Examining the Supply of and Demand for Physiotherapy in Saskatchewan: The Relationship between Where Physiotherapists Work and Population Health Need

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ABSTRACT

Purpose: This research examined the association between the distribution of physiotherapists in Saskatchewan relative to population health characteristics and self-reported physiotherapy use. **Methods:** Using a cross-sectional design, de-identified data were collected from the 2013 Saskatchewan College of Physical Therapy membership renewals ($n = 643$), and Saskatchewan population health characteristics data were obtained from the 2009–2012 Canadian Community Health Surveys (CCHSs). Age- and sex-adjusted proportions of selected population health characteristics were calculated and stratified by health region and rural–urban location; both were determined, for physiotherapists and CCHS participants, using postal codes. The association between physiotherapy distribution and physiotherapy use was calculated, and geospatial mapping techniques were used to display physiotherapist distribution across the province relative to population health characteristics. **Results:** Across health regions, a positive correlation ($r = 0.655$, $p < 0.029$) was found between physiotherapist distribution and self-reported physiotherapy use. Mapping population health characteristics according to physiotherapist distribution demonstrated an imbalance between supply and distribution of physiotherapists and population health needs and demands. **Conclusion:** There is a discrepancy in Saskatchewan among the distribution of physiotherapists, self-reported physiotherapy use, and population health characteristics, especially in rural settings. These findings provide insight into which areas are in need of increased physiotherapy services.

Key Words: geospatial mapping; health services accessibility; rural health.

RÉSUMÉ

Objectif : cette recherche vise à examiner le lien entre la répartition des physiothérapeutes en Saskatchewan et les caractéristiques sanitaires de la population ainsi que le recours autodéclaré aux soins de physiothérapie. **Méthode :** à l'aide d'une méthodologie transversale, les données anonymisées du registre de renouvellement des membres du Saskatchewan College of Physical Therapy ($n = 643$) ont été recueillies et les données sur les caractéristiques sanitaires de la population de la Saskatchewan ont été relevées dans l'Enquête sur la santé dans les collectivités canadiennes (ESCC) de 2009–2012. Les proportions ajustées selon l'âge et le sexe des caractéristiques sanitaires de la population choisie ont été calculées et stratifiées par région sanitaire et par milieu rural ou urbain. Ils ont tous deux été déterminés, pour les physiothérapeutes et les répondants à l'ESCC, à l'aide du code postal. Le lien entre la répartition des physiothérapeutes et le recours aux soins de physiothérapie a été calculé, et des techniques de cartographie géospatiale ont été utilisées pour montrer la répartition des physiothérapeutes dans la province comparativement aux caractéristiques sanitaires de la population. **Résultats :** dans toutes les régions sanitaires, une corrélation positive ($r = 0,655$, $p < 0,029$) a été observée entre la répartition des physiothérapeutes et le recours autodéclaré aux soins de physiothérapie. La cartographie des caractéristiques sanitaires de la population selon la répartition des physiothérapeutes a montré un déséquilibre entre le nombre de physiothérapeutes et leur répartition et les besoins et les demandes en matière de santé de la population. **Conclusion :** il y a en Saskatchewan un écart entre la répartition des physiothérapeutes, le recours autodéclaré aux soins de physiothérapie et les caractéristiques sanitaires de la population, particulièrement en milieu rural. Ces conclusions fournissent des indications quant aux régions où une augmentation de l'offre de services de physiothérapie est nécessaire.

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According to the Canada Health Act, all Canadian residents should have reasonable access to health care regardless of where they live.¹ However, Canadians living in rural communities have poorer health, a shorter life expectancy, and a higher rate of disability than those living in urban centres.^{2,3} Many rural residents have reduced access to health care services, such as physiotherapy, despite potentially greater need.^{4–6} In Saskatchewan, for example, 36% of the population lives in a rural area, whereas only 11.2% of physiotherapists have a primary practice located in a rural community.⁷ To determine whether there is equitable access to physiotherapy services, we need to not only examine where physiotherapists practise but also determine whether the supply and distribution of physiotherapists matches population health needs and demands.

The World Health Organization^{8(p.58–9)} has defined *access to health care* as “the continuing and organized supply of its care that is geographically, financially, culturally and functionally within easy reach of the whole community.” Examining access to health care takes into consideration two types of access: potential and realized. *Potential access* is defined as the opportunity to receive health care, and *realized access* is defined as use of health care services.^{8,9} Potential access can be estimated by using factors such as age, income, level of education, geography, and chronic conditions.¹⁰ Access to and use of health services is a determinant of health;¹¹ therefore, the discrepancy in health status between urban and rural residents may be, at least in part, due to the reduced access and use of health services by those living in rural areas.

Physiotherapists have much to offer in managing a multitude of acute and chronic health conditions as well as in improving the efficiency of the health care system; however, very little research to date has examined whether the supply of physiotherapists adequately meets population health needs, especially in rural areas.¹² Previous research has examined access to physiotherapy and occupational therapy across Ontario by mapping the distribution of both professions and estimating the need for those services in the province.¹⁰ Although this work found a discrepancy between population health characteristics and the supply of health care professionals, it found no relationship between self-reported use of services and service provision.¹⁰ For example, the areas with the greatest use of occupational therapists and physiotherapists in Ontario did not have the highest density of these professionals per 100,000 people.¹⁰ Previous research in Saskatchewan has mapped the distribution of physiotherapists and compared the demographic and practice characteristics of rural and urban physiotherapists; however, this work did not examine whether the supply of physiotherapists was associated with population health need.⁷

The purpose of this study was to determine whether physiotherapists are distributed across Saskatchewan

where they are needed. The objectives of our research were to (1) determine whether the supply of physiotherapists in Saskatchewan meets the demand based on population health characteristics and (2) examine the relationship between physiotherapist supply or distribution and self-reported physiotherapy use.

METHODS

Our research used an integrated knowledge translation approach. Key stakeholder groups were involved in developing the research questions, methods, and interpretation and distribution of the results.¹³ The stakeholder groups for this work included representatives from the Saskatchewan College of Physical Therapists (SCPT), the Saskatchewan Physiotherapy Association, the Clinical Education Unit of the University of Saskatchewan School of Physical Therapy, Continuing Physical Therapy Education, the Saskatchewan Ministry of Health, and the Human Resources Branch of Saskatchewan Health.

A cross-sectional research design was used to examine the prevalence of the population health characteristics of Saskatchewan residents relative to physiotherapist service provision by health region and metropolitan influence zone (MIZ). Health regions are geographical divisions created by the Saskatchewan Ministry of Health to enable it to distribute funding and manage health care provision; *MIZ* is a term used by Statistics Canada (StatsCan) to provide a more in-depth understanding of rural versus urban areas. StatsCan defines a city and urban community as having a minimum of 10,000 inhabitants; a smaller municipality and rural area is classified as a MIZ. A strong MIZ refers to a rural area in which at least 30% of the employed labour force commutes to work in an urban area. In a moderate, weak, or no MIZ, 5%–30%, 0%–5%, or none of the area's population commutes to work, respectively. “No MIZ” also applies to areas with fewer than 40 people in the resident labour force.¹⁴

The SCPT membership information ($n = 643$) was provided in de-identified form to the researchers. Saskatchewan population health characteristic information was obtained from StatsCan's Canadian Community Health Survey (CCHS) through the Saskatchewan Research Data Centre.¹⁵ The CCHS is a cross-sectional survey conducted by StatsCan every year to collect information about the Canadian population's health status, health care use, and determinants of health. Sampling for the CCHS attempts to represent 98% of the population and, thus, Saskatchewan residents aged older than 12 years who live in private dwellings. Those excluded from the survey are individuals living on First Nations reserves and Crown lands, institutional residents, full-time members of the Canadian Armed Forces, and residents of remote regions in which the number of respondents is so small that publishing the data would jeopardize the participants' anonymity.^{16–18}

Two consecutive versions of 2 combined years of CCHS data (i.e., 2009–2010 and 2011–2012) were used

Table 1 Selected Variables and Operational Definitions

Variable	Definition (if applicable) and categories
Population health characteristics	
Predisposing	
Age	12–17, 18–34, 35–49, 50–64, 65+ ¹⁷
Sex	Male, female ¹⁷
Education	Less than secondary, greater than secondary ¹⁷
Ethnicity	Caucasian, Aboriginal (includes First Nations, Métis, Inuk/Inuit), other. Excludes individuals living on First Nations reserves. ¹⁷
Nationality	Canadian-born, immigrant ¹⁷
BMI	A derived variable based on self-reported height and weight (kg/m ²). ¹⁸ Categories: normal or underweight, overweight, obese. ¹⁸ Excludes pregnant women, those younger than age 20 y, and those older than age 64 y. ¹⁸
Smoking status	Never smoked, former smoker, current smoker ¹⁷
Physical activity > 15 min	Based on a 1-mo average. Categories: infrequent, occasional, regular ¹⁸
Sedentary activity	Estimates the number of sedentary hours per week; excludes reading, work, and school. ¹⁸ Categories: 0–14 h, 15–24 h, 25–39 h, 40+ h ¹⁸
Enabling	
Income	Quintiles represent income adequacy. A derived variable based on an adjusted ratio of total household income, low-income cutoff, and size of community. ¹⁸ Categories 1–5 range from low to high income, respectively. ¹⁸
Need-related	
No. of chronic conditions	Conditions lasting 6 or more mo. Categories: no conditions, 1 condition, 2 conditions, 3 or more conditions. ¹⁷
Types of chronic conditions	Top 15 chronic conditions deemed relevant to physiotherapy: back problems; high blood pressure; arthritis (excludes fibromyalgia; excludes those aged <14 y); migraines; asthma; mood disorder (includes depression, bipolar disorder, mania, dysthymia, manic depression); anxiety disorder (includes phobia, obsessive-compulsive disorder, panic disorder); diabetes; previous cancer; bowel disorder (includes Crohn's disease, ulcerative colitis, irritable bowel syndrome, bowel incontinence); heart disease; COPD (excludes those aged <25 y); urinary incontinence; cancer; stroke. ¹⁷
Pain	A StatsCan-derived variable, from the Health Utilities Index Mark 3, considering amount of pain typically felt by respondent and the limitations this pain has on activity. ¹⁸ Categories: no pain or discomfort, prevents no activities, prevents few activities, prevents some activities, prevents most activities. ¹⁸
Perceived overall health	Respondent's judgment of his or her health. Categories: excellent, very good, good, fair, poor. ¹⁷
Self-rated mental health	Respondent's judgment of his or her mental health. Categories: excellent, very good, good, fair, poor. ¹⁷
Self-rated overall work stress	Respondent's judgment of his or her work stress; excludes those not currently employed. Categories: not at all, not very much, a bit, quite a bit, extreme. ¹⁷
Other variables	
Self-reported physiotherapy use	Self-reported use of services (yes–no) in the past 12 months obtained from the CCHS. ¹⁶
Availability of physiotherapy services	Physiotherapist-to-10,000 population ratio at health region level; calculations based on SCPT physiotherapist membership information (2013) and 2011 census data ²⁶

BMI = body mass index; COPD = chronic obstructive pulmonary disease; CCHS = Canadian Community Health Survey; StatsCan = Statistics Canada; SCPT = Saskatchewan College of Physical Therapists.

for this research.^{16,17} Using the combined data increased the sample size available for stratified analysis and allowed us to adhere to StatsCan's confidentiality rules. In Saskatchewan, the total target sample size for the combined 2009–2010 and 2011–2012 surveys was 3,860 for each separate year (for a total target sample of 7,720 for each combined-year survey). The combined response rates for the 2009–2010 and 2011–2012 surveys were 77.7% and 71%, respectively.^{16,17} The population health characteristics were obtained from the combined 2011–2012 version, and the self-reported physiotherapy use

variable was obtained from the combined 2009–2010 version. We used two different combined versions because (1) after 2011 the CCHS no longer included a question regarding self-reported use of physiotherapy services and (2) we wanted the population health data to be closer to the time period of the physiotherapy distribution data used to calculate the availability of services (i.e., 2013). This study was approved by the (institutional) research ethics board.

To examine the relation between the availability of services and population health characteristics, a set of

variables was identified and selected, using Andersen's Behavioural Model of Health Services Use as a theoretical framework.^{8,11,19,20} The model theorizes that the use of health care services is driven by predisposing variables (e.g., age), enabling variables (e.g., income), and need-related variables (e.g., self-reported chronic health conditions). Variables were limited by CCHS content and were selected on the basis of stakeholder input as well as previous research into health care use.^{8,10,11,21–25} An overview of the selected variables and operational definitions can be found in Table 1.

Analyzing supply data included calculating physiotherapy distribution per 10,000 residents by both Saskatchewan health region and MIZ category using the 2013 SCPT membership list and the 2011 census.²⁶ Population health demand or need data included age- and sex-adjusted prevalence rates of selected socio-demographic and health characteristics calculated by health region and MIZ category using 2009–2012 CCHS data. Spearman's ρ was used to evaluate the association of physiotherapist distribution per 10,000 people, using the 2013 SCPT membership data, with self-reported data on physiotherapist use from the 2009–2010 CCHS. Statistical analysis was performed using IBM SPSS Statistics, version 22.0 (IBM Corporation, Armonk, NY) and Excel 2013 (Microsoft Corporation, Redmond, WA).

Geospatial analysis of physiotherapy distribution and prevalence of population health variables was performed at the health region level, and sources were the 2011 census, census subdivisions for MIZ, census metropolitan areas (to locate large urban areas), and the Saskatchewan Health Region boundary file.²⁶ Geocoding was used to generate a set of geographic coordinates (points) for each piece of data, and the corresponding health region information was then assigned to each point. The physiotherapist distribution ratios were categorized into four manually defined classes: 2.00 or less, 2.01–4.00, 4.01–6.00, and more than 6.01 per 10,000 people; this enabled us to emphasize a particular range of values above or below the Canadian Institute for Health Information's 2011 reported average physiotherapist distribution for Saskatchewan and Canada (57.4 and 51.1 physiotherapists per 100,000 people, respectively).²⁷ We chose the population number 10,000 because the resulting ratio would be a more meaningful measure for administrators, policymakers, and local residents.

RESULTS

Population health characteristics

Age- and sex-adjusted proportions for health variables were collected from the CCHS (see Table 1) and categorized according to health region, as displayed in Table 2. (Unadjusted proportions are presented in the online appendix.) Health characteristics were categorized into predisposing, enabling, and need variables according to

Andersen's Behavioural Model of Health Services Use.¹⁹ Because of their small populations and sample sizes, the Keewatin Yatthé, Mamawetan Churchill, and Athabasca health regions were grouped together as Northern Health Regions to adhere to StatsCan's confidentiality requirements.²⁸

Physiotherapy distribution relative to population need

Figure 1a presents the geospatial analysis of physiotherapy distribution by relative rurality (based on MIZ), and Figure 1b compares the selected predisposing and enabling variables related to education and income, overlaid with physiotherapy distribution by health region. Figure 2 shows a range of need variables relating to the physiotherapy profession compared with physiotherapy distribution, mapped according to health region.

Comparison of physiotherapy distribution and self-reported physiotherapy use

We found that Saskatchewan has an average distribution of 5.80 physiotherapists per 10,000 people and a self-reported physiotherapy use of 9.10%; Figure 3 charts this relationship by health region. A strongly positive, statistically significant association was found between physiotherapist distribution and self-reported physiotherapy use ($r = 0.655$, $p = 0.029$). Heartland Health Region and the Northern Health Regions had the lowest distributions of physiotherapists (1.15 and 1.35 per 10,000 people, respectively), and the lowest self-reported use of physiotherapists was in the Sunrise Health Region (4.41%), Sun Country Health Region (5.73%), and Northern Health Regions (5.9%). Saskatoon Health Region had the highest physiotherapist distribution per 10,000 people (8.96) and the highest percentage of self-reported physiotherapy use (11.79%). No statistically significant association was found when we examined the association between physiotherapy distribution and self-reported use by relative rurality ($r = 0.50$, $p = 0.67$).

DISCUSSION

The purpose of this study was to examine the distribution of physiotherapists in Saskatchewan in relation to population health characteristics and self-reported physiotherapy use. Outside the relatively urban Saskatoon and Regina Qu'Appelle health regions, there are six or fewer physiotherapists per 10,000 people. However, Table 2 and Figures 1b and 2 show that the age- and sex-adjusted prevalence of various predisposing, enabling, and need-related population health characteristics remains somewhat consistent between rural and urban areas. Examination by health region determined that there was also a strong, statistically significant, positive relationship between the number of physiotherapists per 10,000 people and the prevalence of self-reported physiotherapy use. No relationship was demonstrated when the same variables were examined by MIZ or relative rurality. Thus, despite the higher prevalence of reduced household

Table 2 Proportions of Population Health Characteristics by Health Region (Adjusted by Age and Sex, %)

		Health region (no.)												
		ST (273)	RQ (218)	PA (56)	PN (49)	SC (45)	SR (44)	FH (44)	HL (36)	CY (36)	KT (32)	NR (9)	SK (842)	
Factor or variable														
Predisposing														
Age, y	12–17	8.9	7.7	9.7	10.1	11.1	9.0	8.5	11.3	9.5	9.9	12.3	9.0	
	18–34	33.4	30.4	23.0	28.3	23.3	19.9	23.7	22.4	21.9	19.6	30.7	28.3	
	35–49	21.1	21.8	22.9	21.9	21.6	20.2	24.3	21.3	23.4	20.3	20.4	21.7	
	50–64	22.4	24.7	24.2	22.7	25.3	26.2	23.4	27.6	24.3	26.1	25.9	24.0	
	65+	14.2	15.4	20.2	17.0	18.7	24.8	20.1	17.4	20.9	24.1	10.7	16.9	
Sex	Female	50.3	50.8	50.8	48.8	48.4	50.5	50.3	49.2	50.2	52.2	49.3	50.3	
Education	<Secondary	19.4	21.0	26.4	31.5	23.9	31.1	24.2	27.8	25.7	26.3	27.7	23.2	
Ethnicity	Caucasian	84.1	82.7	70.5	69.2	94.8	89.5	88.3	96.0	95.7	88.5	38.6	83.7	
	Aboriginal	8.4	8.3	23.9	22.3	3.1	5.9	8.2	1.3	3.4	10.0	58.6	9.8	
	Other	7.5	9.0	5.6	8.6	2.1	4.6	3.5	2.7	0.9	1.5	2.9	6.5	
Nationality	Canadian born	89.6	87.9	91.7	89.2	94.2	95.2	94.7	95.2	96.7	96.8	94.6	91.0	
	Immigrant	10.4	12.1	8.3	10.8	5.8	4.8	5.3	4.77	3.3	3.2	5.4	9.0	
BMI	Normal or underweight	46.5	46.0	38.3	37.4	36.7	39.7	47.5	46.4	40.9	41.8	34.5	44.1	
	Overweight	31.6	35.2	39.2	36.6	40.5	33.0	30.9	28.3	36.0	32.9	36.0	34.0	
	Obese	22.0	18.8	22.5	26.0	22.8	27.3	21.7	25.3	23.1	25.3	29.4	21.9	
Smoking status	Never smoked	44.0	43.9	32.0	35.6	36.4	39.2	32.9	29.2	38.2	40.5	20.7	40.3	
	Former smoker	38.0	36.2	39.4	35.5	39.7	36.8	38.4	43.1	42.9	37.0	33.9	37.8	
Activity > 15 min	Current smoker	18.0	19.9	28.6	28.9	23.9	24.0	28.7	27.8	18.9	22.4	45.4	21.8	
	Infrequent	16.6	16.9	20.2	23.0	13.9	17.5	21.2	19.2	17.4	23.7	12.7	17.7	
	Occasional	14.2	14.8	15.0	19.5	18.6	17.9	15.8	17.0	18.5	11.6	18.7	15.4	
Sedentary activity, h	Regular	69.1	68.3	64.8	57.4	67.5	64.6	63.1	63.9	64.1	64.7	68.5	66.9	
	0–14	16.6	16.9	20.2	23.0	13.9	17.5	21.2	19.2	17.4	23.7	12.7	17.7	
	15–24	14.2	14.8	15.0	19.5	18.6	17.9	15.8	17.0	18.5	11.6	18.7	15.4	
	25–39	69.1	68.3	64.8	57.4	67.5	64.6	63.1	63.9	64.1	64.7	68.5	66.9	
	40+	16.6	16.9	20.2	23.0	13.9	17.5	21.2	19.2	17.4	23.7	12.7	17.7	
	Enabling													
	Income	Quintile 1	14.4	13.1	23.1	21.1	5.9	18.8	17.3	13.6	14.7	12.6	26.9	15.1
		Quintile 2	14.2	13.8	15.2	14.1	11.8	22.4	21.9	13.9	14.3	15.8	14.7	15.0
Quintile 3		21.8	20.1	23.6	18.3	17.7	15.2	24.7	27.2	20.6	29.5	17.2	21.4	
Quintile 4		22.0	22.5	15.9	20.0	25.1	19.1	14.9	15.4	19.7	22.5	14.6	20.8	
Quintile 5		27.5	30.5	22.3	26.5	39.6	24.5	21.2	29.9	30.7	19.6	26.6	27.7	
Need														
No. of chronic conditions	None	42.7	43.0	42.4	41.5	44.5	43.7	43.9	45.1	46.2	41.2	52.5	43.0	
	1	28.2	23.8	26.2	25.0	23.6	22.3	24.1	26.9	26.8	23.8	21.3	25.6	
	2	13.6	14.9	13.4	15.9	17.6	14.3	13.4	13.2	12.4	14.5	11.0	14.3	
	≥3	15.5	18.4	18.0	17.7	14.4	19.7	18.6	14.8	14.6	20.5	15.1	17.1	
Types of chronic conditions	Back problems	20.1	20.3	19.2	19.9	17.2	24.5	19.9	13.9	21.4	26.4	11.8	20.1	
	High BP	14.3	21.1	17.5	25.8	18.9	22.1	17.9	17.8	16.6	17.4	22.2	18.5	
	Arthritis	16.6	17.4	20.0	16.0	17.1	20.3	20.3	18.2	17.2	18.9	15.4	17.7	
	Migraines	12.6	11.8	12.4	8.2	11.1	10.5	10.0	11.5	9.1	12.7	5.6	11.5	
	Asthma	10.7	8.4	10.6	7.9	7.0	6.3	10.3	7.4	5.0	9.4	6.4	9.2	
	Mood disorder	7.7	9.2	7.2	7.6	8.0	5.3	6.9	9.0	5.8	8.0	5.7	7.9	
	Anxiety disorder	7.5	7.7	5.1	3.8	5.6	6.2	4.7	5.4	4.2	3.3	4.7	6.4	
	Diabetes	5.0	6.6	8.9	8.8	5.0	7.5	4.6	5.8	6.7	5.7	12.0	6.2	
	Previous cancer	3.8	5.7	6.7	7.2	3.6	5.1	6.4	5.6	5.2	6.1	4.0	5.2	
	Bowel disorder	4.4	5.9	5.4	4.8	6.1	6.6	6.7	3.0	3.1	8.4	2.0	5.1	
	Heart disease	4.7	5.3	4.8	5.3	4.5	6.8	5.0	4.8	3.9	4.5	3.6	5.0	
	COPD	4.2	5.6	5.1	3.0	2.3	3.5	9.6	4.0	4.9	3.6	4.8	4.6	
	Urinary incontinence	4.0	4.8	4.9	6.6	4.1	5.3	4.3	5.2	5.4	3.6	6.5	4.6	
	Cancer	1.8	3.3	1.6	2.1	1.5	2.5	2.5	2.0	2.4	1.9	1.6	2.3	
	Stroke	1.0	0.9	1.9	0.9	0.9	1.6	2.1	1.0	1.1	1.2	1.6	1.1	
	Pain	No pain or discomfort	80.6	80.0	78.7	75.9	81.7	73.7	73.7	80.9	82.1	75.9	75.6	79.3
Prevents no activities		6.1	7.6	4.7	8.5	4.3	8.1	9.5	6.6	3.3	8.9	8.4	6.7	
Prevents few activities		6.5	4.5	6.8	5.3	6.8	6.9	5.1	6.7	7.2	5.1	4.6	5.9	
Prevents some activities		4.2	4.2	5.6	7.2	4.8	6.4	4.4	3.4	4.1	6.4	6.4	4.7	
Prevents most activities		2.6	3.8	4.1	3.1	2.4	4.9	7.3	2.4	3.4	3.7	5.0	3.5	

Table 2 Continued

Factor or variable		Health region (no.)											
		ST (273)	RQ (218)	PA (56)	PN (49)	SC (45)	SR (44)	FH (44)	HL (36)	CY (36)	KT (32)	NR (9)	SK (842)
Perceived overall health	Excellent + very good	59.0	55.8	50.7	55.0	59.1	51.4	56.2	61.5	57.5	60.1	43.9	56.8
	Good	29.7	30.4	34.3	31.4	31.9	29.9	31.7	29.1	34.9	27.4	37.0	30.6
	Fair + poor	11.3	13.8	14.9	13.6	9.0	18.7	12.2	9.4	7.6	12.5	19.1	12.6
Self-rated mental health	Excellent + very good	68.6	67.9	63.7	67.1	69.3	65.0	67.1	66.9	74.0	67.1	57.5	67.7
	Good	24.5	24.0	29.1	26.9	25.0	28.9	27.1	26.6	22.3	27.6	30.7	25.4
	Fair + poor	6.9	8.1	7.2	5.9	5.8	6.1	5.7	6.5	3.7	5.3	11.9	7.0
Self-rated work stress	Not at all + not very much	34.9	34.7	42.9	34.4	31.9	40.7	34.7	35.0	33.6	45.2	47.6	36.1
	A bit	43.2	44.0	36.8	43.0	48.0	34.4	34.8	43.6	45.3	33.6	31.7	41.5
	Quite a bit and extreme	21.9	21.3	20.3	22.6	20.2	24.9	30.6	21.4	21.0	21.2	20.8	22.4

No. = number of residents per health region (in thousands) eligible to complete the Canadian Community Health Survey; ST = Saskatoon Health Region; RQ = Regina Qu'Appelle Health Region; PA = Prince Albert Parkland Health Region; PN = Prairie North Health Region; SC = Sun Country Health Region; SR = Sunrise Health Region; FH = Five Hills Health Region; HL = Heartland Health Region; CY = Cypress Health Region; KT = Kelsey Trail Health Region; NR = Northern Health Regions (Keewatin Yatthé, Mamawetan Churchill, and Athabasca); SK = Saskatchewan overall; BMI = body mass index; BP = blood pressure; COPD = chronic obstructive pulmonary disease.

income and lower levels of post-secondary education in many rural areas (factors that the Andersen model suggests are barriers to realized health care access),^{8,11,19,20} it appears that if currently under-served rural and remote areas had more physiotherapists, their services would be used.

Figure 1a illustrates the relative rurality among the health regions in Saskatchewan; health regions with more rurality have potentially decreased access to physiotherapy services. This decreased access may be due to increased distance from urban centres (e.g., falling within weak to no MIZs) in the health region as well as the lack of available physiotherapists, creating a need for individuals to travel to use physiotherapy services. For example, the Heartland Health Region, Northern Health Regions, and Kelsey Trail Health Region have a greater proportion of weak to no MIZs, as shown, and a low density of physiotherapists: 1.15, 1.35, and 3.36 per 10,000 people, respectively. Unfortunately, population health needs, adjusted for age and sex, show similar or higher needs for people living in these rural and remote areas (Table 1, Figures 1b and 2). Unadjusted, the need is more pronounced in certain areas, and this is likely due to the higher number of individuals aged older than 65 years (see online Appendix 1).

The predisposing and enabling variables of the population represent the potential for access to health services.^{11,19} For example, people with higher income may be better able to travel to access services and have the means to pay for them.^{8,11,19,20,24,29} Analyzing Table 2 and Figure 1b, proportions of certain predisposing and enabling factors appear the same, but certain health regions show subtle differences. These differences, in most instances, coincide with changes in need-related factors. In essence, health regions in which a greater pro-

portion of the population have higher income and higher levels of education tend to show a lower prevalence of chronic health conditions. For example, Sun Country, Cypress, Regina Qu'Appelle, Heartland, and Saskatoon health regions had a higher number of residents reporting income in the highest bracket (39.6%, 30.7%, 30.5%, 29.9%, and 27.5%, respectively) and a lower percentage of individuals reporting less than post-secondary education (23.9%, 25.7%, 21.0%, 27.8%, and 19.4%, respectively). These areas also had lower proportions of individuals with three or more chronic conditions (14.4%, 14.6%, 18.4%, 14.8%, and 15.5%, respectively).

Figure 2 illustrates the discrepancy in physiotherapy distribution compared with need-related population health characteristics. Areas with a lower distribution of physiotherapists were observed to have the same or a higher prevalence of need-related population health characteristics, such as number of chronic conditions and pain-preventing activity. Therefore, despite the fact that some health regions have greater population needs and potential barriers to accessing care, the availability of physiotherapy services across the province was not equally distributed.

This research demonstrates that potential access to physiotherapy services in Saskatchewan is inequitable. It also indicates actual, realized access by examining self-reported use of physiotherapy. Figure 3 displays a positive relationship between physiotherapists per 10,000 people and the proportion of self-reported use. From this, it can logically be inferred that if physiotherapists became available in areas that lack services, physiotherapy use would likely increase.

As Figure 3 shows, some health regions fall further from the line of best fit. It is possible that differences in predisposing and enabling factors among health regions,

Figure 1 (a) Physiotherapy distribution by relative rurality, based on MIZ; (b) physiotherapy distribution and predisposing and enabling factors by health region.

*Number of PTs per 10,000 population

PN = Prairie North Health Region; PA = Prince Albert Parkland Health Region; KT = Kelsey Trail Health Region; HL = Hearthland Health Region; ST = Saskatoon Health Region; RQ = Regina Qu'Appelle Health Region; SR = Sunrise Health Region; CY = Cypress Health Region; FH = Five Hills Health Region; SC = Sun Country Health Region; NR = Northern Health Regions; CMA = census metropolitan area; MIZ = metropolitan influence zone; HR = health region.

as well as proximity to urban centres, account for notable differences in self-reported use. For example, Cypress Health Region has approximately the same number of physiotherapists as Sunrise (4.61 and 4.45, respectively), but much higher self-reported use (11.68% and 4.41%, respectively). In addition, Cypress Health Region has the second-greatest proportion of individuals in the highest income bracket (30.7%), and Sunrise Health Region is one of the lower ranking health regions in this category (24.5%). Education may also contribute because Cypress has fewer individuals with less than post-secondary education than Sunrise (25.7% and 31.1%, respectively). It is

also possible that the reduced availability of physiotherapists in Cypress causes many of those reporting contact with a physiotherapist to travel to a metropolitan area in the next province (i.e., Medicine Hat, Alberta) to access services.

No significant relationship was found between physiotherapy distribution and use by relative rurality. To protect the confidentiality of those living in these smaller units of population, data from strong and moderate as well as weak and no MIZs were combined. Thus, only three data points were available for this association, which likely accounted for the non-significant result.

Figure 2 Physiotherapy distribution and selected need-related population health characteristics.

NR = Northern Health Region; PN = Prairie North Health Region; PA = Prince Albert Parkland Health Region; KT = Kelsey Trail Health Region; HL = Hearthland Health Region; ST = Saskatoon Health Region; RQ = Regina Qu'Appelle Health Region; SR = Sunrise Health Region; CY = Cypress Health Region; FH = Five Hills Health Region; SC = Sun Country Health Region; COPD = chronic obstructive pulmonary disorder.

Overall, the results of this study align with those of other studies in finding that factors other than availability of services contribute to health care use.^{8,11,24} Other research in Canada, and in other countries, has emphasized the trend to lower distributions of physiotherapists in rural settings and areas with a greater burden: that is, a higher proportion of people who are older, have a lower income, and have a higher prevalence of conditions and diseases warranting physiotherapy.^{4–6} Also, the dis-

crepancy in self-reported use between Cypress and Sunrise health regions, despite the same number of physiotherapists, has been reflected in research examining other health care professions with mixed public and private provision. For example, Allin²⁹ found that self-reported use of dentists, a profession similar to privately delivered physiotherapy because it is dependent on self-pay or extended health benefits, was influenced largely by income and higher levels of education.

Figure 3 Self-reported physiotherapy use and distribution by health region.

This study builds on research in Ontario, which has identified a similar discrepancy between rural and urban physiotherapist density and population health needs.^{10,25} The current study incorporated MIZs, or relative rurality, to enable a more nuanced examination of the potential influence of living in more rural locations on access to physiotherapy services.

In 2007, Passalent and colleagues¹⁰ analyzed the relationship between physiotherapy distribution and self-reported physiotherapy use in Ontario; however, they did not find a significant correlation between the two. The current study found a significantly positive relationship between physiotherapist density and self-reported use but did not examine whether public or private services were available. We do know that in Saskatchewan, 58.1% of physiotherapists work in public practice.⁷ Considering that a greater proportion of Saskatchewan physiotherapists are in public rather than private practice, more publicly funded physiotherapy services may be available in rural areas. Thus, despite a similar prevalence of those who report being in the lowest income bracket and having less than secondary education, rural Saskatchewan residents may have been able to access physiotherapy in the years we studied, resulting in a significantly positive relationship between physiotherapist distribution and self-reported use.

In 2015, the World Confederation for Physical Therapy³⁰ conducted research on the distribution of physiotherapists around the world. Overall, Saskatchewan's average of 5.8 physiotherapists per 10,000 people aligns with Canada's average distribution of 5–10 physiotherapists per 10,000 people. These numbers are also similar to those of the United States and much of Europe, but lower than the 10–15 per 10,000 people in Australia and France as well

as the 20 or more per 10,000 people in the highest ranking countries, such as Norway and Finland.³⁰ Before asserting that Saskatchewan and Canada should increase their numbers of physiotherapists, it is recommended that an in-depth assessment be undertaken of population health characteristics, population density, and rural physiotherapist supply as well as of the evolving role of physiotherapists in primary health care across these countries.^{4–6}

Clinical significance

This study is one of the first to examine the supply of and demand for physiotherapists in Canada and the first to incorporate an examination of relative rurality. Mapping supply and demand is a straightforward way to present inequity of access to physiotherapists and health care, and it provides a strong foundation for advocating for an increase in the number of physiotherapy positions in rural areas. This study also highlighted the need for innovative physiotherapy service delivery models and for recruitment and retention strategies for rural regions. The methods and analysis of this research may be used in other Canadian provinces, and in other countries, to understand equitable potential and realize access to physiotherapy as well as to other health care professions.

The findings of this research should be considered in light of several limitations. Most notable is the fact that because the CCHS removed the question concerning physiotherapy use after 2011, the data used were from different years of the CCHS (2009–2010 and 2011–2012). As previously mentioned, some geographical locations and populations are also not included in the CCHS. In addition, it is important to recognize that the Northern Health Regions had to be grouped together for the

purposes of this research because of the small sample size they represented in the CCHS; this may misrepresent the population in these health regions. The categorization of ethnicity presents a further limitation. For example, aboriginal ethnicity includes diverse groups; however, the CCHS data are available only for aboriginal people living off reserve, and analysis is limited to the categories Aboriginal, Caucasian, and other—categories that are not homogeneous.

Unfortunately, the CCHS did not include questions on extended health insurance or benefits, thereby limiting our knowledge of whether and how people are accessing physiotherapy when they have additional insurance coverage. The self-reported use of physiotherapy indicates only that the population is accessing physiotherapy; it does not reveal how or where they are accessing it.

Physiotherapists who had a primary employer outside Saskatchewan were not included in this study. This eliminated physiotherapists who may have licences in multiple provinces yet still provide services in Saskatchewan, thus potentially underestimating the distribution of physiotherapists practising in rural and urban areas of Saskatchewan. This study did not consider whether physiotherapists were in full-time or part-time positions, and it only considered their primary place of work, even though they may have a second location to which they traveled to provide services. Last, the cross-sectional design of this study provides information relative to only one point in time. Further longitudinal research, demonstrating trends over time, would be beneficial.

CONCLUSION

There is an unequal distribution of physiotherapists relative to population need characteristics in Saskatchewan, especially in rural areas. There is also a positive relationship between higher per capita physiotherapy distribution and self-reported use. Lower income, less than secondary education, and geographical location are potential barriers that rural and remote Saskatchewan residents may face when attempting to access physiotherapy services. However, this research suggests that when the number of physiotherapists per capita is equalized between rural and urban areas, realized access to physiotherapy might be enhanced.

KEY MESSAGES

What is already known on this topic

Factors other than health condition and disease contribute to the accessibility and use of health care services. Rural areas have the same or higher prevalence of factors negatively affecting health and have fewer health professionals. There are fewer physiotherapists in rural areas of Saskatchewan and Canada, despite a potentially greater population health need.

What this study adds

This study extends knowledge of potential barriers (lower income, geographical location, and less than secondary education) to access to physiotherapy services, and it suggests that if physiotherapists are practising in rural, under-served areas, their services are likely to be used. This study also presents a model for examining the supply and demand of physiotherapists and other health professionals in other Canadian provinces as well as in other countries.

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