The Distribution of Physiotherapists in Ontario: Understanding the Market Drivers

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ABSTRACT

Purpose: To understand the factors that affect the distribution of physiotherapists in Ontario by examining three potential influences in the multi-payer physiotherapy (PT) market: population need, critical mass (related to academic health science centres [AHSCs]), and market forces. **Methods:** Physiotherapist density and distribution were calculated from 2003 and 2005 College of Physiotherapists of Ontario registration data. Physiotherapists' workplaces were classified as not-for-profit (NFP) hospitals, other NFP, or for-profit (FP), and their locations were classified by census division (CD) types (cities and counties). **Results:** Physiotherapist density varied significantly and distribution was neither uniformly responsive to population need, nor driven primarily by market forces. The largest factor was an AHSC in a CD; physiotherapists locate disproportionately in NFP hospitals in AHSCs rather than in the growing FP sector. **Conclusions:** While some patterns can be discerned in the distribution and densities of physiotherapists across Ontario, further work needs to be done to identify why population need and market forces appear to be less influential, and why CDs with AHSCs are so attractive to physiotherapists. With this additional information, it may be possible to identify ways to influence uneven distribution in the future.

Key Words: delivery of health care market; health manpower; policy; demography.

RÉSUMÉ

Objectif : Comprendre les facteurs qui affectent la répartition des physiothérapeutes en Ontario en analysant trois influences potentielles dans le marché de la physiothérapie à payeurs multiples, soit les besoins de la population, la masse critique (liée aux centres universitaires de sciences de la santé) et les forces du marché. **Méthode :** La répartition et la densité de physiothérapeutes ont été calculées pour les années 2003 et 2005 à partir des données d'inscription à l'Ordre des physiothérapeutes de l'Ontario. Les milieux de travail des physiothérapeutes ont été classés par catégories : hôpitaux à but non lucratif (HBNL) ou autres milieux à but non lucratif (BNL) ou à but lucratif (BL). Leurs emplacements ont ensuite été classés par types de division du recensement (villes ou comtés). **Résultats :** La densité de physiothérapeutes varie considérablement et leur répartition n'était ni unilatéralement définie en fonction des besoins de la population, ni motivée principalement par les forces du marché. Le plus important facteur était un centre universitaire de sciences de la santé dans une division du recensement; les physiothérapeutes sont présents de manière disproportionnée dans les hôpitaux à but non lucratif de tels centres universitaires au lieu d'être dans le secteur en croissance des cliniques à but lucratif. **Conclusions :** Bien que certains modèles peuvent être dégagés dans la répartition et la densité des physiothérapeutes en Ontario, d'autres recherches devront être entreprises afin de préciser pourquoi les besoins de la population et les forces du marché semblent avoir moins d'influence et pourquoi les divisions du recensement avec centres universitaires de sciences de la santé sont si attrayantes pour les physiothérapeutes. Avec ces renseignements supplémentaires, il pourrait être possible d'identifier des moyens d'influer éventuellement sur la répartition inégale de ces professionnels.

There is ongoing policy discussion in Canada regarding appropriate allocation of health human resources, including physiotherapy (PT) human resources.¹⁻⁶ Considerable research has identified need for rehabilitation

services, including physiotherapy,^{7,8} while other research has focused on identifying disparities in the distribution of physiotherapists and different rates of growth and supply between provinces in Canada.^{6,8,9} However, less

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is known about why physiotherapists are distributed as they are. While effective health human resources planning is often said to require assessing optimum levels of supply to meet needs,^{4,6,10} it is important to know what influences distribution patterns in the event that policy makers want to influence those patterns in the future.

The distribution of physicians has been studied extensively in Ontario; many attempts to alter physician distribution patterns have centred on modifying levels and structures of payment.^{4,5} The underlying assumption of using financial incentives is that health professionals will respond to those incentives as economics predicts, but in practice, the extent to which health professionals respond to such incentives when making decisions about where to locate and whom to serve is unclear. A further complication is that the factors that influence the distribution patterns of physicians may be less applicable to physiotherapists. Whereas physicians are remunerated almost exclusively from a single, public source,¹¹ the Ontario PT market features multiple payers for PT services, including public, quasi-public, and private organizations.^{12,13} Different funders of PT may focus on services for different segments of the prospective patient population,¹³ which reduces their ability or will to act together. In addition, there is a mix of for-profit (FP) and not-for-profit (NFP) PT provider organizations,^{12,13} and this raises questions about whether these different categories of organizations might respond differently to needs for PT services and to financial incentives.

To identify what might be influencing the distribution of physiotherapists and their practice patterns, we examined the distribution and density of registered physiotherapists in 2003 and 2005 at the city and county (census division [CD]) level, employing a similar methodology as has been used to analyze the distribution of physicians.^{4,14} We then explored three propositions, each premised on a different understanding of the nature of the factors that might influence the distribution and density pattern.

First, while appropriate measures of need for PT services across populations do not yet exist,¹⁵ we posited that if physiotherapists were distributed predominantly according to population need, they should theoretically be relatively evenly distributed based on population across the province, assuming similar needs and minimum number of patients within reasonable distances.

Second, we posited that if PT is primarily a service that complements specialized medical services found in academic health science centres (AHSCs) and requires a critical mass of patients and health professionals to be viable in a particular geographic area, then the distribution should be skewed toward regions with AHSCs.^{4,16} We also posited, based on literature relating to the distribution of other health professionals, that physiotherapists in academic regions could draw patients from nearby

cities and CDs, which would create a lower density of therapists in adjacent regions.^{17,18}

Third, we used an economic model of spatial competition to understand the likely location strategies of physiotherapists if they respond to competitive forces.¹⁹ Using this model, we hypothesized that physiotherapists working for FP provider organizations, attracted to the potential for profit, would be more highly concentrated in more populated regions with greater numbers of potential patients. We also expected, based on the work of Landry and colleagues,¹² that if PT is market driven, we would find a continued drift away from provision of PT in NFP hospitals toward FP provider organizations.

METHODS

Data

The College of Physiotherapists of Ontario (CPO) maintains a comprehensive online listing of registered physiotherapists engaged in direct patient care, including the name and address of the organization or organizations for which each works.²⁰ We downloaded this list on October 4, 2003 and October 11, 2005. The 2003 list had 4,728 physiotherapists and the 2005 list had 4,835.

Physiotherapists who indicated a hospital workplace were coded as working in an NFP hospital. Workplaces such as the Arthritis Society and other commonly known charitable organizations were coded as other NFP. Some long-term care homes and some rehabilitation corporations were identified as possible NFP organizations, and we confirmed their status via Internet search. All other organizations were coded as for-profit (FP) organizations, including small businesses and large corporations with multiple sites.

Using postal codes, we classified the locations of physiotherapists according to Ontario's 49 Statistics Canada CDs,²¹ which reflect historical city and county boundaries. When a physiotherapist reported working in more than one CD, he or she was attributed in equal parts to each.

Density is a common way of measuring the supply of health professionals available to provide services to a population.^{2,4,14,22} To compare densities of physiotherapists, we calculated a ratio (number of registered physiotherapists in direct patient care per 10,000 population) for 2003 and 2005, for each CD for all physiotherapists, and for each category (NFP hospital, other NFP, and FP).

Ontario population data were drawn from Statistics Canada's Annual Demographic Statistics publication.²¹ To analyze the distribution patterns, we divided the CDs into three categories (see Box 1 and Figure 1): the six CDs with academic PT training programs (academic CDs), the 23 CDs adjacent to (or touching) academic CDs (adjacent CDs), and the 20 other CDs (other CDs). For some analyses, adjacent CDs and all other CDs were combined into a category called non-academic CDs.

Box 1 Ontario CDs by type

Academic CDs (<i>n</i> = 6)	Adjacent CDs (<i>n</i> = 23)	Other CDs (<i>n</i> = 20)
Frontenac <i>Queen's University</i>	Lanark Leeds & Grenville Lennox & Addington Stormont, Glengarry & Dundas	Bruce Cochrane Dufferin Essex
Hamilton <i>McMaster University</i>	Brant Halton Niagara Waterloo Wellington	Greater Sudbury Grey Haldimand-Norfolk Haliburton Hastings Kawartha
Middlesex <i>University of Western Ontario</i>	Chatham-Kent Elgin Huron Lambton Oxford Perth	Manitoulin Muskoka Nipissing Northumberland Parry Sound Peterborough Prince Edward
Ottawa <i>University of Ottawa</i>	Lanark Leeds & Grenville Prescott & Russell Renfrew	Simcoe Sudbury District Timiskaming
Thunder Bay*	Algoma Kenora Rainy River	
Toronto <i>University of Toronto</i>	Durham Peel York	

*Of the six academic CDs, only Thunder Bay did not have a medical school in the period under study nor an academic centre with an entry-to-practice programme in physiotherapy. However, McMaster University's northern stream PT programme, in collaboration with Lakehead University, allowed McMaster PT students to have their clinical education placements in the Thunder Bay area.²³ For this reason, Thunder Bay is included as an academic CD. CD = census division.

ANALYSIS

To assess whether physiotherapists were distributed according to population, we calculated correlation coefficients for CD-level population and all physiotherapist, FP, NFP hospital, and other NFP physiotherapist densities in these CDs. The question of whether CDs with AHSCs attracted more physiotherapists than other CDs was addressed by comparing the proportion of the Ontario population represented by each CD with the proportion of all physiotherapists in each CD category. To investigate the hypothesis that adjacent CDs, affected by nearby academic CDs, would have lower physiotherapist density than other CDs, we compared the mean densities of physiotherapists in each of these groups, as well as in academic CDs, using one-way ANOVAs with one between-

Figure 1 Ontario census divisions (CDs) by type.

subjects factor. To assess whether FP physiotherapists were more concentrated in more populous CDs than in other CDs, we considered whether the CDs with the greatest population growth between 2003 and 2005 had higher densities than slower-growing CDs. Finally, we considered the absolute number and the proportion of physiotherapists in NFP hospitals in 2003 and 2005 to see whether there was a decline in NFP hospital physiotherapists, which would show a continued trend from a report by other researchers for an earlier period.¹²

RESULTS**The province-wide distribution of physiotherapists**

Between 2003 and 2005, Ontario's population grew by 2.5%²¹ and the number of registered physiotherapists grew by 2.3%. The all-Ontario all-physiotherapist density was almost the same in 2005 as in 2003, with 3.863 physiotherapists in direct patient care per 10,000 residents in 2003 and 3.855 in 2005. A paired *t*-test demonstrated that there was no significant difference between the CD-level all-physiotherapist densities in 2003 and 2005 ($t = 0.36$, $df = 48$, $p = 0.72$).

Were physiotherapists distributed according to population?

At the CD level, the absolute number of physiotherapists was generally related to population. The most populous CD, Toronto, had the most physiotherapists (1,258 for 2,611,661 residents in 2003; 1,249 for 2,607,637 residents in 2005). The least populous CD, Manitoulin, had the smallest number of active physiotherapists (2 in 2003 and 1.8 in 2005); the population increased modestly from 13,346 residents in 2003 to 13,395 in 2005.

There was considerable variation in physiotherapist density (number of physiotherapists per 10,000 popula-

tion) among CDs (see Table 1). Thirteen CDs in 2003 and 14 in 2005 were above the all-Ontario density (range 0.87–7.00/10,000 population in 2003; 1.23–7.03/10,000 population in 2005).

There were low but statistically significant correlations between the all-physiotherapist density and CD-level population ($r = 0.298$, $p = 0.038$) and between density of physiotherapists in FP organizations and population ($r = 0.325$, $p = 0.023$), but no statistically significant relationships between physiotherapist densities and population for either NFP hospitals ($r = 0.162$, $p = 0.27$) or other NFP ($r = 0.002$, $p = 0.99$) provider organization types.

Was distribution skewed toward regions with AHSCs?

Table 2 shows that the CDs with AHSCs, with less than 40% of the population, had more than half the physiotherapists in the province. However, the adjacent CDs, with a greater proportion of the population than the academic CDs, had less than 30% of total physiotherapists. The other CDs had a slightly lower proportion of physiotherapists than the proportion of the population in 2003 and 2005.

The six CDs with the highest density of active physiotherapists per 10,000 residents in 2003 and 2005 are grouped at the top of Table 1. All were academic CDs. Taken individually (Table 1) or as a group (Table 2), they appear different from all other CDs. The density of hospital physiotherapists was fairly consistent across the academic CDs, although notably higher in Frontenac, but FP and other NFP physiotherapist densities in these CDs varied. Ottawa, Thunder Bay, Hamilton, and Toronto had higher FP density and lower other NFP density than Frontenac (centred on Kingston) and Middlesex (centred on London).

Did CDs with AHSCs draw patients from adjacent CDs?

Densities of physiotherapists in both adjacent and other CDs were lower than in academic CDs (see Table 2). NFP hospital physiotherapists were slightly less prevalent in adjacent CDs than in all other CDs but much less prevalent than in all the academic CDs taken together. The density of FP physiotherapists was about the same in adjacent CDs as in other CDs but, again, lower than in the academic CDs.

In all respects except density of other NFP physiotherapists, the academic CDs showed a statistically significant difference from the other two types of CDs, but differences among non-academic CDs types were not statistically significant (see Figure 2).

Was distribution driven by market forces?

With respect to the distribution of physiotherapists working in FP organizations, there was no discernible pattern of higher density in the most populous CDs. Table 3 shows the five CDs with the highest densities of FP physiotherapists. Ottawa, the fourth most populous

CD in both 2003 and 2005, and Hamilton, the sixth most populous in 2003, illustrate that while these highly populated CDs attracted FP organizations, the other CDs at the top (Wellington, Kawartha, and Grey in 2003; Kawartha, Wellington, and Nipissing in 2005) had relatively small populations but high densities of physiotherapists working in FP organizations.

We also examined the four CDs with the highest rates of population growth in Ontario: Peel (8.3% growth in population), York (8.2%), Durham (5.0%), and Halton (7.2%).²¹ These CDs had populations comparable to or greater than those of the academic CDs, but placed number 33, 32, 30, and 17, respectively, in all-physiotherapist density in 2005 (see Table 1). Even with respect to FP density alone, they placed number 26, 19, 20, and 10 in 2005. Each was ranked higher in 2005 than in 2003, but clearly not top ranking.

Were there fewer NFP hospital physiotherapists in 2005 than in 2003?

All-physiotherapist density did not change significantly at the provincial level between 2003 and 2005, but the proportion of physiotherapists in FP settings grew from 49.2% in 2003 to 54.6% in 2005. Similarly, the all-Ontario density of physiotherapists in FP settings rose significantly, from 1.90 to 2.11 per 10,000 population between those years ($t = -4.476$, $df = 48$, $p < 0.001$).

NFP hospital physiotherapists constituted 43.6% of all physiotherapists in 2003 and decreased to 39.1% in 2005. The all-Ontario NFP hospital physiotherapist density declined from 1.68 physiotherapists per 10,000 residents in 2003 to 1.51 in 2005. NFP hospital physiotherapist densities decreased significantly from 2003 to 2005 at the CD level ($t = 3.389$, $df = 48$, $p = 0.001$).

Other NFP physiotherapists constituted 7.2% of all active physiotherapists in 2003 and only 6.2% in 2005; province-wide density fell from 0.28 physiotherapists per 10,000 residents in 2003 to 0.24 in 2005. Likewise, density of other NFP physiotherapists changed from 2003 to 2005 at the CD level ($t = 2.594$, $df = 48$, $p = 0.013$).

DISCUSSION

Three potential archetypal influences on the shape of the Ontario PT market were examined with respect to the distribution of physiotherapists across the provider organization types: population need, critical mass, and market mechanisms. Physiotherapists were not consistently distributed according to population across Ontario, and factors beyond population base appear to influence distribution. There is a gap in knowledge about actual need for PT services across the population, but our study used a measure of need directly related to the population at the local CD level. However, even if need is not consistent across the population because of differences among CDs in the incidence of various chronic diseases and acute injuries, such differences are unlikely to be as great

Table 1 Density of Physiotherapists by CD Category and Workplace, Rank-Ordered by All-Physiotherapy Density, 2003 and 2005

CD (population)	2003				CD (population)	2005			
	All PTs	FP PTs	NFP Hosp PTs	Other NFP PTs		All PTs	FP PTs	NFP Hosp PTs	Other NFP PTs
Frontenac* (146,903)	7.00	1.87	4.27	0.86	Frontenac* (147,297)	7.03	2.38	3.75	0.91
Ottawa* (825,247)	6.30	3.44	2.58	0.27	Ottawa* (832,550)	6.20	3.50	2.35	0.32
Middlesex* (428,783)	5.46	1.74	2.86	0.86	Middlesex* (434,222)	5.78	2.00	2.67	1.11
Thunder Bay* (155,570)	5.33	2.49	2.58	0.26	Hamilton* (519,878)	5.09	2.58	2.27	0.25
Hamilton* (517,904)	5.30	2.67	2.49	0.14	Toronto* (2,607,637)	4.79	2.39	2.27	0.13
Toronto* (2,613,832)	4.82	2.03	2.55	0.23	Thunder Bay* (153,873)	4.77	2.27	1.98	0.51
Grey† (93,893)	4.71	2.80	1.91	0.00	Renfrew† (99,548)	4.62	1.41	1.94	1.27
Wellington† (199,713)	4.42	3.51	0.90	0.00	Peterborough† (133,667)	4.56	2.78	1.26	0.52
Timiskaming‡ (34,589)	4.37	0.87	2.62	0.87	Nipissing‡ (85,362)	4.28	2.75	1.35	0.18
Renfrew† (99,154)	4.31	0.96	1.92	1.42	Kawartha‡ (74,519)	4.18	3.44	0.74	0.00
Greater Sudbury‡ (160,932)	4.28	1.06	1.90	1.31	Grey† (94,811)	4.13	2.55	1.58	0.00
Perth† (77,451)	4.14	1.88	2.14	0.13	Wellington† (205,166)	4.11	3.06	1.05	0.00
Nipissing‡ (85,964)	4.01	1.98	1.11	0.93	Greater Sudbury‡ (160,990)	3.94	1.46	1.71	0.78
ONTARIO (12,239,200)	3.863	1.90	1.68	0.28	Waterloo† (485,248)	3.86	2.72	0.92	0.22
Peterborough‡ (132,580)	3.86	2.14	1.28	0.44	ONTARIO (12,541,410)	3.855	2.11	1.51	0.24
Algoma† (122,148)	3.83	0.82	1.28	1.73	Kenora† (66,552)	3.73	0.98	2.23	0.53
Cochrane‡ (87,127)	3.81	0.75	2.36	0.69	Algoma† (121,290)	3.71	1.11	0.99	1.61
Brant† (131,359)	3.78	2.52	1.11	0.15	Halton† (443,402)	3.65	2.39	1.17	0.09
Kenora† (66,729)	3.70	0.68	2.34	0.68	Muskoka‡ (57,058)	3.59	2.48	1.05	0.06
Kawartha‡ (73,360)	3.62	3.14	0.55	0.00	Perth† (77,624)	3.54	1.74	1.80	0.00
Simcoe‡ (411,324)	3.54	2.37	1.03	0.14	Brant† (134,044)	3.53	2.35	0.99	0.19
Lanark† (66,384)	3.53	0.98	2.10	0.45	Lanark† (67,320)	3.47	1.26	2.20	0.00
Waterloo† (470,187)	3.36	1.94	1.05	0.37	Simcoe‡ (427,313)	3.44	2.35	0.96	0.14
Muskoka‡ (56,438)	3.30	1.69	1.16	0.45	Cochrane‡ (85,913)	3.43	1.05	1.69	0.70
Halton† (415,400)	3.23	2.13	1.08	0.02	Niagara† (434,437)	3.20	2.01	1.04	0.15
Rainy River† (22,547)	3.13	0.00	3.13	0.00	Prescott Russell† (83,542)	3.01	1.32	1.34	0.36
Lambton† (132,484)	3.13	1.47	1.36	0.30	Timiskaming‡ (34,445)	2.90	0.82	1.84	0.24
Oxford† (104,331)	3.03	1.30	1.64	0.10	Lambton† (132,283)	2.89	1.45	1.36	0.08
Niagara† (430,417)	2.95	1.90	0.94	0.11	Hastings‡ (135,684)	2.80	1.55	1.18	0.07
Hastings‡ (133,820)	2.94	1.51	1.18	0.25	Oxford† (105,183)	2.79	1.54	1.25	0.00
Essex‡ (400,205)	2.82	1.61	0.99	0.22	Durham† (575,201)	2.78	1.79	0.85	0.14
Durham† (550,851)	2.76	1.55	1.01	0.20	Rainy River† (22,207)	2.70	0.45	2.25	0.00
Peel† (1,127,061)	2.62	1.59	0.86	0.16	York† (922,857)	2.67	1.81	0.71	0.15
Huron† (61,931)	2.58	1.21	1.29	0.08	Peel† (1,215,261)	2.64	1.54	0.92	0.18
Prescott Russell† (81,810)	2.52	0.98	1.23	0.31	Essex‡ (404,839)	2.59	1.77	0.68	0.14
York† (849,123)	2.51	1.56	0.79	0.16	Haliburton‡ (16,271)	2.46	1.23	1.23	0.00
Haliburton‡ (16,103)	2.50	1.25	1.25	0.00	Prince Edward‡ (26,479)	2.45	1.57	0.76	0.12
Elgin‡ (86,221)	2.48	0.87	1.49	0.12	Elgin† (88,502)	2.41	2.30	0.06	0.06
Chatham-Kent† (110,664)	2.36	0.64	1.18	0.54	SDG† (116,412)	2.41	1.20	1.20	0.00
Dufferin‡ (54,697)	2.34	0.82	1.51	0.00	Parry Sound‡ (42,179)	2.25	0.24	2.02	0.00
SDG† (116,369)	2.17	0.89	0.93	0.35	Dufferin‡ (56,396)	2.07	1.18	0.89	0.00
Parry Sound‡ (41,852)	2.16	0.36	1.68	0.12	Sudbury District‡ (22,553)	2.00	1.11	0.89	0.00
Bruce‡ (67,151)	2.08	1.27	0.67	0.15	Huron† (61,527)	1.92	0.95	0.98	0.00
Haldimand Norfolk‡ (110,699)	1.90	1.04	0.86	0.00	Bruce‡ (67,291)	1.88	1.09	0.79	0.00
Prince Edward‡ (26,273)	1.71	0.82	0.76	0.13	Chatham-Kent† (109,237)	1.85	0.93	0.73	0.18
Leeds & Grenville† (101,783)	1.51	0.79	0.63	0.10	Northumberland‡ (83,765)	1.57	0.86	0.72	0.00
Manitoulin‡ (13,251)	1.50	0.00	1.50	0.00	Leeds & Grenville† (102,310)	1.56	1.12	0.34	0.10
Lennox & Addington† (41,494)	1.01	0.32	0.60	0.08	Haldimand Norfolk‡ (111,951)	1.46	0.74	0.71	0.00
Sudbury District‡ (23,239)	0.86	0.43	0.43	0.00	Manitoulin‡ (13,395)	1.37	0.00	1.37	0.00
Northumberland‡ (82,266)	0.86	0.24	0.61	0.00	Lennox & Addington† (42,009)	1.23	0.48	0.71	0.04

*Academic CD.

† Adjacent CD.

‡ Other CD.

CD = census division; PT = physiotherapist; FP = for-profit workplace; NFP hospital = not-for-profit hospital workplace; other NFP = not-for-profit workplace other than a NFP hospital; SDG = Stormont Glengarry Dundas.

Source: CPO Database²⁰ and Statistics Canada.²¹

Table 2 Proportion and Density of Physiotherapists by CD Category and Workplace, 2003 and 2005

CD Category	Number (% of total)		Density of physiotherapists by type of workplace			
	Population	Physiotherapists	All	FP	NFP hospital	Other NFP
2003						
Academic	4,682,312 (38.3)	2,470 (52.2)	5.27	2.34	2.63	0.30
Adjacent	4,783,911 (39.1)	1,347 (28.5)	2.92	1.63	1.05	0.24
Other	2,772,977 (22.7)	911 (19.3)	3.16	1.64	1.21	0.31
Ontario	12,239,200 (100)	4,728 (100)	3.86	1.90	1.68	0.28
2005						
Academic	4,695,507 (37.4)	2,458 (50.8)	5.23	2.56	2.35	0.32
Adjacent	5,020,658 (40.0)	1,444 (29.9)	3.00	1.83	0.98	0.19
Other	2,825,295 (22.5)	933 (19.3)	3.10	1.84	1.07	0.19
Ontario	12,541,460 (100)	4,835 (100)	3.86	2.11	1.51	0.24

CD = census division; FP = for-profit workplace; NFP = not-for-profit workplace.

Sources: CPO Database²⁰ and Statistics Canada.²¹

Figure 2 Summary of ANOVAs for the densities of physiotherapists in academic, adjacent, and other census divisions for all physiotherapists and each workplace type, 2003 and 2005.

as the six- to eightfold differences in densities found across CDs. For example, in 2000–2001, the standardized prevalence of arthritis across Ontario's regions ranged from 15.2% of the population to 22.1%²⁴—only a 1.45-fold difference, as opposed to the six- to eightfold difference we found in physiotherapist densities across CDs.

If the 2005 density of physiotherapists in the highest-density CD (Frontenac) represents the optimum density of physiotherapists,¹⁵ the number of therapists in Ontario (4,835) was just over half the optimum level (8,816), with the difference (3,981) representing the extra physiothera-

pists that would bring the all-Ontario density of about 3.9 physiotherapists per 10,000 population up to the density of Frontenac. If this supply target were the goal of health human resource planning, achieving it would be difficult in the absence of significant complementary plans to, for example, increase the number of training programs, enrollments, and credentialing of foreign-trained physiotherapists and decrease attrition.

On the other hand, if we assume that the lowest-density CDs have just about the right density of physiotherapists (and that the highest-density CDs are there-

Table 3 Five CDs with the Highest Density of Physiotherapists Working in FP Organizations and Population, 2003 and 2005

CD	Density of physiotherapists in FP	Population
2003		
Wellington	3.51	199,213
Ottawa	3.44	823,608
Kawartha	3.14	72,797
Grey	2.80	93,468
Hamilton	2.67	516,776
2005		
Ottawa	3.50	832,550
Kawartha	3.44	74,519
Wellington	3.06	205,166
Peterborough	2.78	133,667
Nipissing	2.75	85,362

CD = census division; FP = for-profit workplace.

Sources: CPO Database²⁰ and Statistics Canada.²¹

fore over-served), there may be about three times too many physiotherapists in Ontario. In light of projections of an increasing, but as yet unquantifiable, need for PT resources^{7,25} and of higher overall densities of physiotherapists in most other provinces in Canada,⁶ it seems unlikely that a lower density of physiotherapists is required in Ontario and that the problems that the cross-CD data in this study help identify are undersupply and uneven distribution.

At first glance, the continuing trend of physiotherapists' movement from NFP hospitals to FP provider organizations lends support to the view that the distribution pattern of physiotherapists is explained by market forces. Not only is there an increasing proportion of all physiotherapists working in FP provider organizations (and a decreasing proportion in NFP hospitals), but there is also a declining absolute number of physiotherapists in NFP hospitals and an increasing number of FP organizations during the period under study. There has been a real shift of physiotherapists from the non-market arena of NFP hospitals to FP organizations, which are usually characterized as driven by market forces. We were not able to determine whether this shift to FP organizations is internally or externally driven, though other researchers have suggested that the provincial government's policy of constraining hospital funding has been influential in this regard.¹²

The dominant distribution characteristic in Ontario, however, was the disproportionately greater presence of physiotherapists in NFP and FP organizations in academic counties, with no statistically significant differences in the distribution of therapists in all other non-academic CDs. The hypothesis that physiotherapists in academic CDs could draw patients across boundaries, creating a lower density of therapists in adjacent CDs, was not supported by the data. PT service providers were strongly drawn to CDs with AHSCs and were not drawn to areas

of high population growth to the same degree—even among FP PT providers—as would be expected if competitive market mechanisms were the predominant drivers of physiotherapists' location decisions. Frontenac and Middlesex stood out from the other academic CDs with higher other NFP physiotherapist densities and lower FP densities, which suggests that there may be local factors in these CDs leading to greater development of community-based NFP providers.

Though uneven distribution of other health professionals in Ontario is commonly identified as primarily affecting rural areas,^{4,14,26} reflective of their relative economic unattractiveness, the story is more complex for physiotherapists. For example, Grey, Perth, and Nipissing in 2003, and Nipissing, Kawartha, and Grey in 2005, all had physiotherapist densities greater than the all-Ontario figure (see Table 1), yet all are non-academic CDs, predominantly rural and sparsely populated (all under 100,000, and together representing less than 3% of Ontario's population),²¹ and have significant difficulty in attracting and keeping other health professionals, such as physicians.¹⁴ One explanation of this pattern could be that the role of the physiotherapist in a rural community—with fewer supports from other health professionals (including physicians) and more autonomy—is different from the physiotherapist's role in a city with an AHSC. Overall, however, these CDs amplify the signal that physiotherapists' location decisions were driven not by usual demand market forces but by other criteria.

In contrast to the puzzle posed by these relatively well served rural CDs and the apparent low impact of market forces, the draw of academic CDs for physiotherapists is clear. While our hypothesis in relation to the academic CDs was stated only in terms of critical mass, our findings in the other areas suggest that there may be additional reasons for the different densities of physiotherapists in different parts of the province.

Other data from our research on the PT market show that FP provider organizations are not as focused on the most remunerative revenue streams in the PT market as might be expected if they were "profit maximizers"; instead, they appear to concentrate on ensuring an appropriate number of PT patients or clients within the areas of practice that are of interest to them professionally and in which they have developed significant clinical expertise.¹³ Alternative factors driving physiotherapists' decisions on practice location might include the personal preferences and interests of physiotherapists involved in the market, such as the relative attractiveness of the place where a person receives his or her professional education, the importance of AHSCs for research and continuing professional development, and a wide range of patient care opportunities, including tertiary and quaternary care.²⁷ It may also be that there is such a level of unmet need in the province that physiotherapists have considerable freedom in their location decisions, as long as

they have enough work to maintain their practice at the level and in the manner they wish.¹³

While academic CDs have the greatest densities of physiotherapists, their dominance is strongly influenced by the employment levels in NFP hospitals (many of which are training sites) in those CDs. If health human resource planners wish to affect physiotherapists' location decisions by increasing NFP hospital funding, the pattern of skewed distribution is likely to continue. Alternatively, they may wish to increase funding for PT practice through community care access centres (CCACs) and/or increase funding and the number of community-based clinics in which physiotherapy is paid by public funds (known as Designated Physiotherapy Clinics [DPCs]) to serve specific patient groups. For example, of Ontario's 94 DPCs, there are only 2 in each of the fast-growing Peel and Halton CDs and 3 in each of York and Durham.²⁸ Similarly, positions for physiotherapists within primary care Family Health Teams (which have better coverage across Ontario than DPCs)²⁹ might be created closer to where patients require services and aligned with health human resource planning initiatives for other health professionals. Another option would be to focus on the other NFP providers in the market, although, since these providers' role was relatively small and appeared to be declining, they may not be the appropriate focus for policy changes.

On the other hand, planners may wish to influence the gradually increasing and now predominant part of the market—the FP organizations employing physiotherapists. While we posited that high-population CDs would be disproportionately attractive to physiotherapists seeking profits in larger, growing markets, our findings did not support this proposition.

It may be possible to use AHSCs' capacity to reach outside their CDs to support intermediate care and shared care and to provide specialist outreach virtual AHSCs for physiotherapy, in the same way this has been recommended to support primary medical care in rural areas.³⁰ This would have the advantage of taking the features of best care to areas of most need.

Another potential strategy would call upon the profound sense of professional responsibility that physiotherapists appear to feel¹³ and the desire among many physiotherapists to attain specialist or advanced practitioner status to improve client outcomes.³¹ For example, the professional association and the regulatory college might provide additional opportunities for physiotherapists to expand their skills and thus potentially influence their personal practice preferences to align with areas of identified short supply. As is recommended from time to time for dealing with uneven distribution of physicians,^{4,5,32} such an approach could be supplemented by increasing the numbers of physiotherapists available for practice and investigating how properly trained and clinically prepared assistants may be able to

extend the reach of physiotherapists to greater numbers of patients.

LIMITATIONS

Our findings provide insights into the distribution of regulated physiotherapists, but they do not directly measure the availability of all human resources for delivery of rehabilitation services in Ontario. Comparisons of the rates of availability of regulated physiotherapists across the province, therefore, give an appropriate indication of the relative but not the absolute scarcity or abundance of physical therapy resources across the province. These rates also do not indicate the potential to achieve planned health human resource outcomes by extending physiotherapists' reach through the involvement of trained assistants such as physical therapy assistants. While some comparative information has been presented concerning physicians, the distribution of other health professionals, such as occupational therapists and speech-language pathologists, might be revealing. We also assumed similar needs for PT across the population in Ontario to assess whether physiotherapists were distributed according to need; when reliable measures of need are developed, the analysis and results may be different.

CONCLUSION

This study identifies significant variations in the distribution and density of physiotherapists across Ontario. There are some discernible distribution and density patterns at the CD level—such as the apparent attractiveness of areas with AHSCs for physiotherapists, whether they work in the AHSCs or not—and these suggest approaches or factors that may affect distribution patterns in the future. However, considerable work remains to be done to investigate other factors at work in the PT market if policy makers, funders, other health professionals, and patients want to influence the distribution, and perhaps the redistribution, of physiotherapists in the future.

KEY MESSAGES

What is already known on this topic

A growing body of knowledge about factors that influence the location and practice decisions of both physicians and physiotherapists demonstrates key differences between the two groups, particularly against the complex nature of funding for PT and the existing changes in the provision of services by FP and NFP provider organizations.

What this study adds

The distribution pattern of physiotherapists across Ontario varies significantly, and undersupply and uneven distribution appear to be significant issues in need of further investigation. This study documents the relative attractiveness of regions with AHSCs over other regions

for physiotherapists but does not identify the reasons for this pattern, which suggests an area for further inquiry. However, some possibilities for addressing the uneven distribution by taking that attractiveness into account are suggested. Further research is also needed to determine why market forces and population need do not appear to exert much influence on the distribution patterns in this complex health-care market. Research comparing the distribution of such health professionals as occupational therapists and speech-language pathologists might be revealing.

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