

FINAL REPORT

DEVELOPING NOVA SCOTIAN COMMUNITY CLUSTERS FOR HEALTH SERVICE PLANNING AND RESEARCH

AN INTER-SECTORAL, COLLABORATIVE APPROACH TO THE
DEVELOPMENT OF COMMUNITY CLUSTER BOUNDARIES



Strategy for Patient-Oriented Research

SPOR  **SRAP**

Putting Patients First

Stratégie de recherche axée sur le patient

Le patient d'abord

PROJECT INFO

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Mikiko Terashima, PhD, is an Assistant Professor in the School of Planning, Faculty of Architecture and Planning, and cross-appointed to the Department of Community Health and Epidemiology, Dalhousie University. Mikiko lives in North End Halifax with her three loves —two greyhounds, Corona and Modelo (Della), who are enjoying retired life after their racing career, and Jason (human), her husband of 20 years.

**MESSAGE FROM THE**

Principal Investigator

To say that all members of the health research and policy decision making community in Nova Scotia have felt a need for a good set of geographic area boundaries will hardly be an exaggeration. Here, 'good' may mean that it matches well with their understanding of community boundaries while linking well with many types of health-related data used to analyze community health status. It can therefore tell clearer stories of what is needed to improve health. There are a number of geographic area boundaries available (e.g. census geographies), but researchers and policy decision makers have often struggled using them because they do not meet the criteria of a 'good' set of geographic area boundaries.

The termination of Nova Scotia Community Counts in 2015 posed additional challenges. However, it also presented the opportunity to develop a 'good' set of geographic area units to meet our specific needs. It has been extremely exciting to work with the Nova Scotia Health Authority and the Nova Scotia Department of Health and Wellness to come up with the community clusters, which can be universally applied to work in different organizations. This project would not have been possible without the expertise of officials in the health authority working closely with communities, the insights of the provincial department in policy, and the technical capability of the university. The common use of the community cluster units will enhance consistency across research and strengthen the evidence we produce. A truly collaborative effort like this allows us to take another step toward our ultimate goal—to improve the health of Nova Scotians.

Mikiko

COMMUNITY CLUSTERS REPORT

HIGHLIGHTS

1. A **community cluster geography**, in which boundaries appropriately align with the communities they serve, is essential for efficient and effective health service planning and research.
2. The development of the community clusters was a **collaborative effort** between researchers and government stakeholders, incorporating census data with local knowledge of care delivery.
3. Researchers, health planners and health program providers, as well as the general public, can access the community clusters through the **Nova Scotia Health Atlas** (www.healthatlas.ca).

MEANINGFUL GEOGRAPHIC AREAS ARE NEEDED FOR CONSISTENT USE IN BOTH RESEARCH AND EVIDENCE-INFORMED HEALTH PLANNING AND DECISION MAKING.



EXECUTIVE SUMMARY

Planning efficient and effective community health services requires accurate information on the geographic distribution of the population. To understand health statuses, patterns of health services use, and social and environmental influences on health, we need a geography that distinguishes our unique communities for which data can be collected, organized, and analyzed. The boundaries of local communities are not well represented by existing administrative (e.g. census) area boundaries. Without having geographic area boundaries that align with the communities they serve, health service planners need to approximate various measures of health and disease outcomes using administrative, area-based data including rates of illness and service delivery.

In this report, we describe the process of developing a set of geographic area units for health service planning, particularly planning for primary healthcare services. This is a component of a larger Nova Scotia Health Atlas project involving collaboration among the Nova Scotia Department of Health and Wellness (DHW), the Nova Scotia Health Authority (NSHA), and the Maritime SPOR SUPPORT Unit (MSSU).

The project team—comprised of researchers and officials from the three partner institutions—conducted a series of consultation processes to construct a geography called “community clusters”. Unlike previous efforts which relied on postal code data, Census Dissemination Areas (DAs) were used as the building blocks for the community clusters. A Geographic Information System (ArcGIS 10.3, ESRI) was used extensively in the process of determining how to best delineate the community cluster boundaries, while minimizing the need for complex recalibration when DA-level data are aggregated to the clusters.

The resulting 54 community clusters are nested in two (larger) levels of geographies—14 community health networks, and four management zones. The range of



population size in the community clusters were set to be approximately 2,700 to 51,000 to:

1. keep the volume of demand for services and programs at the cluster-level viable; and
2. allow stable calculation of the most uncommon disease incidence rates.

Residents’ drive time to comprehensive primary health care programs and services and service utilization patterns observed by the local officials were also taken into consideration in determining cluster boundaries.

The community cluster, community health network, and management zone boundary files are available to the public through the Nova Scotia Health Atlas portal (www.healthatlas.ca). This information enables Nova Scotia’s health care stakeholders to better understand and respond to the health care challenges facing the province.



IMPROVED EFFICIENCY AND EFFECTIVENESS OF HEALTH SERVICES LEAD TO BETTER HEALTH OUTCOMES

DEVELOPING NOVA SCOTIAN COMMUNITY CLUSTERS FOR HEALTH SERVICE PLANNING AND RESEARCH

BACKGROUND

Governments, health authorities, and health researchers need a clear understanding of the geographic distribution of disease occurrence, clinical outcomes, healthcare utilization, and social determinants to better inform targeted interventions. There have been major barriers to discerning these geographic distributions in Nova Scotia. Until now, one significant barrier was the lack of geographic area units that were meaningful for policy and health services planning and readily linkable to routinely collected survey data. Another barrier was the difficulty of accurately linking health data to geography. The small population size of many communities also posed a challenge in calculating rates of uncommon diseases and understanding their associated service needs due to confidentiality.

Between 2004 and 2014, the government of Nova Scotia maintained various population databases, with Nova Scotia Community Counts, including social and demographic (e.g. census, National Household Survey), tax-related, and other data (e.g. crime, electoral). These data were organized at various geographic levels and made available to the public. Their 'community' geography, developed by the government, was unique to Nova Scotia and catered largely to the planning needs of health and other community services. With the termination of Community Counts in 2015, however, it became urgent for organizations such as the Department of Health and Wellness (DHW) and Nova Scotia Health Authority (NSHA) to develop alternative geography.

The concept of community clusters came out of earlier work by DHW and the province's former District Health Authorities, which combined Community Counts' communities to larger units covered by local primary care services. After the resolution of Community Counts, DHW and now NSHA worked independently to redevelop a geography suitable for their respective responsibilities to support day-to-day and long-term service planning. At the same time, researchers at Dalhousie University were exploring ways to develop a geography that catered to the needs of understanding patterns of health and health service utilization at a small-area level. All three institutions were using different versions of geographic areas, which made it difficult to interpret and compare results. With support from the MSSU, the three parties teamed up to develop this new community cluster geography.

This community cluster geography serves three diverse purposes: health service planning for DHW and NSHA; health service implementation for NSHA; and health status and service research for Dalhousie University. The cluster development is part of the Nova Scotia Health Atlas Project, a larger scale effort to develop a data infrastructure for health and health determinants within the province.



COMMUNITY CLUSTERS CAN BE USED FOR HEALTH SERVICE PLANNING, IMPLEMENTATION AND RESEARCH



DEVELOPING CLUSTERS

GENERAL CRITERIA

The geographic units need to meet the following three criteria:

1. Align with what are generally perceived as clusters of areas sharing a community identity, known as *natural communities*;
2. Allow for ready data linkage with common population data, such as the census; and
3. Represent a geography that makes sense from a health service delivery perspective.

Patterns of health service use—particularly community-based programs and services, including primary health care—are often associated with geographic areas that residents consider to be their community or nearby community. Their day-to-day activities are also often organized around their community. ‘Communities’ are a helpful geographic base to design areas of service delivery and many primary health care services and programs as they tend to be responsive to groups of communities. Community clusters are therefore the appropriate smallest geographic area unit considered from service planning and delivery perspective.

Census data are an important source of information for understanding the social, economic, and demographic characteristics of the population. The incompatibility between the geographic areas that a health service may cover and areas in which census data are organized makes it difficult to discern the relationships between the social determinants of, and evidence in, health and disease statuses. It is vital that the geographic area boundaries allow ready linkage with population data and show a clear picture

of health of communities for surveillance, policy evaluation, and service planning.

THE PROCESS

The research team comprised of representatives from Dalhousie, DHW, and NSHA who were knowledgeable about local geography and willing to participate in the area review process. A GIS analyst from MSSU created a preliminary set of community clusters as a starting point geography using DAs (from 2011 census) as a building block and aggregating them to create areas as similar to the clusters developed by NSHA and DHW as possible. Four officials from NSHA, one from DHW, and staff and affiliates from MSSU participated in the first, two-day area review process.

The clusters are a grouping of neighbouring communities, primarily determined by the local leaders’ knowledge about both where their users are currently coming from to receive their services and projections of how future care delivery could be best coordinated. The review team inspected the GIS map showing each of the initial community clusters and discussed if they were consistent with these general criteria, as well as three more technical criteria:

1. Avoid splitting DAs as much as possible;
2. Maintain sufficient population size for each cluster so that, a) local health services are sustainable, and b) it allows stable calculation for incidence and prevalence of relatively uncommon diseases; and
3. Ensure the protection of privacy of individuals included in various health data.

Many of the team members have been serving their communities for many years and, as a result, are knowledgeable about what is happening in their respective locale. Their knowledge enabled the cluster boundaries to take into account some important social relationships associated with schools, languages, and shared gathering places, access patterns for health programs and services, and alignment with other existing boundaries (community health boards, counties) and former Community Counts communities, wherever possible. Consequently, some of the DAs that might have been split by looking at the geographically 'natural' divisions were kept intact, and vice versa.

Occasionally, it was necessary to divide DAs into two different clusters as some DAs encompass two or more clearly distinctive community entities. It was determined that these split areas would be assigned population weights based on approximate number of population falling into the respective areas.

The weights were determined based on approximate population using the number of buildings derived from the Nova Scotia Civic Address File (NSCAF). NSCAF is a set of spatial data maintained by the Nova Scotia government. It contains data for point (latitude and longitude) locations of all buildings in the province. It is not possible to differentiate types of buildings (such as apartments vs. detached homes, residential buildings vs. commercial buildings) but this is unlikely to dramatically affect population weight estimates.

Participating team members brought the GIS maps to their local leadership teams for further consultation with their colleagues, when needed. The GIS analyst redrew boundaries based on all of the team member and local office responses. The revision process was repeated until all the cluster boundaries were accepted by the review team and consulted members in the respective jurisdictions.



RESULTS

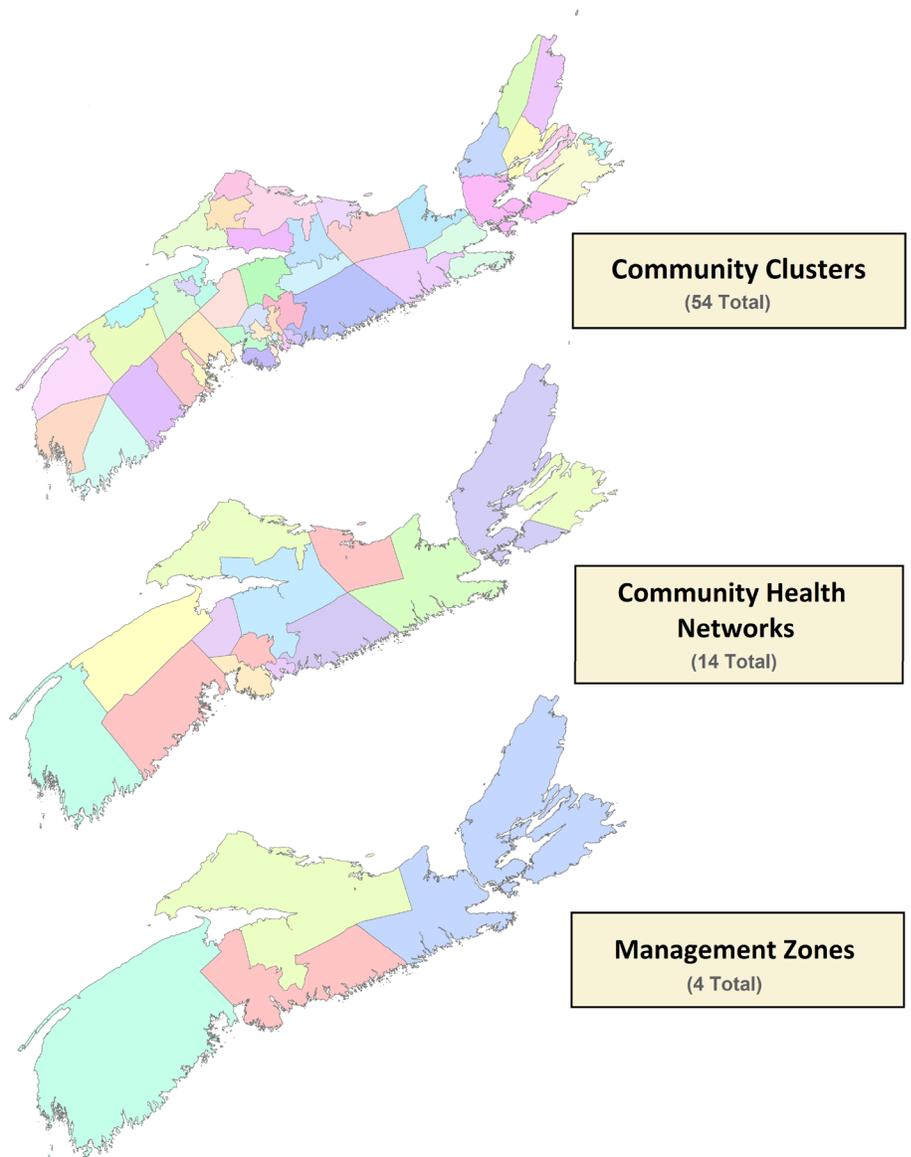
CLUSTER BOUNDARIES

The process of determining cluster boundaries between DHW and NSHA officers with knowledge of local user patterns and the GIS analysts at MSSU resulted in a total of 54 community clusters in the province. The clusters are nested in 14 community health networks, which, in turn, are nested in management zones (Figure 1).

The 2011 census divides Nova Scotia into 1,645 DAs. The initial review session identified 28 clusters that needed further validation, involving 43 DAs in total. After the consultation process, 13 out of these 43 DAs were split and assigned weights for the weight reference table. (The weight refers to the percentage of the original DA population that is assigned to each new portion of that split DA.)

The names and population distribution of each community cluster, community health network, and management zone are listed in [Appendix A](#).

FIGURE 1. COMMUNITY CLUSTERS NESTED IN COMMUNITY HEALTH NETWORKS AND MANAGEMENT ZONES



EXAMPLES OF RESOLVING PROBLEM DAs

Figures 2-4 show examples of challenges encountered with the aggregation of DAs to clusters. In these figures, clusters are delineated by a unique colour, black lines represent DA boundaries, pink lines represent county boundaries, and purple dots represent building locations.

For example, Figure 2 shows where DA 12090677 of the Lunenburg cluster (yellow) extends to the coastal areas of a neighbouring cluster. This DA crosses over the county boundary well past the community of Hubbards. Assigning this DA to the Lunenburg cluster best represents the community boundaries.

In Figure 3, the boundary of DA 12090901 follows Starboard Drive between Bedford and Clayton Park in Halifax. New development along this road branches off to both sides of the DA boundary, resulting in this community being split between the Bedford (green) and Clayton Park (orange) clusters.

FIGURE 2. AN EXAMPLE OF CENSUS DISSEMINATION AREAS (OUTLINED IN BLUE) THAT EXTEND INTO THE COASTLINES OF NEIGHBOURING CLUSTERS

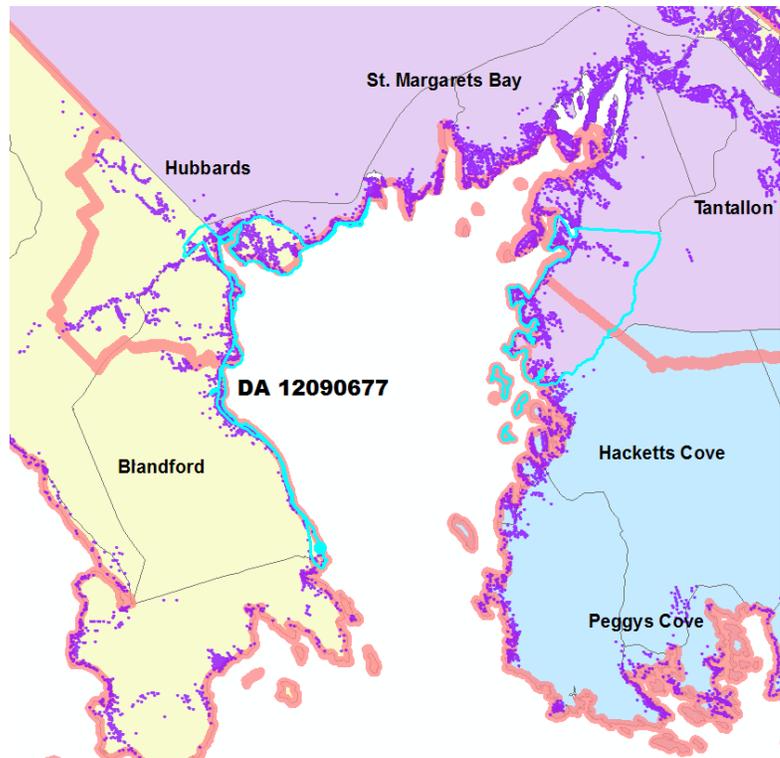
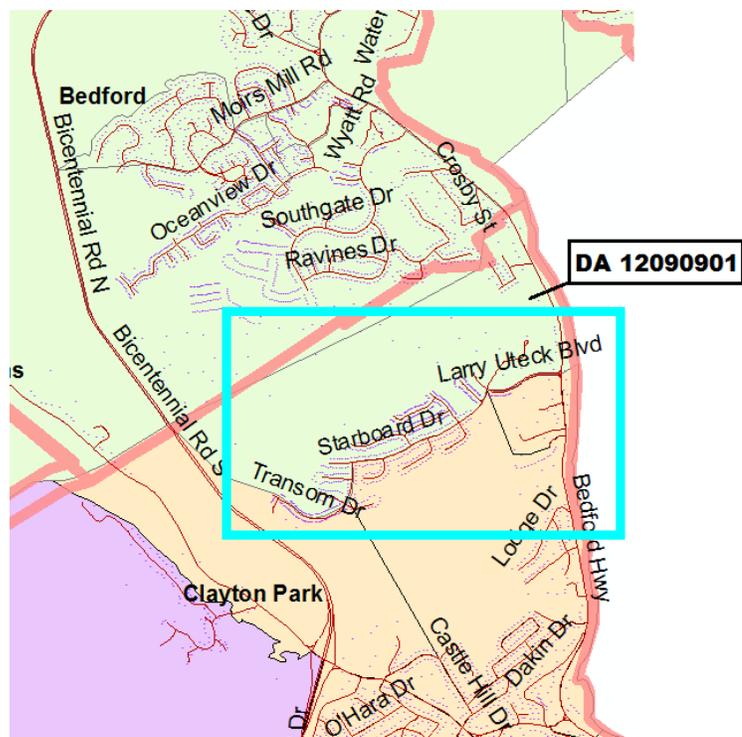


FIGURE 3. AN EXAMPLE OF NEW DEVELOPMENT CROSSING BOUNDARIES BASED ON THE OLD CONCEPT



In some cases, a group of islands have the same DA code, while the populations in the respective islands are socially more closely connected with different clusters. **Figure 4** shows two DAs (12180027 and 12180026) in Boularderie Island area. The research team noted distinct access patterns for health care services, with primary health care being one example. In this case, it does not make sense to keep the DA as one unit. The team agreed that the DA should be separated into different clusters.

In some cases, the DA split is not desirable even though it appears to make sense geographically (e.g. looking at natural borders, such as rivers and mountains, and road connections). Those cases occur when the local services extend to both areas for reasons despite a physical boundary – for example, two areas closely connected historically. Another may be when population on one side of the physical boundary uses the services of the other side because of proximity to other amenities such as shopping malls.

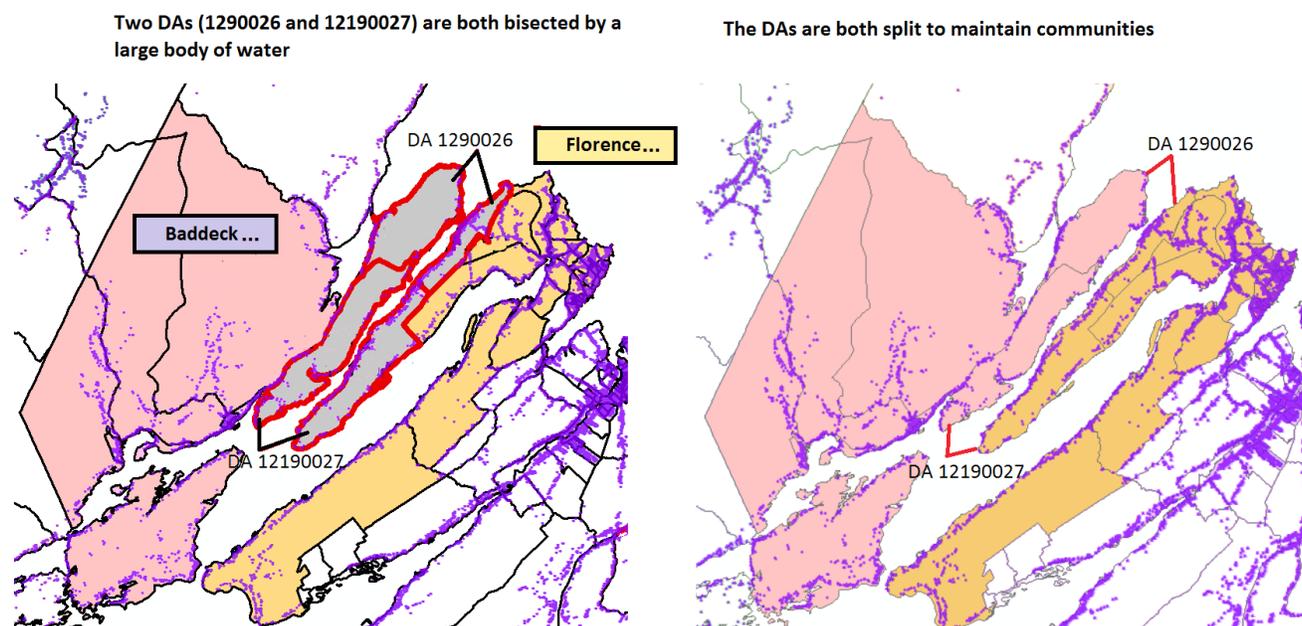
The boundaries of rural clusters are more challenging to configure because the DAs tend to be large and cover sparsely populated areas encompassing multiple communities. Newly developed suburbs

are also challenging due to their rapidly changing landscape and population distribution into neighbouring areas, as seen in **Figure 3**. Determining which community clusters these newly emerging residential areas should belong to relies heavily on the participating team members' knowledge about the neighbourhoods and communities surrounding them. Without this local knowledge of how many services reach these sparsely populated areas, it would not be possible to determine the boundaries easily.

The resulting 54 clusters have a population size ranging from 2,725 (Sherbrooke) to 51,169 (Sydney). **Appendix B** shows the list of community clusters, community health networks, and management zones and the population size.

While the boundaries have been finalized for the time being, no geographic boundaries remain static. Periodical maintenance and fine-tuning of cluster boundaries will be needed. For example, it is anticipated that these boundaries will be subjected to further change with revisions of DA boundaries in the future census.

FIGURE 4. AN EXAMPLE AREA WHERE SPLITTING CENSUS DISSEMINATION AREAS IS NECESSARY (BOULARDERIE ISLAND)



ACCESSING THE CLUSTER AREA FILE

The community cluster, community health network, and management zone boundaries are available through the Nova Scotia Health Atlas website for researchers, health planners, and health program providers interested in understanding the status of health, health service utilization, and disease occurrences. The Atlas is also a helpful resource for the general public to better understand the health and well-being of their communities. Visit www.healthatlas.ca to access the cluster area geographic boundary file. The Atlas website also provides a guide on how to use the boundary file, with look-up and population weight tables.

MORE ABOUT THE NOVA SCOTIA HEALTH ATLAS

The ongoing Nova Scotia Health Atlas Project represents an orchestrated effort by DHW, NSHA, and MSSU to pool knowledge and data sources from key interest groups for research, policy, and planning. This report describes one phase of this project: developing community cluster units for health service planning.

The Nova Scotia Health Atlas (www.healthatlas.ca) is an interactive, web-based mapping tool that provides timely information pertaining to the distribution of health-related indicators—health and disease measures, health service use, social determinants of health—across different geographic areas of Nova Scotia. The availability of this information in a single location in a user-friendly format, through the Atlas, will better enable Nova Scotia's health care stakeholders to understand and respond to the health care challenges facing the province. In doing so, Nova

Scotia will join other Canadian provinces and health authorities at the forefront of evidence-informed health care planning.

MSSU and DHW are currently developing a method of geocoding MSI registry data. This geocoding method will enable more reliable and accurate location of people's place of residence, and therefore calculation of population-level health and service utilization using data linkable to MSI registry data.

The project will continue to receive oversight and guidance from a diverse advisory panel, including provincial government representatives, NSHA / IWK Health Centre administrators, and patient advisors, as well as input on its content and priorities, as identified by decision makers and the public.



THE NOVA SCOTIA HEALTH ATLAS IS AVAILABLE
AT WWW.HEALTHATLAS.CA.

APPENDICES

APPENDIX A. AREA LEVELS AND APPROXIMATE SIZE

| AREA LEVEL | DEFINITION | NUMBER OF PEOPLE PER UNIT (approximate) |
|---------------------------------------|---|---|
| Census Dissemination Area (DA) | As defined by Statistics Canada ¹ , a DA is a small, relatively stable geographic unit composed of one or more adjacent dissemination blocks (an area bounded on all sides by roads and/or boundaries of standard geographic areas, with a population of 400 to 700 persons). The dissemination block is the smallest geographic area for which population and dwelling counts are disseminated. Dissemination blocks cover all the territory of Canada and all of Canada is divided into DAs. | 300 - 1,000 |
| Community Clusters | Community clusters are newly developed area units based on aggregated census DAs intended to align as closely as possible with community activity. | 2,700 (Sherbrooke) to 51,000 (Sydney and Area) |
| Community Health Networks | Community health networks are geographic units based on aggregated community clusters and serve as a mechanism to facilitate linkages across all health system and community partners, linking primary, secondary, tertiary, and diagnostic care across settings (hospital, community, long term care). | 18,000 (Eastern Shore / Musquodoboit) to 165,000 (Halifax Peninsula / Chebucto Community) |
| Management Zones | Nova Scotia Health Authority management zones support local health services leadership, management, and delivery, and are developed in accordance with typical service access, practitioner referral patterns, and other service planning and delivery boundaries. | 157,000 (Zone 2: Northern) to 408,000 (Zone 4: Central) |

¹ Statistics Canada (2011). <https://www12.statcan.gc.ca/census-recensement/2011/ref/dict/geo021-eng.cfm>

APPENDIX B. LIST OF COMMUNITY HEALTH NETWORKS, COMMUNITY CLUSTERS AND POPULATION

ZONE 1 Western

| COMMUNITY HEALTH NETWORKS & COMMUNITY CLUSTERS | POPULATION* |
|---|-------------|
| Lunenburg & Queens Community Health Network | |
| Bridgewater | 26,453 |
| Chester and Area | 12,092 |
| Liverpool | 10,960 |
| Lunenburg / Mahone Bay | 9,258 |
| Yarmouth, Shelburne & Digby Community Health Network | |
| Digby / Clare / Weymouth | 19,317 |
| Shelburne / Lockeport | 14,496 |
| Yarmouth | 25,275 |
| Annapolis & Kings Community Health Network | |
| Annapolis Royal | 5,833 |
| Berwick | 13,746 |
| Kentville | 23,937 |
| Middleton | 21,187 |
| Wolfville | 15,001 |

ZONE 2 Northern

| COMMUNITY HEALTH NETWORKS & COMMUNITY CLUSTERS | POPULATION* |
|--|-------------|
| Colchester, East Hants Community Health Network | |
| East Hants Corridor | 12,212 |
| Economy / Glenholme | 5,400 |
| Hants North | 7,054 |
| South Colchester | 11,060 |
| Truro and Area | 34,970 |
| Cumberland Community Health Network | |
| Amherst | 13,535 |
| Cumberland North / North Shore | 8,734 |
| South Cumberland | 4,216 |
| Springhill | 7,915 |
| Pictou Community Health Network | |
| New Glasgow / Westville / Stellarton | 34,979 |
| Pictou West | 10,664 |

*Population data are from 2011 Statistics Canada Census of Population.

ZONE 3 Eastern

| COMMUNITY HEALTH NETWORKS & COMMUNITY CLUSTERS | POPULATION* |
|--|-------------|
| Cape Breton Community Health Network | |
| New Waterford | 9,803 |
| Sydney and Area | 51,169 |
| Dominion / Glace Bay | 21,886 |
| Florence / Sydney Mines / North Sydney | 20,031 |
| Antigonish & Guysborough Community Health Network | |
| Antigonish | 19,589 |
| Guysborough / Canso | 5,418 |
| Sherbrooke | 2,725 |
| Inverness, Victoria & Richmond Community Health Network | |
| Port Hawkesbury / L'Ardoise / Isle Madame | 16,016 |
| Baddeck / Whycocomagh | 3,527 |
| Cheticamp | 4,119 |
| Dingwall | 2,769 |
| Inverness | 7,105 |

ZONE 4 Central

| COMMUNITY HEALTH NETWORKS & COMMUNITY CLUSTERS | POPULATION* |
|--|-------------|
| Dartmouth & Southeastern Community Health Network | |
| Dartmouth North | 19,149 |
| Dartmouth South | 25,623 |
| Dartmouth East | 23,694 |
| Cole Harbour / Eastern Passage | 36,264 |
| Preston / Lawrencetown / Lake Echo | 11,116 |
| Bedford Sackville Community Health Network | |
| Bedford / Hammonds Plains | 32,040 |
| Sackville South | 21,730 |
| Sackville North and Area | 20,892 |
| Fall River and Area | 14,163 |
| Halifax Peninsula & Chebucto Community Health Network | |
| Tantallon / Timberlea / St. Margarets Bay | 20,990 |
| Sambro Rural Loop | 12,836 |
| Armdale / Spryfield / Herring Cove | 24,007 |
| Halifax Needham | 19,641 |
| Halifax Chebucto | 19,127 |
| Fairview | 15,797 |
| Clayton Park | 32,953 |
| Halifax Citadel | 19,683 |
| Eastern Shore Musquodoboit Community Health Network | |
| Eastern Shore / Musquodoboit | 17,992 |
| West Hants Community Health Network | |
| West Hants | 20,269 |





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The Maritime SPOR SUPPORT Unit (MSSU) is one of several SUPPORT Units across Canada, bringing health research findings to life by helping to integrate them into patient care.

We engage with patients from across New Brunswick, Nova Scotia, and Prince Edward Island, and collaborate with the research community on governance, priority setting, and the planning and conducting of research. Through this meaningful and active collaboration, we contribute to an enhanced health system, engaged health research, and improved health outcomes. We are dedicated to supporting patient-oriented research and decision-making that will reflect the needs and values of Maritime patients.

The MSSU and other Support for People and Patient-Oriented Research and Trials (SUPPORT) Units across Canada are administered by SPOR, the Strategy for Patient-Oriented Research. SPOR, a Canadian Institutes of Health Research (CIHR) initiative, is focused on integrating health research more effectively into care.