Elementary Schools by Socio-economic Statistics



Appendix F Acadian Elementary Schools