The geographic accessibility of pharmacies in Nova Scotia

Michael R. Law, PhD; Deborah Heard, BAsC; Judith Fisher, PhD; Jay Douillard, BA; Greg Muzika, BA, BEd, MPA; Ingrid S. Sketris, PharmD, MPA (HSA)

ABSTRACT

Introduction: Geographic proximity is an important component of access to primary care and the pharmaceutical services of community pharmacies. Variations in access to primary care have been found between rural and urban areas in Canadian and international jurisdictions. We studied access to community pharmacies in the province of Nova Scotia.

Methods: We used information on the locations of 297 community pharmacies operating in Nova Scotia in June 2011. Population estimates at the census block level and network analysis were used to study the number of Nova Scotia residents living within 800 m (walking) and 2 km

and 5 km (driving) distances of a pharmacy. We then simulated the impact of pharmacy closures on geographic access in urban and rural areas.

Results: We found that 40.3% of Nova Scotia residents lived within walking distance of a pharmacy; 62.6% and 78.8% lived within 2 km and 5 km, respectively. Differences between urban and rural areas were pronounced: 99.2% of urban residents lived within 5 km of a pharmacy compared with 53.3% of rural residents. Simulated pharmacy closures had a greater impact on geographic access to community pharmacies in rural areas than urban areas.

Conclusion: The majority of Nova Scotia residents lived within walking or short driving distance of at least 1 community pharmacy. While overall geographic access appears to be lower than in the province of Ontario, the difference appears to be largely driven by the higher proportion of rural dwellers in Nova Scotia. Further studies should examine how geographic proximity to pharmacies influences patients' access to traditional and specialized pharmacy services, as well as health outcomes and adherence to therapy. *Can Pharm J* 2013;146:39-46.

Nearly every province has recently taken steps to lower generic drug prices. Pharmacies have raised concerns that these changes might result in pharmacy closures. While prior work has shown that Ontario residents have ready access to pharmacies, we were interested in whether Nova Scotia, which is more rural, would be different.

Pratiquement toutes les provinces ont récemment pris des mesures afin de réduire le prix des médicaments génériques. Les pharmacies ont signalé leur inquiétude, car ces changements risquent d'entraîner la fermeture de certaines d'entre elles. Des études antérieures ont montré que les habitants de l'Ontario ont facilement accès à des pharmacies, mais nous nous sommes intéressés à la Nouvelle-Écosse, plus rurale, pour savoir si la situation est différente.

Introduction

Pharmacies fill an important role as the key sources of pharmaceutical services in the community and as providers of a variety of primary care services, including screening and monitoring for diseases (e.g., hypertension, diabetes, osteoporosis), administering vaccinations and providing diagnostic aids, home health care and nonprescription drug products. Some community pharmacies prepare medications, provide consultations for hospitals and nursing homes and provide services such as

medication management by initiating, adapting and continuing prescriptions.¹⁻³ Thus, it is important to assess whether Canadians have ready access to a pharmacy location. At the same time, higher margins on pharmacy supplies and services will likely lead to a greater (and eventually inefficient) number of pharmacies.⁴

Multiple factors influence the geographic distribution of community pharmacies within a region: population distribution and density, economic and labour markets, community support, access to primary care and hospital services, as

© The Author(s) 2013

DOI: 10.1177/1715163512473062

KNOWLEDGE INTO PRACTICE

- Most Nova Scotia residents live close to 1 or more community pharmacies.
- On average, geographic access appears worse in Nova Scotia than in Ontario, which is likely due to the more rural population of Nova Scotia.
- There is still little research on how geographic proximity to pharmacies influences access to traditional and specialized pharmacy services, adherence to therapy and health outcomes.

well as policies related to the reimbursement of pharmaceutical services. The latter came to the forefront in Canada due to the ongoing debates concerning the price of generic drugs. In 2010, the government of Ontario announced major changes to generic drug payments and moved to reimburse generic drugs at a nationwide low of 25% of the brand-name equivalent. The province also placed restrictions on so-called rebates from generic manufacturers to pharmacies. Other provinces, including Quebec, British Columbia, Saskatchewan and Nova Scotia, have since followed Ontario's lead and introduced their own generic drug price reductions. Nova Scotia passed legislation in 2011 that reduced the price of generic drugs paid for by the public drug program to 35% of the brand-name price.⁵

Throughout the reimbursement debates in Ontario, pharmacy chains claimed that the loss of revenue associated with this policy would result in the closure of pharmacies, but it is uncertain whether this has happened.⁶ A previous analysis of pharmacy distribution in Ontario found that a reduction in the number of pharmacies would only modestly affect access to pharmacies near people's residence.⁷ For example, a random 30% reduction of pharmacies would only reduce by 2.7% the number of people within 5 km of a pharmacy. Pharmacy closures in Nova Scotia would potentially have a greater impact on the geographic accessibility of community pharmacies. This is because Nova Scotia differs from Ontario in 3 important ways.

First, while Nova Scotia does not have regions as remote as Ontario, a greater percentage of Nova Scotia's population lives in rural areas as compared with Ontario (45% vs 15%, respectively).⁸ Differences in access to pharmacies in rural and urban areas, as well as their roles in these communities, have been noted in some jurisdictions.⁹ Second,

Nova Scotia has the highest ratio of pharmacists per 100,000 population in Canada and a substantially higher ratio than Ontario (122.4 in Nova Scotia vs 79.6 in Ontario).¹⁰ These pharmacists, similar to those in Ontario, are located largely in the urban areas, with 20 pharmacists per 10,000 population in urban areas and only 6 per 10,000 in rural areas. Third, Nova Scotia has more retail pharmacies per capita than Ontario (about ~31 per 100,000 vs ~26 per 100,000 in 2011).^{11,12}

This raises 2 important questions from a policy perspective: 1) What is the current geographic distribution of pharmacies in Nova Scotia? 2) What impact might closures have on Nova Scotians' geographic access to pharmacies?

Data

Study population

Nova Scotia had a population of about 945,000 in 2011.¹² While medically necessary hospital and physician care is publicly funded, community pharmacies are privately owned, either as independent pharmacies or as part of chains, franchises, banner or mass merchandiser systems.¹³ About 43% of prescription drug costs are paid for by the public sector.¹⁴ The Nova Scotia government's Pharmacare Program is available to eligible residents, including seniors aged 65 years and older without private drug coverage, those receiving income assistance through the Department of Community Services and families who either have no drug coverage or have high annual out-of-pocket drug costs that become a financial burden to them. Alongside this public coverage, many residents of the province have private drug coverage, typically provided as a benefit of employment.

The Dalhousie University Research Ethics office determined that this project did not require a submission to the research ethics committee.

Pharmacy locations

Information was obtained from the Nova Scotia College of Pharmacists on the 297 community pharmacies operating in Nova Scotia in June 2011. Pharmacy addresses were used to geo-code pharmacy locations. For any pharmacy that our geo-coding software was unable to identify with high precision (those identified with "Can-Map street low precision" or GIS Precision Codes 200+), the location was manually coded using telephone inquiries, the government of Nova Scotia's Civic Viewer,¹⁵ Google Earth and street-level photographs from Google Maps.

Pharmacy location data were merged with data sets from DMTI Spatial and dissemination block-level 2006 census data from Statistics Canada.¹⁶⁻¹⁸ Dissemination blocks are small areas typically bounded by roads and the smallest areas for which population counts are available. Although Nova Scotia's population has increased since the 2006 census, Statistics Canada estimates that between 2006 and 2011, the population change was only 0.8%.¹² In the 2006 census, 913,462 Nova Scotia residents were counted in 14,656 dissemination blocks, an average of 62.3 residents per dissemination block. Each dissemination block was classified as either urban (6182 blocks) or rural (8474 blocks) using a rough Statistics Canada definition: urban if it had a population of 1000 or above and a density of at least 400 persons per square kilometre.¹⁸

Statistical analysis

The network analysis conducted in a prior analysis of geographic access to pharmacies in Ontario was replicated for this study.⁷ Using the Network Analysis tool in ESRI ArcGIS, walking (800 m) and driving (2 km and 5 km) service areas were constructed for each pharmacy based on road travel distance. Each census block was analyzed to determine if it was intersected by each pharmacy's service area.^{19,20}

The number and proportion of Nova Scotia residents living in census dissemination blocks within each distance of 1 to 5 or more pharmacies was calculated. Monte Carlo simulation was used to analyze changes in these proportions under different pharmacy closure scenarios.⁷ In these simulations, a percentage of pharmacies (10%, 20%, 30%, 40% and 50%) was randomly omitted from the analysis and the proportions were then recalculated. Ten thousand iterations were used to generate means and confidence intervals for both the entire province and stratifications based on urban and rural classification.

Results

As shown in Table 1, 40.3% of Nova Scotians lived in a census block within walking distance (800 m) of at least 1 community pharmacy, while 62.6% of residents were in a dissemination block within 2 km and 78.8% of residents lived within 5 km. Almost half (49.3%) lived within 5 km driving distance of 5 or more community pharmacies and 99.2% lived in a dissemination block within 30 km driving distance of at least

MISE EN PRATIQUE DES CONNAISSANCES

- La plupart des habitants de la Nouvelle-Écosse vivent à proximité d'une ou plusieurs pharmacies communautaires.
- En moyenne, l'accès géographique paraît moins bon en Nouvelle-Écosse qu'en Ontario, ce qui est sans doute lié à la nature plus rurale de la population néo-écossaise.
- Il existe très peu d'études menées sur l'influence de la proximité géographique aux pharmacies sur l'accès aux services de pharmacie classiques et spécialisés, l'observance du traitement et les résultats pour la santé.

1 community pharmacy (not shown in Table 1). These overall numbers, however, hide differences in the geographic proximity of pharmacies for urban and rural areas.

As expected, there were substantial differences in geographic access between urban and rural areas (Table 2). In urban areas, 61.3% of residents lived in a census block within walking distance of a pharmacy and 99.2% were within 5 km. There was also significant overlap in the service areas for many pharmacies: 79.4% of urban residents lived in a census block with 5 or more pharmacies within 5 km. Figure 1 presents coverage of the city of Halifax and the number of pharmacies within 800 m of each census block in the urban areas. In contrast, just 53.3% of rural residents lived within 5 km of 1 or more pharmacies.

The results of our simulation exploring the possible impact of hypothetical pharmacy closures in Nova Scotia are shown in Table 3. The closure of community pharmacies would not lead to a large proportional decrease in overall geographic access. For example, a random closure of 30% of community pharmacies reduced by just 4.9%, from 78.8% to 73.9% (95% confidence interval [CI], 71.6%–75.9%), the population living in a census block within 5 km driving distance of at least 1 pharmacy. A random closure of 50% of community pharmacies reduced the number within 5 km from 78.8% to 69.2% (95% CI, 66.2%–71.8%).

As with our estimates for access to pharmacies discussed above, the impact of closures differentially affected urban and rural areas. As shown in Table 4, closures in urban areas had a greater impact on walking distance access than on driving distance access. For example, a random closure of 20% of community pharmacies reduced by 4.9%, from 61.3% to 56.4% (95% CI,

TABLE 1 Accessibility of pharmacies in Nova Scotia

Number of pharmacies	Walking		Driving			
	800 m		2 km		5 km	
	Number	%	Number	%	Number	%
≥1	368,387	40.3	571,416	62.6	719,397	78.8
≥2	217,158	23.8	437,553	47.9	595,454	65.2
≥3	138,953	15.2	353,549	38.7	531,183	58.2
≥4	85,489	9.4	297,583	32.6	482,876	52.9
≥5	43,697	4.8	250,076	27.4	450,207	49.3
Total population	913,462					

Estimated population (and proportion) living in a 2006 census dissemination block located within walking distance (800 m) and short driving distances (2 km and 5 km) of 1 or more through 5 or more pharmacy locations. Based on these estimates, 59.7%, 37.4% and 21.2% of the population do not currently live in a census dissemination block within 800 m, 2 km and 5 km of a pharmacy, respectively.

TABLE 2 Accessibility of pharmacies in urban and rural areas of Nova Scotia

Number of pharmacies	Walking		Driving			
	800 m		2 km		5 km	
	Number	%	Number	%	Number	%
Urban						
≥1	310,947	61.3	458,426	90.4	502,694	99.2
≥2	199,655	39.4	395,729	78.1	470,940	92.9
≥3	134,684	26.6	332,449	65.6	440,268	86.8
≥4	84,394	16.6	288,438	56.9	419,622	82.8
≥5	43,697	8.6	244,694	48.3	402,547	79.4
Total population	506,932					
Rural						
≥1	57,440	14.1	112,990	27.8	216,703	53.3
≥2	17,503	4.3	41,824	10.3	124,514	30.6
≥3	4269	1.1	21,100	5.2	90,915	22.4
≥4	1095	0.3	9145	2.2	63,254	15.6
≥5	0	0	5382	1.3	47,660	11.7
Total population	406,530					

Estimated population (and proportion) of residents living in urban and rural 2006 census dissemination blocks located within walking distance (800 m) and short driving distances (2 km and 5 km) of 1 or more through 5 or more pharmacy locations.

FIGURE 1 The number of pharmacies within an 800 m road travel distance of census dissemination blocks in Halifax, Nova Scotia.

53.5%–58.7%), the population living in an urban census block within 800 m of a pharmacy. For 5 km driving distances, this reduction is much smaller; less than one-third (1.5%), from 99.2% to 97.7% (95% CI, 95.4%–99.0%). The reverse is true for rural areas, reducing geographic access from 14.1% to 12.0% (95% CI, 10.6%–13.2%) for 800 m distances and 53.3% to 48.4% (95% CI, 45.8%–50.8%) for 5 km distances.

Discussion

Our results suggest that Nova Scotia residents have good overall geographic access to community pharmacies. Three-quarters of the population lives within a 5 km driving distance of at least 1 location and nearly all are within 30 km. Even with the hypothetical closure of 50% of pharmacies, more than two-thirds of residents would be able to access at least 1 community pharmacy within 5 km of their home and one-half within 2 km. This suggests that if some community pharmacies were to close in Nova Scotia, the impact on geographic access to pharmacies would likely be limited.

Differences between rural and urban areas are apparent, however. Almost all urban residents live within a short driving distance of at least 1 pharmacy (90% and 99% for 2 km and 5 km, respectively), but this proportion is substantially lower for rural residents (28% and 53%). This pattern is similar to that noted in the prior results from Ontario, where 96% of urban residents and 18% of rural residents lived within 2 km of a pharmacy.⁷

Further comparison with the results from Ontario illustrates the distinct impact of urbanization on geographic access to pharmacies.⁷ Overall, a greater proportion of Ontario residents live within a short distance of a community pharmacy than Nova Scotians. For example, 85% and 91% of Ontario residents live within 2 km and 5 km, respectively, of at least 1 pharmacy and 77% and 87% of at least 2 pharmacies. The comparable results for Nova Scotia are 63% and 79% (1 pharmacy) and 48% and 65% (2 pharmacies). Thus, despite having more pharmacies per capita, the more dispersed population in Nova Scotia means that residents have less proximate access than residents of the more urbanized Ontario.^{7,11}

TABLE 3 Accessibility of pharmacies in Nova Scotia after calculating pharmacy reduction scenarios

Pharmacy reduction	Walking		Driving			
	800 m		2 km		5 km	
	Estimate (%)	95% CI	Estimate (%)	95% CI	Estimate (%)	95% CI
None	40.3	—	62.6	—	78.8	—
10%	38.6	37.3–39.5	61.0	59.6–62.0	77.3	75.9–78.4
20%	36.7	35.0–38.0	59.2	57.4–60.7	75.7	73.8–77.4
30%	34.4	32.6–36.1	57.1	55.0–59.0	73.9	71.6–75.9
40%	31.8	29.8–33.7	54.6	52.2–56.9	71.7	69.1–74.0
50%	28.9	26.8–30.9	51.7	48.9–54.2	69.2	66.2–71.8

Estimated proportion of residents living in a 2006 census dissemination block located within walking distance (800 m) and short driving distances (2 km and 5 km) of 1 or more pharmacy locations. We calculated pharmacy reduction scenarios by randomly selecting pharmacies for closure and using identical methods over 10,000 iterations of Monte Carlo simulation. CI, confidence interval.

TABLE 4 Accessibility of pharmacies in urban and rural Nova Scotia after calculating pharmacy reduction scenarios

Pharmacy reduction	Walking		Driving			
	800 m		2 km		5 km	
	Estimate (%)	95% CI	Estimate (%)	95% CI	Estimate (%)	95% CI
Urban						
None	61.3	—	90.4	—	99.2	—
10%	59.0	56.8–60.5	89.0	87.1–90.3	98.5	96.8–99.2
20%	56.4	53.5–58.7	87.4	84.7–89.5	97.7	95.4–99.0
30%	53.3	50.0–56.2	85.3	82.0–88.1	96.6	94.0–98.6
40%	49.6	46.0–53.1	82.6	78.6–86.1	95.3	92.3–97.8
50%	45.4	41.4–49.0	79.2	74.5–83.2	93.6	90.1–96.6
Rural						
None	14.1	—	27.8	—	53.3	—
10%	13.1	12.1–13.9	26.0	24.4–27.2	50.9	48.9–52.6
20%	12.0	10.6–13.2	24.1	22.0–25.9	48.4	45.8–50.8
30%	10.9	9.2–12.2	22.0	19.5–24.2	45.5	42.3–48.5
40%	9.6	7.8–11.2	19.8	17.0–22.2	42.3	38.6–45.7
50%	8.3	6.3–10.1	17.4	14.5–20.1	38.7	34.6–42.4

Estimated proportion of both rural and urban Nova Scotia residents living in a 2006 census dissemination block located within walking distance (800 m) and short driving distances (2 km and 5 km) of 1 or more pharmacy locations. Pharmacy reduction scenarios were calculated by randomly selecting pharmacies for closure and using identical methods over 10,000 iterations of Monte Carlo simulation. CI, confidence interval.

The influence of the higher proportion of rural residents in Nova Scotia is also apparent when considering the potential impact of pharmacy closures. For example, a 50% closure of pharmacies in Ontario would still leave 87.2% of residents in the province within a 5 km distance of at least 1 pharmacy, a decrease of 3.5% from the current distribution. However, a similar closure rate in Nova Scotia would leave only 69.2% of the population within 5 km of at least 1 pharmacy, a decrease of 9.6%.

Our results indicate that pharmacy closures in rural areas are more likely to affect geographic access than those in urban areas. Additionally, some evidence suggests that policy changes such as generic pricing strategies may affect rural and urban pharmacies differently. Independent stores, which are more common in rural areas, may be more vulnerable to changes in reimbursement models for prescription drugs, as they are more dependent than chain stores on the sales of prescription medications as a revenue source.⁴ These urban/rural differences are potentially important because rural pharmacies, and particularly sole rural pharmacies, may play a more significant role in health care access in their communities.¹ Further research is needed to determine whether these differences translate into disparities in access to necessary pharmaceutical services or optimal care.

Limitations

It is important to note some limitations in our study. First, only the home was used as the locus of access in our analysis. This means that we could not account for geographic access to pharmacies near workplaces, shopping locations, physician offices or ambulatory clinics. However, this would only serve to make our estimates more conservative. Second, the study was limited to census data from 2006, the most recent data available when we conducted our analysis. Third, the geo-coding of pharmacy locations may not be exact, though there is no reason to believe this would introduce any systematic bias into our results. Fourth, the Statistics Canada census definition of rural and

urban areas was used, and therefore our study did not address degrees of remoteness. A definition using a combination of population statistics and proximity to major population centres and commuting routes would have allowed for a more refined analysis.²¹ In addition, the study did not examine transportation-related issues such as the availability of public or private transportation, seasonal travel restrictions or access to pharmacy delivery or mail-order pharmacy services. Finally, our simulation assumed that all pharmacies were equally likely to close. However, as discussed above, rural and independent pharmacies may be more vulnerable to revenue changes.

Conclusions

We found that most residents of Nova Scotia have reasonable access to pharmacy services. About 4 in 5 residents are within 5 km of a pharmacy; about 3 in 5 are within 2 km and 2 in 5 live within a walking distance of less than 800 m. However, differences were found in access between urban and rural areas. While Nova Scotia appears to have substantial pharmacy penetration in urban areas, rural residents have more limited access. Just over half of rural residents can access at least 1 pharmacy within a 5 km radius. We also found that hypothetical pharmacy closures would have more of an impact on rural residents than on urban residents in Nova Scotia. However, even with the hypothetical closure of 50% of pharmacies, more than one-third of rural residents would live within 5 km of a community pharmacy.

The implications of geographic access for patient care remain uncertain. Further research is needed to determine whether differences in geographic access to community pharmacies in rural and urban areas translate into differences in access to pharmaceutical services (e.g., programs such as medication management and emergency contraception) and patient outcomes (e.g., patient adherence). The longitudinal geographic mapping of pharmacy openings and closures would be useful in examining these trends, as well as the impacts of policies that modify pharmacy reimbursement. ■

From the Centre for Health Services and Policy Research, School of Population and Public Health (Law, Heard) and the Mapping Unit, Human Early Learning Partnership (Douillard), University of British Columbia, Vancouver, BC; the College of Pharmacy, Dalhousie University (Fisher, Sketris), Halifax; and Pharmaceutical Services, Nova Scotia Department of Health and Welfare (Muzika), Halifax, NS. Contact mlaw@chspr.ubc.ca.

Acknowledgments: We would like to acknowledge James Boxall, FRCGS, FRGS, Director, GISciences Centre, and Adjunct Professor and Lecturer, Schools of Planning and Environment and Management, Dalhousie University, for his review of this paper.

Financial disclosure: Michael Law received salary support through a New Investigator Award from the Canadian Institutes of Health Research and a Scholar Award from the Michael Smith Foundation for Health Research. Ingrid Sketris held a chair in health services research from CHSRF/CIHR Cosponsored by NHSRF. Judith Fisher received salary support as a postdoctoral fellow from this chair. The views expressed in this paper are those of the authors, and not necessarily of the Nova Scotia Department of Health and Wellness.

References

- Radford A, Richardson I, Mason M, Rutledge S. *The key role of sole community pharmacists in their local healthcare delivery systems*. Chapel Hill (NC): North Carolina Rural Health Research and Policy Analysis Center and RUPRI Center for Rural Health Policy Analysis; 2009. Available: www.shepscenter.unc.edu/rural/pubs/finding_brief/FB88.pdf (accessed August 5, 2011).
- Traynor AP, Sorensen TD. Assessing risk for loss of rural pharmacy services in Minnesota. *J Am Pharm Assoc* (2003) 2005;45:684-93.
- Law MR, Ma T, Fisher J, Sketris IS. Independent pharmacist prescribing in Canada. *Can Pharm J* 2012;145(1): 17-23.e1.
- Grootendorst P, Rocchi M, Segal H. *An economic analysis of the impact of reductions in generic drug rebates on community pharmacy in Canada*. Toronto (ON): Leslie Dan Faculty of Pharmacy, University of Toronto; 2008. Available: http://individual.utoronto.ca/grootendorst/pdf/Grootendorst_et_al_Pharmacy_Rebates_Report_Final.pdf (accessed March 14, 2012).
- Government of Nova Scotia. *Fair drug prices for Nova Scotians: consultation summary*. 2011. Available: www.gov.ns.ca/health/fairdrugprices/documents/drug-consultation.pdf (accessed March 14, 2012).
- Howlett K, Strauss M. Ontario pharmacy fight intensifies. *The Globe and Mail* 2010 Apr 12. Available: www.theglobeandmail.com/news/politics/ontario-pharmacy-fight-intensifies/article1531647/ (accessed May 21, 2010).
- Law MR, Dijkstra A, Douillard JA, Morgan SG. Geographic accessibility of community pharmacies in Ontario. *Healthc Policy* 2011;6:36-45.
- Statistics Canada. *Population, urban and rural, by province and territory (Nova Scotia): summary tables*. 2009. Available: www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo62d-eng.htm (accessed June 28, 2011).
- Lin SJ. Access to community pharmacies by the elderly in Illinois: a geographic information systems analysis. *J Med Syst* 2004;28:301-9.
- Canadian Institute for Health Information. *Pharmacists in Canada, 2010: national and jurisdictional highlights and profiles*. Ottawa (ON): Canadian Institute for Health Information; 2011. Available: <https://secure.cihi.ca/estore/productFamily.htm?pf=PFC1667&lang=en&media=0> (accessed December 16, 2011).
- IMS Brogan. *Retail pharmacies by province and territory, February 2011*. Available: www.imshealth.com/deployedfiles/ims/Global/North%20America/Canada/Home%20Page%20Content/Pharma%20Trends/RetailPharmaciesProvince_En_11.pdf (accessed March 14, 2012).
- Statistics Canada. *Population by year, by province and territory: summary tables*. 2011. Available at: www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/demo02a-eng.htm (accessed March 15, 2012).
- Sketris I, Bowles S, Manuel R. Canadian public policies and practices related to drug prices, utilization and expenditures. *J Pharm Finance Econ Pol* 2003;12:23-54.
- Canadian Institute for Health Information. *Drug expenditure in Canada, 1985 to 2010*. Ottawa (ON): Canadian Institute for Health Information; 2010. Available: https://secure.cihi.ca/free_products/drug_expenditure_2010_en.pdf (accessed June 27, 2011).
- Government of Nova Scotia. *Nova Scotia civic address finder*. Available: <http://nscf1.nsgc.gov.ns.ca/civicviewer/civic.aspx?ok=true> (accessed June 27, 2011).
- DMTI Spatial. *CanMap GeoPinpoint Suite*. Available: www.dmtispatial.com/en/Products/DataManagement/CanMapProductSuite/GeoPinpointSuite.aspx (accessed March 15, 2012).
- DMTI Spatial. *CanMap Route Logistics*. Available: www.dmtispatial.com/en/Products/DataManagement/CanMapProductSuite/CanMapRouteLogistics.aspx (accessed March 15, 2012).
- Statistics Canada. *2006 Census Dictionary*. 2008. Available: www.recensement2006.ca/census-recensement/2006/ref/dict/index-eng.cfm (accessed May 25, 2010).
- McGregor J, Hanlon N, Emmons S, et al. If all ambulances could fly: putting provincial standards of emergency care access to the test in northern British Columbia. *Can J Rural Med* 2005;10:163-8.
- Schuurman N, Fiedler R, Grzybowski S, Grund D. Defining rational hospital catchments for non-urban areas based on travel-time. *Int J Health Geogr* 2006;5:43.
- Laditka JN, Laditka SB, Probst JC. Health care access in rural areas: evidence that hospitalization for ambulatory care-sensitive conditions in the United States may increase with the level of rurality. *Health Place* 2009;15:761-70.