

Examining Community Health Centres According to Geography and Priority Populations Served, 2011/12 to 2012/13

An ICES Chartbook

November 2015



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Contents

3	Publication Information	7	LIST OF EXHIBITS
5	Authors' Affiliations	8	INTRODUCTION
5	Acknowledgements	8	Purpose of the Chartbook
6	About ICES	9	Key Findings
		10	Overview of Data Sources and Methods
		12	RESULTS
		29	REFERENCES
		30	APPENDIX

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About ICES

The Institute for Clinical Evaluative Sciences (ICES) is an independent, non-profit organization that produces knowledge to enhance the effectiveness of health care for Ontarians. Internationally recognized for its innovative use of population-based health information, ICES evidence supports health policy development and guides changes to the organization and delivery of health care services.

Key to ICES' work is its ability to link population-based health information, at the patient level, in a way that ensures the privacy and confidentiality of personal health information. Linked databases reflecting 13 million of 34 million Canadians allow researchers to follow patient populations through diagnosis and treatment, and to evaluate outcomes.

ICES receives core funding from the Ontario Ministry of Health and Long-Term Care. In addition, ICES scientists and staff compete for peer-reviewed grants from federal funding agencies, such as the Canadian Institutes of Health Research, and project-specific funds from provincial and national organizations. These combined sources enable ICES to have a large number of projects underway, covering a broad range of topics. The knowledge that arises from these efforts is always produced independently of funding bodies, which is critical to ICES' success as Ontario's objective, credible source of evidence guiding health care.

List of Exhibits

Exhibit 1 Distribution of CHCs, CHC clients and demographic characteristics by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 2 Distribution of CHC clients, by age group and priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 3 Distribution of CHC clients, by income quintile and priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 4 Avoidable hospitalizations per 1,000 CHC clients, by disease and priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 5 Hospital readmissions among CHC clients, by type of readmission and priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 6 Average number of physician and nurse practitioner visits among CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 7 Emergency department utilization rate per 1,000 CHC clients, by urgency and priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 8 Specialist visits per 1,000 CHC clients, by specialist type and priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 9 Cancer screening among CHC clients, by screening type and priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 10 Standardized ACG Morbidity Index (SAMi) for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 11 Adjusted Diagnostic Groups (ADGs) for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 12 Resource Utilization Bands (RUBs) for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 13 Demographic characteristics of CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 14 Client complexity and expected resource use for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 15 Health care utilization by CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 16 Specialist and primary care utilization by CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Exhibit 17 Cancer screening among CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Introduction

Purpose of the Chartbook

There is continued interest in evaluating primary care models in Ontario. This is an important step in evaluating the accessibility and quality of care being provided to Ontarians. In typical evaluations the various primary care models are compared to each other. However, it is becoming increasingly evident that the models themselves are quite varied with widely differing geographic and demographic characteristics, leading to different patterns of health care utilization. It is important to understand these differences so that appropriate comparisons are made. Regression analyses are commonly used to control for variations in demographics and case mix, but regression can fail to adequately control for these factors when populations vary widely. For example, when comparing a model that is primarily rural with a model that is primarily urban, there are few points of actual comparison and regression models may fail to provide an appropriate basis for comparison. There is evidence to suggest that stratifying data by subpopulations can improve the appropriateness of comparisons.¹ There are also a number of precedents in other sectors, including acute care, where assigning institutions to peer groups has contributed to more appropriate measurement, evaluation of performance and accountability.²

The Chartbook allows for visual comparisons of demographic and health care utilization data analyzed over stratifications of Community Health Centres (CHCs) that serve different priority populations. The Chartbook reports on a set of key indicators commonly examined for system transformation and used to measure primary care performance including emergency department visits, readmissions and avoidable hospitalizations.

The Chartbook suggests that caution should be used when interpreting aggregate data for the CHC sector, due to the diverse populations seen in CHCs. In the future, it may be appropriate to also stratify other primary care models according to their geographic and demographic characteristics. The Chartbook serves the following purposes:

- It provides demographic and health care utilization data for CHCs in Ontario, stratified according to the priority populations they serve. These analyses demonstrate a large amount of diversity among CHCs.
- It provides a snapshot of the care provided by CHCs in Ontario and describes the demographic and socioeconomic characteristics of clients who receive primary care from physicians and nurse practitioners (NPs) in Ontario's CHCs.

Key Findings

The Chartbook characterizes the clients who receive primary care at Ontario CHCs. Each CHC was stratified based on the priority population served. Demographic and health service use over time across the six CHC stratification categories is reported, as well as totals for all CHCs together and for Ontario (stratified by urban/rural).

Demographic patterns illustrated that the CHCs identified in the various stratification categories have similar age group profiles compared to Ontario totals, however both the 'at risk urban' and 'newcomer' groups exhibited a few differences worth noting. The 'newcomer' group had a greater percentage of children younger than 4 years (compared to all CHCs and the Ontario average) and both groups had a lower percentage of people older than 65 years. Generally, CHCs provide primary care to a greater percentage of women than men. All CHCs had a greater number of people living in the lowest income quintiles compared to Ontario as a whole, however the 'newcomer' and 'at risk urban' CHC groups both had a greater number of people living in the lowest income quintiles at 73.6% and 62.6%, respectively.

Emergency department (ED) visit data demonstrated that although overall CHC rates of ED use appear higher than the Ontario average, this finding is primarily influenced by CHC clients classified as 'at risk urban'. This group had rates almost three times the rate for Ontario. On average, the 'newcomer' group used the ED the least for both urgent and non-urgent visits.

Hospitalization data revealed a similar trend: avoidable hospitalizations were higher in CHCs compared to the Ontario average. Again, this finding is primarily seen in the 'at risk urban' group, and predominately among those with diabetes and chronic obstructive pulmonary disease (COPD). The 'Francophone' CHCs also had higher avoidable hospitalizations for COPD compared to the other CHCs and the Ontario totals.

In general, the percentage of 30-day readmissions was slightly higher in CHCs compared to the Ontario average. The 'at risk urban' CHCs had the highest percentage of 30-day readmissions (7.8%) compared to the CHC total (6.6%) and the Ontario average (5.3%).

Specialist and primary care visits were higher in CHCs compared to the Ontario averages, particularly in the 'at risk urban' CHCs. Overall, CHC clients had more specialist visits, primarily seen in psychiatry visits and the 'other' group. 31.0% of the 'at risk urban' group's specialist visits were for psychiatry, compared to 17.6% for all CHCs and 9.6% for Ontario.

Cancer screening was relatively high in CHCs compared to the Ontario total; this finding was seen among all of the CHC groups. Between the CHCs, the lowest screening percentage was in the 'at risk urban' group. The percentage of clients receiving colorectal and breast screening was higher than Ontario totals in all CHC groups except 'at risk urban'. The percentage of women receiving cervical screening was higher in all CHC groupings than for Ontario.

Overall patterns demonstrate that there were substantial differences between CHCs in geography, sociodemographics and health care utilization. The 'at risk urban' group in particular had very high rates of low income status, morbidity, co-morbidity and health care utilization. This group comprised almost one-fifth of the CHC primary care population and as an outlier it skewed many of the health care utilization measures for CHCs overall. There were also large differences in age, sex, income, morbidity, co-morbidity and health care use among the other CHC groups. These differences indicate that it may not always be appropriate to consider the CHC sector as a single entity, but rather it is important to stratify CHCs when examining needs, resource use and performance.

Overview of Data Sources and Methods

Key to the data presented in the Chartbook is the ability to link provincial, population-based health information at the person level with administrative data from CHCs. The study time period was April 1, 2011 to March 31, 2013. CHC data were extracted from electronic health records and linked with data holdings at the Institute for Clinical Evaluative Sciences (ICES) and accessed through an Applied Health Research Question. Data sources included: CHC data, the Registered Persons Database, physician billings from the Ontario Health Insurance Plan, the hospital Discharge Abstract Database, emergency department visits from the National Ambulatory Care Reporting System, Client Agency Program Enrolment tables, the Ontario Cancer Screening Registry, the Rurality Index of Ontario for urban-rural residence and the 2006 Census of Canada data for sociodemographic variables (a description of each data source is provided in the [Appendix](#)). These datasets were linked using unique, encoded identifiers and analyzed at ICES. Case mix was determined using the Johns Hopkins Adjusted Clinical Group (ACG) methodology. ACGs are used to measure client illness burden.³ The system estimates the illness burden of individuals and, when aggregated across individuals, of populations. The ACGs help to predict utilization of medical resources, based on the finding that people with certain groups of diagnoses tend to have similar health care utilization patterns.

CHC Data

The CHCs have been stratified based on their main priority population or geographic catchment area. All CHCs provide care for people who experience barriers to health but the populations served vary depending on the needs in the community. Each CHC is governed by a board of directors comprised of clients, community members, health providers and community leaders. It is their objective to determine that the services provided are relevant to the needs of the community. In addition, some CHCs have specific priority populations who are the main client group served. Priority populations are identified through community needs assessments, community focus groups and by actively engaging clients. The following six classifications of CHCs were developed and used to stratify:

- At risk urban: CHCs that predominantly serve persons who are homeless and/or who have issues with mental health and addictions
- Urban geography: CHCs with RIO (Rurality Index of Ontario) ≤ 40
- Rural geography: CHCs with RIO (Rurality Index of Ontario) > 40
- Francophone: CHCs that serve the Francophone community
- Newcomers: CHCs that serve persons who have recently come to Canada as immigrants and refugees
- Other: Includes CHCs that predominantly serve one age group (e.g. CHCs that predominantly serve youth)

Analyses

Descriptive analyses were conducted to determine the number and proportion of clients in each of the CHC strata based on demographic, case mix, and health care utilization.

Limitations

A number of limitations should be considered when interpreting the findings presented in the Chartbook:

- The proportion of CHC clients that could not be linked to Ontario's health care registry, and therefore were unlikely to be covered by Ontario health insurance, varied widely by priority population and included one-third of all clients in the 'newcomers' group. When such a large proportion of a population is missing, comparisons may be skewed as the individuals missing may be dissimilar to those who were included.
- When reporting client complexity, some measures such as the Standardized ACG Morbidity Index (SAMI) are standardized at the average value for Ontario physician visits. This standardization makes it challenging to report complexity measures that include nurse practitioners because nurse practitioners are not included in the standardized measure. For that reason, the SAMI is only meaningful for physician visits and is therefore of limited usefulness in a sector like CHCs where nurse practitioners play a large role in care provision. Future studies that compare CHCs and CHC groupings may benefit from a SAMI measure that includes physicians and nurse practitioners and that is standardized for CHCs.
- Clients who died before April 1, 2013 were excluded from the analysis. This may have resulted in underestimating the complexity within all of the groupings because those who died may have had complex problems and high resource utilization needs during the period prior to death.
- Income quintiles represent area-level income and may not accurately reflect income levels of individuals. They are very commonly used in health services research, however, and do correlate with individual-level income.
- These analyses are not adjusted for age, sex, socioeconomic status or client complexity. The groups are only partially stratified by urban-rural geography and by immigration; for example, groups such as 'Francophone' may be urban or rural and may include many newcomers. These characteristics have a major influence on health care utilization and should be taken into account when interpreting variation across groups in utilization.

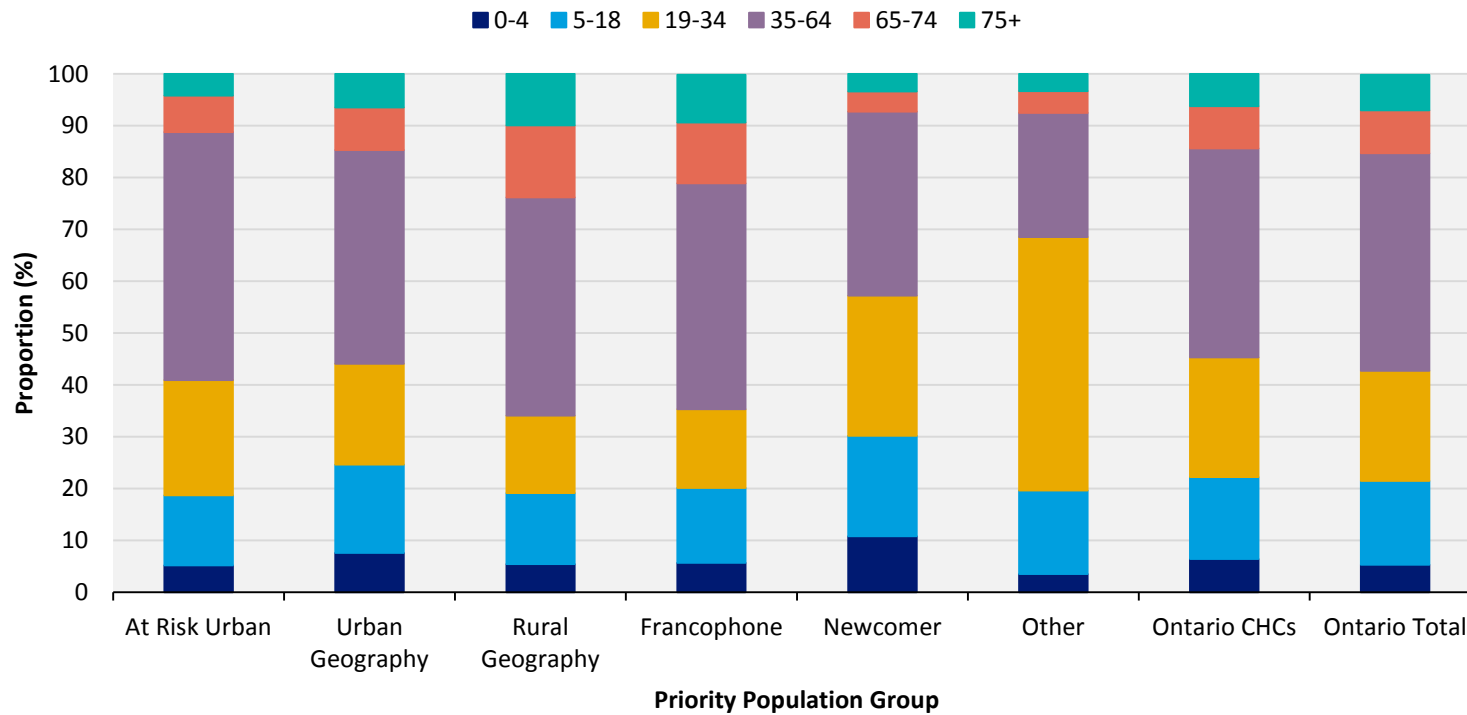
For the reasons noted above, utilization measures in this report cannot be compared directly with those for other primary care models in Ontario. The ICES report *Comparison of Family Health Teams to Other Ontario Primary Care Models, 2004/05 to 2011/12*⁷ includes comparisons of CHCs to other models of care with adjustment for age, sex, rurality and morbidity. Those comparisons make use of a single random physician diagnosis per visit in CHCs and include only clients with health insurance coverage. The regression models included CHCs as a single group without stratifying, as has been done in this report, and for that reason CHC utilization patterns are likely to be skewed by outliers such as the 'at risk urban' group.

Results

EXHIBIT 1 Distribution of CHCs, CHC clients and demographic characteristics by priority population group, in Ontario, 2011/12 to 2012/13

Priority Population	Number of CHCs (or satellites)	Number of Clients	Client age (average)	Female (%)	Non-Insured (%)
At Risk Urban	18	35,105	39.3	54.2	16.6
Urban Geography	33	80,532	38.5	57.6	11.5
Rural Geography	20	21,416	45.0	55.0	4.0
Newcomer	8	21,257	31.6	57.9	33.3
Francophone	18	12,422	43.5	63.8	5.6
Other	9	23,981	31.6	70.5	16.0
Total	106	194,713	38.6	58.7	13.5

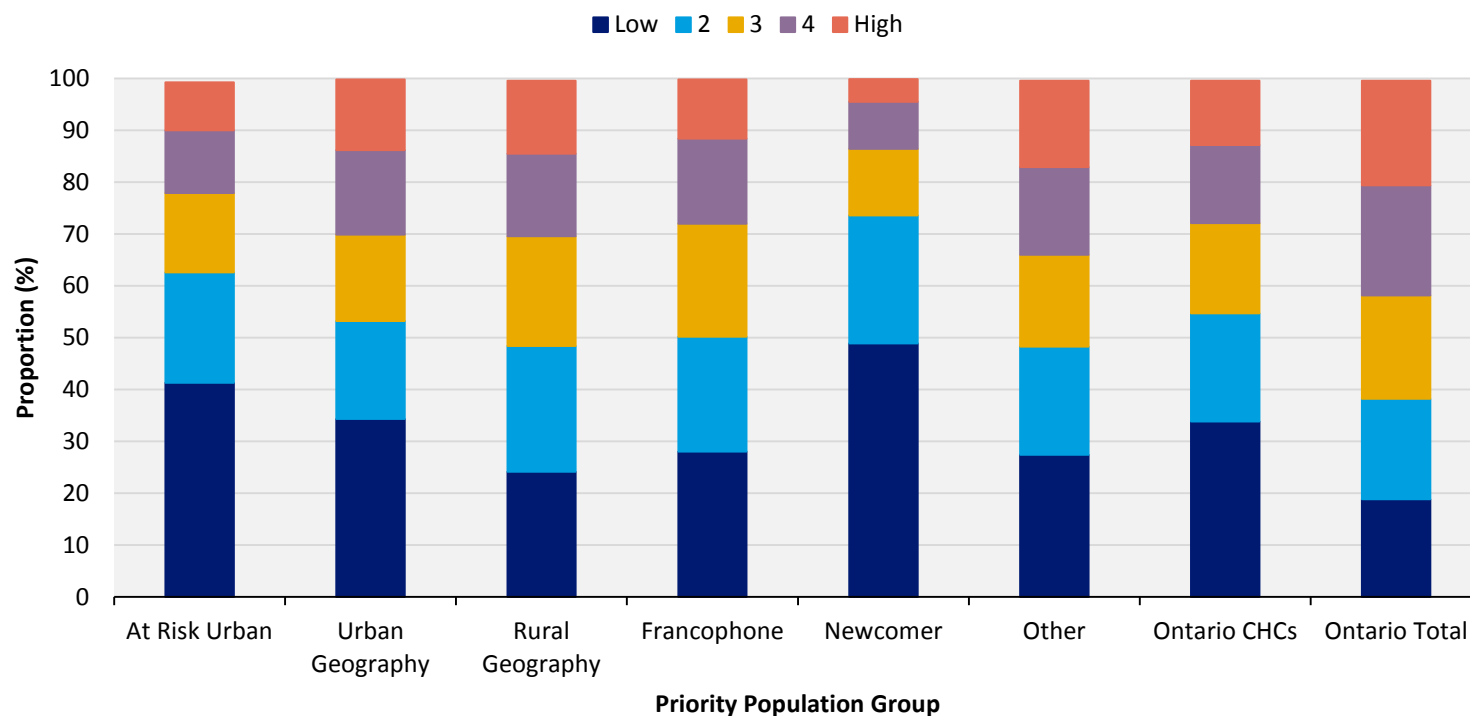
EXHIBIT 2 Distribution of CHC clients, by age group and priority population group, in Ontario, 2011/12 to 2012/13



Key messages

The priority population group ‘newcomers’ had a larger percentage of young children compared to the other CHCs and compared to the Ontario average. This finding contrasts with the ‘at risk urban’ group, where 47.9% of the population was between 35 and 64 years of age. The ‘other’ group includes three youth centres, which explains the high percentage of persons younger than 34 years of age.

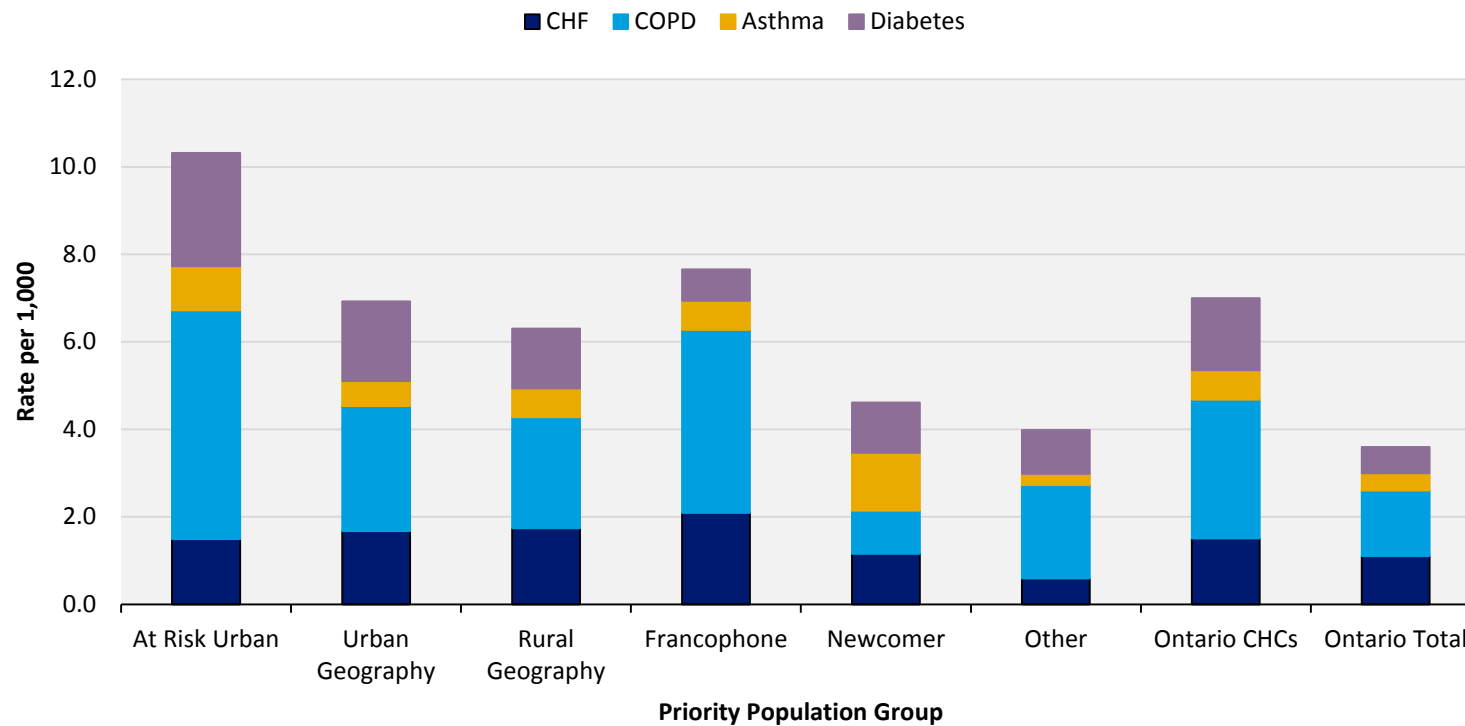
EXHIBIT 3 Distribution of CHC clients, by income quintile and priority population group, in Ontario, 2011/12 to 2012/13



Key messages

By definition, the two lowest income quintiles represent close to 40% of the residents in each community. Those living in the lowest income neighbourhoods were over-represented in all CHCs, however lower incomes were particularly evident for the priority populations that included ‘newcomers’ (73.6%) and ‘at risk urban’ (62.6%).

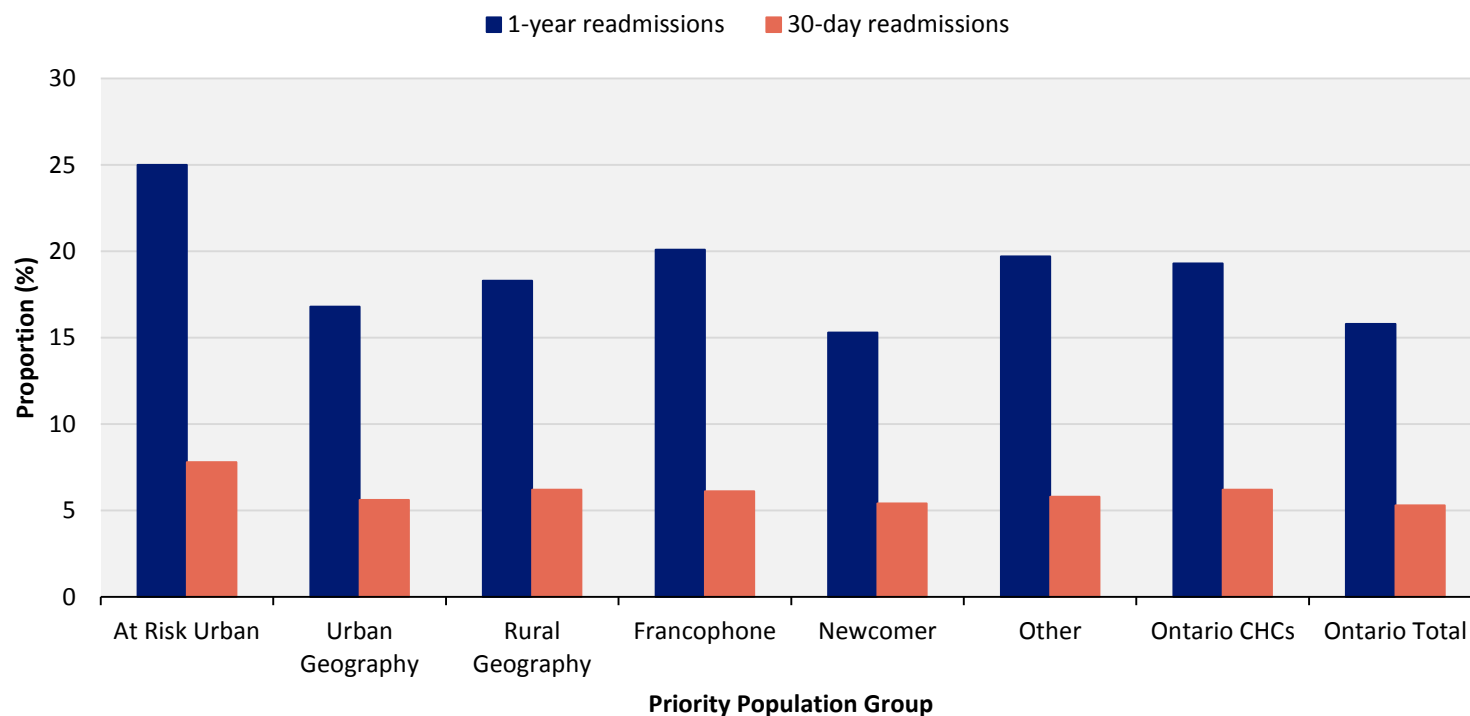
EXHIBIT 4 Avoidable hospitalizations per 1,000 CHC clients, by disease and priority population group, in Ontario, 2011/12 to 2012/13



Key messages

Avoidable hospitalizations were higher in CHCs compared to the Ontario average. COPD was a significant driver of this rate and was particularly high in the ‘at risk urban’ and the ‘francophone’ priority population groups at 5.2 and 4.2 per 1,000 CHC clients, respectively. The rates of COPD admissions for these groups were approximately three times higher than the Ontario average.

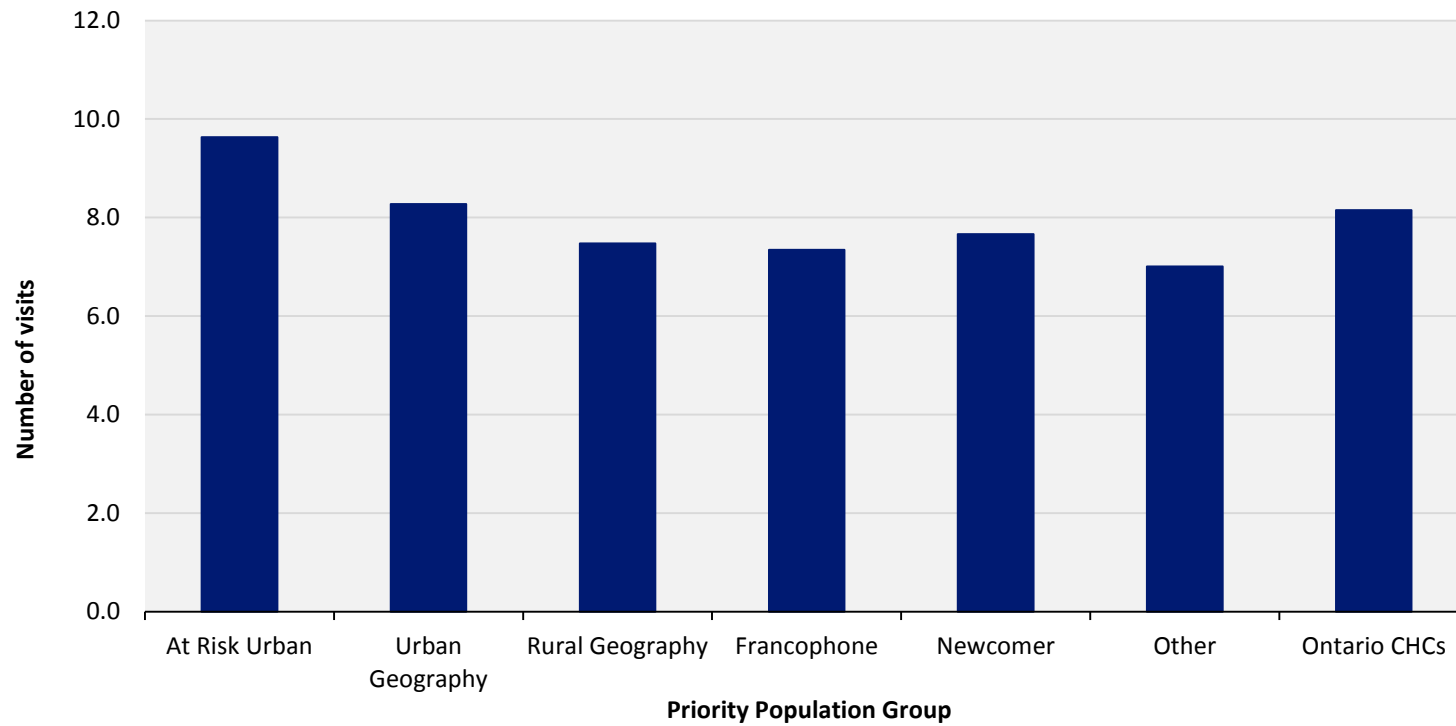
EXHIBIT 5 Hospital readmissions among CHC clients, by type of readmission and priority population group, in Ontario, 2011/12 to 2012/13



Key messages

The percentage of both 30-day and 1-year hospital readmissions were lowest in the ‘newcomer’ priority population group and highest in the ‘at risk urban’ priority population group.

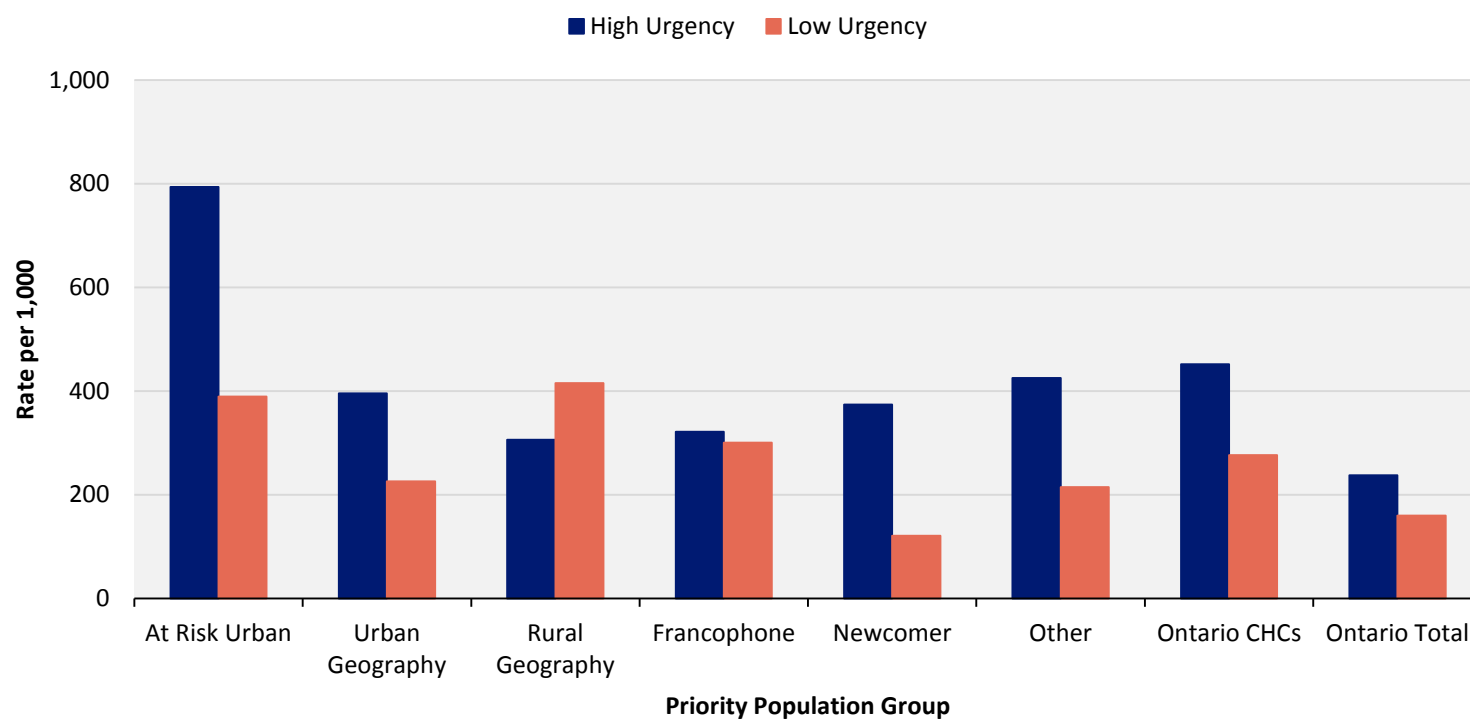
EXHIBIT 6 Average number of physician and nurse practitioner visits among CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13



Key messages

The average number of visits for a one-year period were fairly similar across the different priority population groups, however the ‘at risk urban’ and the ‘urban geography’ groups had the highest number of visits to CHC physicians and CHC nurse practitioners.

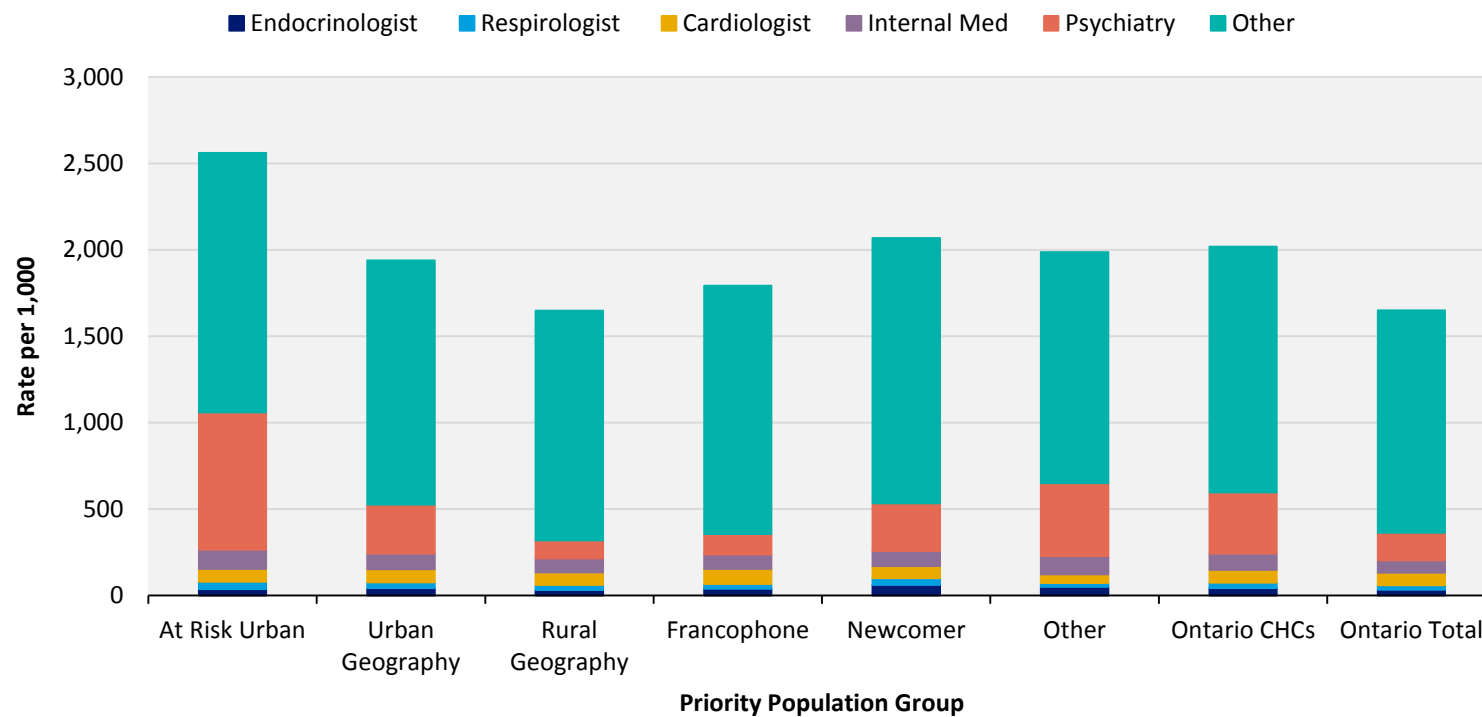
EXHIBIT 7 Emergency department utilization rate per 1,000 CHC clients, by urgency and priority population group, in Ontario, 2011/12 to 2012/13



Key messages

The rate of emergency department (ED) utilization was higher in CHCs compared to the Ontario average. In CHCs, this high utilization was driven by the ‘at risk urban’ priority population, among whom the rate of high urgency ED visits was twice the rate of ED visits for all Ontario CHCs. Only the ‘rural geography’ group had a higher rate of low urgency than high urgency ED visits.

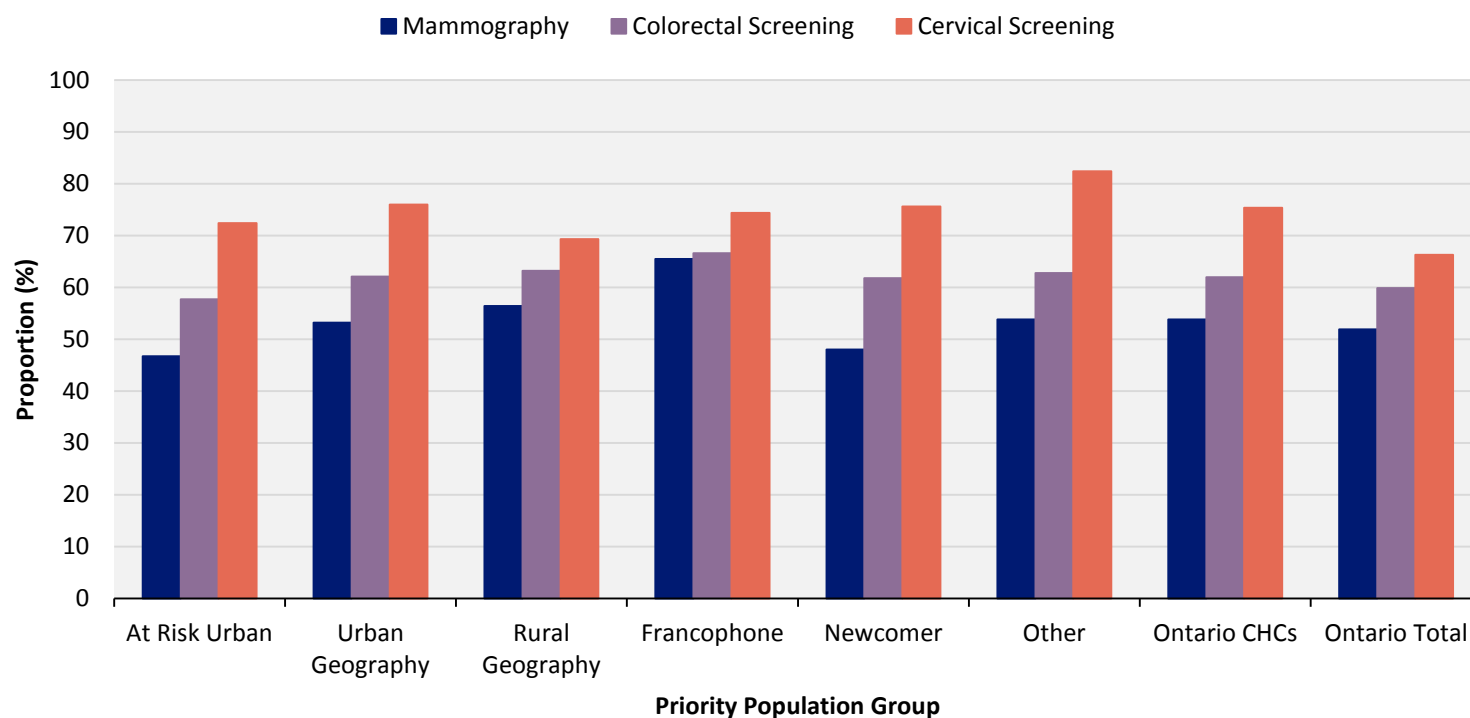
EXHIBIT 8 Specialist visits per 1,000 CHC clients, by specialist type and priority population group, in Ontario, 2011/12 to 2012/13



Key messages

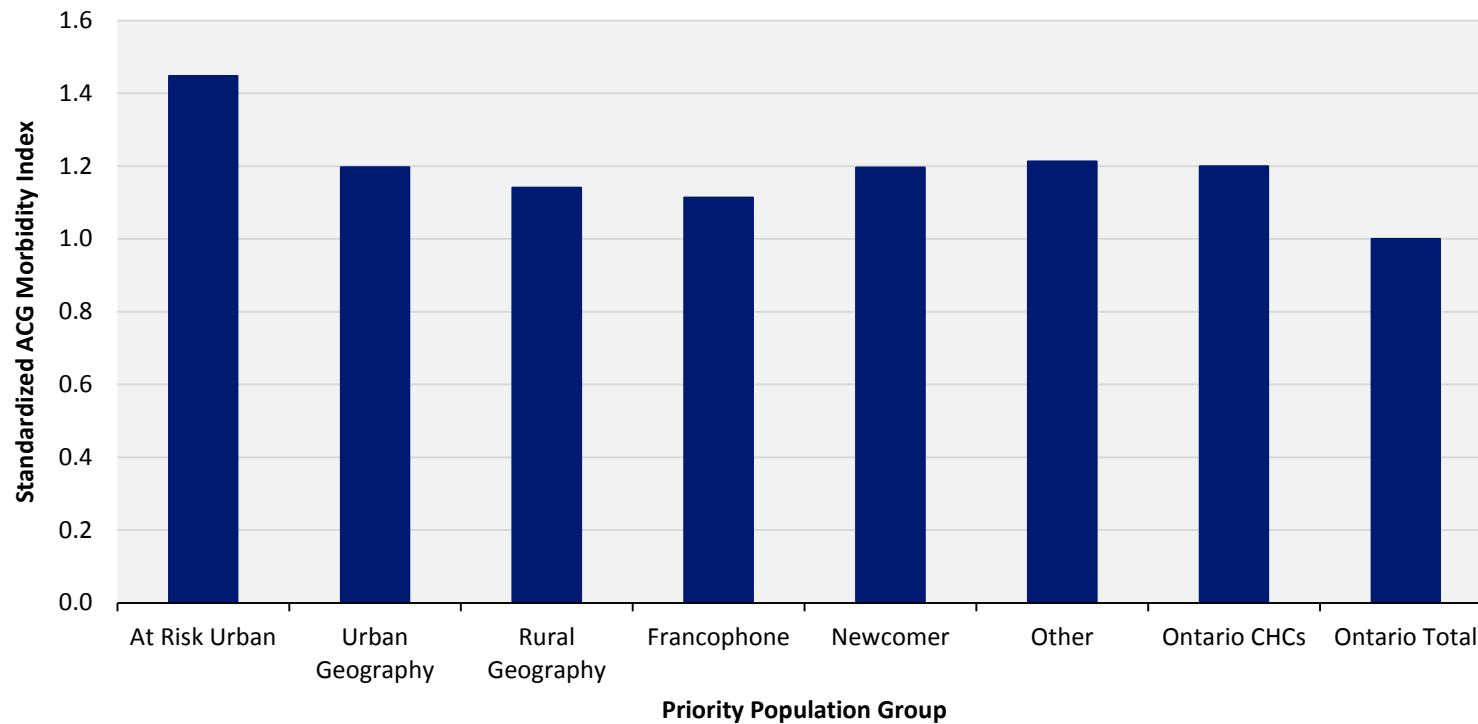
On average, rates of specialist visits were slightly higher among CHCs compared to the Ontario average. The lowest rates of specialist visits were seen in the 'rural geography' and 'francophone' priority population groups. This finding may represent an issue of access for these communities. Conversely, specialist visits were significantly higher in the 'at risk urban' group compared to all others, mainly due to psychiatry visits.

EXHIBIT 9 Cancer screening among CHC clients, by screening type and priority population group, in Ontario, 2011/12 to 2012/13



Key messages

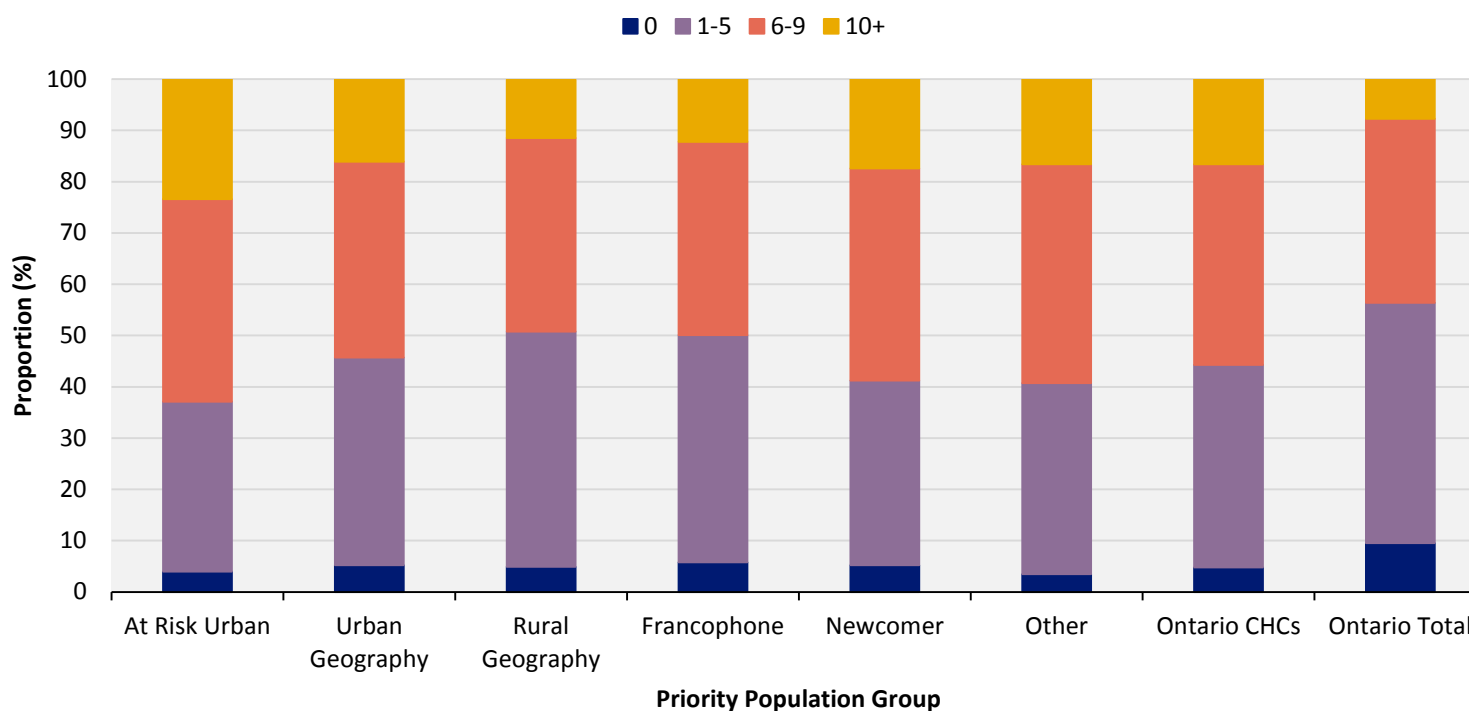
On average, all cancer screening rates were higher in Ontario CHCs compared to the Ontario average. Colorectal screening rates were higher than the Ontario average in all CHC groups, with the exception of the ‘at risk urban’ group. Mammography rates showed a similar trend, however the ‘newcomer’ group was also slightly lower. Cervical screening was higher in CHCs compared to the Ontario average and this finding was seen in all priority population groups.

EXHIBIT 10 Standardized ACG Morbidity Index (SAMI) for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

Key messages

The Standardized ACG Morbidity Index (SAMI) represents expected primary care utilization given the previous pattern of ambulatory and hospital diagnoses. It has been standardized at 1, which means the average Ontarian has a SAMI that equals 1. Using physician data only, the expected need for health care for a CHC client, on average, was approximately 20% greater than that of the average Ontarian. The 'at risk urban' group had the highest expected utilization.

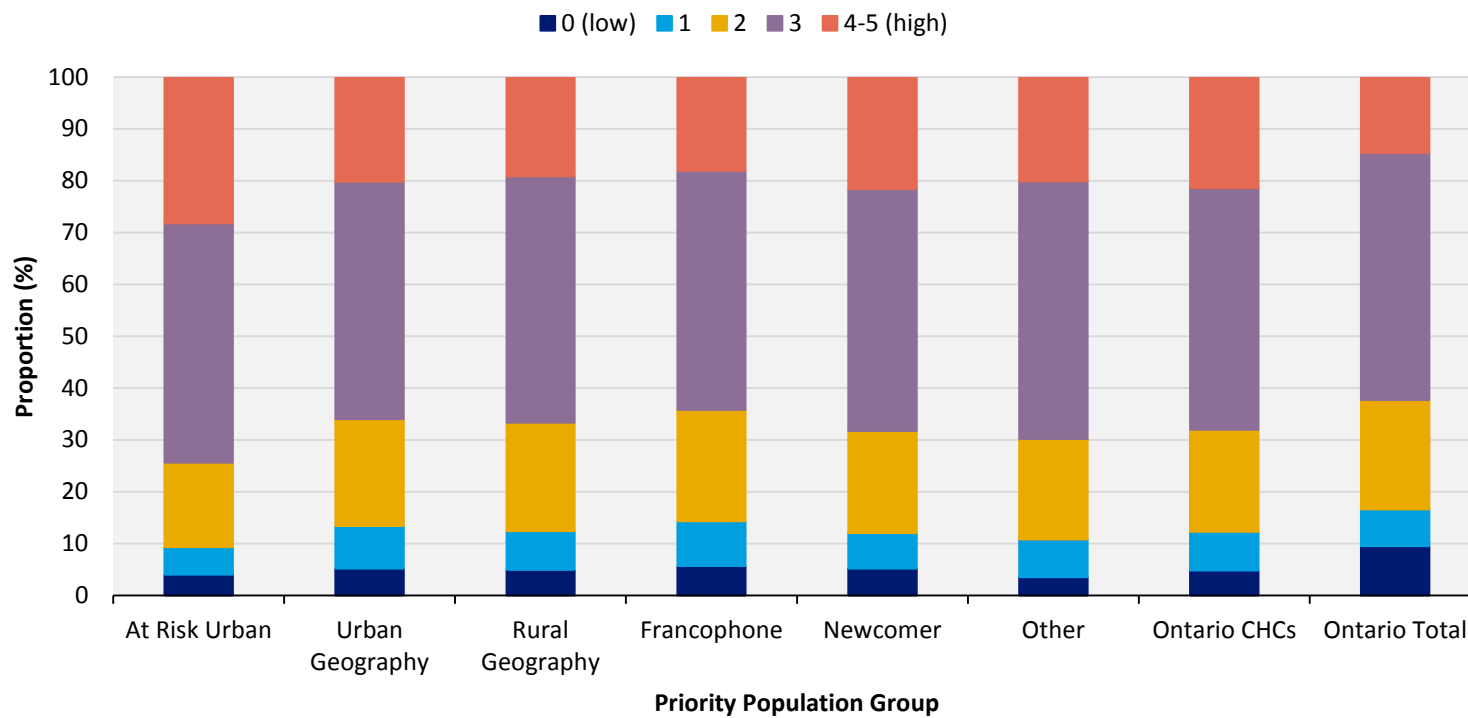
EXHIBIT 11 Adjusted Diagnostic Groups (ADGs) for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13



Key messages

Adjusted diagnosis groups (ADGs) are a measure of comorbidity. On average, Ontario CHCs have a greater percentage of persons with higher numbers of ADGs. This was most obvious in the ‘at risk urban’ group. These analyses include only physician data; when nurse practitioner diagnostic data was included a similar trend was found. (See [Exhibit 14](#)).

EXHIBIT 12 Resource Utilization Bands (RUBs) for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13



Key messages

Resource utilization bands (RUBs) represent quintiles of expected healthcare utilization across the whole system. Those with no utilization (RUB 0) and in the lowest two categories (RUBs 1 and 2) had the greatest representation in the Ontario total, the ‘Francophone’ and the ‘rural geography’ priority population groups. The ‘at risk urban’ group had the greatest representation in the highest RUB, reflecting a high expected resource use.

EXHIBIT 13 Demographic characteristics of CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

	At Risk Urban	Urban Geography	Rural Geography	Francophone	Newcomer	Other	Ontario CHCs	Large City Ontario Total	Smaller City Ontario Total	Rural Ontario Total	Ontario Total
N	35,105	80,532	21,416	21,257	12,422	23,981	194,713	9,771,548	2,576,617	987,086	13,447,365
Age (mean)	39.3	38.5	45.0	43.5	31.6	31.6	38.6	39.0	41.3	43.0	39.7
Age											
0-4	5.2	7.6	5.4	5.7	10.8	3.5	6.4	5.5	5.0	4.7	5.3
5-18	13.5	17.0	13.7	14.4	19.4	16.1	15.8	16.4	16.1	14.9	16.2
19-34	22.2	19.5	15.0	15.2	27.0	48.9	23.1	22.1	19.0	17.7	21.2
35-64	47.9	41.2	42.1	43.6	35.5	24.0	40.3	42.0	42.2	42.7	42.0
65-74	7.0	8.2	13.9	11.7	3.9	4.2	8.2	7.6	9.9	11.4	8.3
75+	4.2	6.5	9.9	9.2	3.4	3.3	6.2	6.5	7.8	8.4	6.8
Newcomers	11.8	15.7	2.7	13.8	46.7	11.7	14.8	13.2	3.1	3.1	10.4
Income Quintiles											
Low	41.3	34.3	24.1	28.0	48.9	27.4	33.8	19.8	13.6	20.7	18.9
2	21.3	18.9	24.3	22.2	24.7	20.9	20.9	19.6	17.4	23.5	19.4
3	15.3	16.7	21.2	21.8	12.8	17.7	17.4	19.8	20.6	20.5	20.0
4	12.1	16.3	15.9	16.4	9.1	16.9	15.1	20.7	24.7	18.5	21.2
High	9.3	13.6	14.1	11.4	4.4	16.7	12.4	19.9	23.7	16.4	20.2
Female	54.2	57.6	55.0	57.9	63.8	70.5	58.7	51.2	50.6	49.9	51.0
Male	45.8	42.4	45.0	42.1	36.2	29.5	41.3	48.8	49.4	50.1	49.0

EXHIBIT 14 Client complexity and expected resource use for CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

	At Risk Urban	Urban Geography	Rural Geography	Francophone	Newcomers	Other	Ontario CHCs	Large City Ontario Total	Smaller City Ontario Total	Rural Ontario Total	Ontario Total
Adjusted Diagnostic Groups (ADGs) (%) – MD + NP											
1-4	23.9	31.7	38.4	33.4	26.9	27.7	30.4	n/a	n/a	n/a	n/a
5-9	44.8	46.1	46.0	47.7	48.9	48.8	46.5	n/a	n/a	n/a	n/a
10+	31.3	22.1	15.7	18.9	24.2	23.5	23.0	n/a	n/a	n/a	n/a
Adjusted Diagnostic Groups (ADGs) (%) – MD (1 dx)											
0	4.0	5.2	4.9	5.8	5.2	3.5	4.8	9.2	9.7	11.3	9.5
1-5	38.2	46.2	49.4	48.3	40.2	41.5	44.4	45.5	50.1	51.5	46.9
6-9	40.3	37.2	36.8	36.3	41.3	42.4	38.5	37.2	33.5	31.1	35.9
10+	17.4	11.3	8.9	9.6	13.3	12.6	12.2	8.2	6.8	6.1	7.7
Resource Utilization Band (%) – MD + NP											
1 (Low)	3.8	6.2	6.3	6.3	5.1	5.1	5.6	n/a	n/a	n/a	n/a
2	11.4	15.5	16.6	16.0	14.0	15.4	14.6	n/a	n/a	n/a	n/a
3	47.3	50.5	53.0	53.2	52.4	54.3	51.1	n/a	n/a	n/a	n/a
4	25.0	20.6	17.0	17.8	23.5	17.9	20.9	n/a	n/a	n/a	n/a
5 (High)	12.5	7.2	7.0	6.6	5.1	10.0	7.8	n/a	n/a	n/a	n/a
Resource Utilization Band (%) – MD (1 dx)											
0	4.0	5.2	4.9	5.7	5.2	3.5	4.8	9.2	9.6	11.3	9.5
1 (Low)	5.3	8.2	7.5	8.6	6.8	7.3	7.5	6.9	7.4	7.6	7.1
2	16.3	20.6	20.9	21.5	19.7	19.4	19.7	20.8	21.8	21.6	21.1
3	46.2	45.8	47.6	46.1	46.7	49.7	46.6	47.4	45.2	43.7	47.7
4	18.9	14.9	13.5	13.1	17.6	15.8	15.5	12.0	11.6	11.3	11.8
5 (High)	9.4	5.4	5.6	5.0	4.0	4.3	5.8	3.7	4.4	4.5	3.9
Standardized ACG Morbidity Index	1.65	1.39	1.30	1.34	1.39	1.40	1.00	1.00	1.00	0.90	1.00

EXHIBIT 15 Health care utilization by CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

	At Risk Urban	Urban Geography	Rural Geography	Francophone	Newcomers	Other	Ontario CHCs	Large City Ontario Total	Smaller City Ontario Total	Rural Ontario Total	Ontario Total
N	35,105	80,532	21,416	21,257	12,422	23,981	194,713	9,771,548	2,576,617	987,086	13,447,365
ED Utilization Rate per 1,000											
High Triage	794.1	395.6	306.1	321.6	374.1	425.5	454.4	220.4	281.5	281.1	237.5
Low Triage	389.4	226.0	415.3	300.6	121.0	214.5	276.5	160.0	241.5	481.1	160.0
Total Avoidable Hospitalizations Rate per 1,000											
CHF	1.5	1.7	1.7	2.1	1.2	0.6	1.5	1.1	0.3	0.3	1.1
COPD	5.2	2.9	2.5	4.2	1.0	2.1	3.2	1.2	1.3	1.4	1.5
Asthma	1.0	0.6	0.7	0.7	1.3	0.3	0.7	0.4	2.2	2.6	0.4
Diabetes	2.6	1.8	1.4	0.7	1.2	1.0	1.6	0.5	0.7	0.9	0.6
Total	10.3	6.9	6.3	7.7	4.6	4.0	7.0	3.1	4.5	5.2	3.6
30-day Readmissions (%)	7.8	5.6	6.2	6.1	5.4	5.8	6.2	5.2	5.3	6.1	5.3
1-year Readmissions (%)	25.0	16.8	18.3	20.1	15.3	19.7	19.3	15.1	16.3	18.8	15.8

EXHIBIT 16 Specialist and primary care utilization by CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

	At Risk Urban	Urban Geography	Rural Geography	Francophone	Newcomers	Other	Ontario CHCs	Large City Ontario Total	Smaller City Ontario Total	Rural Ontario Total	Ontario Total
N	35,105	80,532	21,416	21,257	12,422	23,981	194,713	9,771,548	2,576,617	987,086	13,447,365
Rate of Specialist Visits (per 1,000)											
Endocrinologist	37.6	42.3	30.7	37.7	61.0	49.3	41.7	36.9	21.4	15.9	32.2
Respiratory	41.8	32.7	30.2	29.0	38.4	22.6	32.8	29.5	22.9	18.3	27.3
Cardiologist	73.8	77.2	72.4	86.6	70.4	50.0	73.3	75.1	63.8	54.8	71.2
Internal Med	111.7	91.0	80.8	84.1	87.1	106.2	94.5	72.7	78.9	66.4	73.2
Psychiatry	794.3	282.9	103.8	118.8	276.7	421.6	354.5	184.4	100.6	65.2	158.6
Other	1,503.1	1,413.5	1,331.0	1,437.4	1,535.7	1,536.4	1,421.4	1,335.4	1,216.7	1,037.3	1,286.8
Total	2,562.2	1,939.6	1,648.9	1,793.4	2,069.4	1,986.9	2,018.1	1,733.9	1,504.3	1,258.0	1,649.3
Total Visits (MD/NP)	9.7	8.3	7.5	7.4	7.7	7.0	8.2	n/a	n/a	n/a	n/a

EXHIBIT 17 Cancer screening among CHC clients, by priority population group, in Ontario, 2011/12 to 2012/13

	At Risk Urban	Urban Geography	Rural Geography	Francophone	Newcomers	Other	Ontario CHCs	Large City Ontario Total	Smaller City Ontario Total	Rural Ontario Total	Ontario Total
Mammography (%)	58.4	63.6	65.6	72.0	64.5	63.4	64.2	62.1	64.5	62.8	62.7
Colorectal Screening (%)	57.7	62.1	63.2	66.6	61.8	62.8	62.0	60.1	60.4	58.4	59.9
Cervical Screening - 3 year (%)	72.4	76.0	69.3	74.4	75.6	82.4	75.4	66.2	67.6	64.6	66.3

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Appendix

Data Sources and Methodology

Participants

The Ontario data includes all residents of Ontario eligible for health care between April 1, 2011 and March 31, 2013, who had a physician visit during this time period, had a health card number and were alive on March 31, 2013. The CHC data had similar inclusion criteria; however, visits with both nurse practitioners (NPs) and physicians (MDs) were included. The stratifications were determined based on whether the CHC had defined a specific priority population or a geographical catchment area (rurality was based on the Rurality Index of Ontario (RIO) scores of 40 and above). All CHCs provide services for people who experience barriers to care, however some CHCs provide care specific to these populations. Therefore, these stratifications reflect broad, centre-level characteristics and may not characterize every client seen at that CHC.

Data Sources

Data were utilized from a variety of sources. CHC data were extracted from electronic records and linked with data holdings at the Institute for Clinical Evaluative Sciences (ICES). These databases included: CHC data, the Registered Persons Database, physician billings from the Ontario Health Insurance Plan, the hospital Discharge Abstract Database, emergency department visits from the National Ambulatory Care Reporting System, Client Agency Program Enrolment tables, the Rurality Index of Ontario for urban-rural residence and the 2006 Census of Canada data for sociodemographic variables.

CHC Data

The electronic record systems used at the participating CHCs included Purkinje and Nightingale on Demand. Data cleaning and validation was conducted by one of the authors (JR) prior to submitting the data for linkage at ICES. This is a routine procedure and data are provided to ICES yearly from all CHCs. Linkage was performed using the health card number for each client on the CHC files. Following linkage, only the unique ICES encoded identifier remained on the files used for analysis. Among the CHC clients, 14.0% did not have a health card number and could not be linked to administrative data. This proportion varied significantly between sites and the range of non-insured was between 2.1% and 50.0% of clients being excluded.

Case Mix

The Johns Hopkins Adjusted Clinical Group (ACG) methodology was used to measure case mix and expected resource utilization. ACGs are used to measure client illness burden.³ The system estimates the illness burden of individual clients and, when aggregated across individuals, of populations. The ACG methodology is one of several diagnosis-based risk adjustment systems developed to predict utilization of medical resources and is based on the finding that clients who have certain groups of diagnoses tend to have similar health care utilization patterns. Clients using the most health care resources are typically not those with single diseases, but rather those with multiple and sometimes unrelated conditions. This clustering of morbidity is a better predictor of health care utilization than the presence of specific diseases. In the United States,

ACGs are able to explain 50% of same-year resource use by individuals.⁴ Similar predictive ability has been reported in Canada.⁵ In contrast, age and sex only explain approximately 10% of the variation in resource and cost.^{1,6}

The ACG system assigns all ICD-9 and ICD-10 codes to one of 32 diagnoses clusters known as Adjusted Diagnosis Groups (ADGs). Individual diseases or conditions are placed into a single ADG cluster based on five clinical dimensions: duration of the condition, severity of the condition, diagnostic certainty, etiology of the condition and specialty care involvement. In addition to ADGs, the ACG software was used to generate Resource Utilization Bands (RUBs), which involve aggregations of ACGs with similar expected overall health care utilization (0=no health care use, 1=low, 5=high) and the Standardized ACG Morbidity Index (SAMI). The SAMI was developed at the Manitoba Centre for Health Policy.⁶ This index is a set of illness weights for the ACGs using average provincial health care costs and can be used to examine differential morbidity and expected primary care utilization at the practice level. SAMI has been adapted by ICES for use in Ontario and has used the number of in-basket Family Health Organization (FHO) primary care visits to weight the ACGs. These visits are a measure of expected workload in a primary care practice.

All physician diagnoses, including those made by primary care physicians, specialists, and hospital discharge abstracts, were used to run the Johns Hopkins ACGs. CHC providers (MDs and NPs) can record more than one diagnosis at each visit, but OHIP allows only a single diagnosis per visit. The case mix data includes the MD and NP data as well as MD diagnostic data, using only one randomly-selected diagnosis per visit as a comparator.

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