

## A protocol for determining differences in consistency and depth of palliative care service provision across community sites

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### Abstract

Numerous accounts document the difficulty in obtaining accurate data regarding the extent and composition of palliative care services. Compounding the problem is the lack of standardisation regarding categorisation and reporting across jurisdictions. In this study, we gathered both quantitative and spatial – or geographical – data to develop a composite picture that captures the extent, composition and depth of palliative care in the Canadian province of British Columbia (BC). The province is intensely urban in the southwest and is rural or remote in most of the remainder. For this study, we conducted a detailed telephone survey of all palliative care home care teams and facilities hosting designated beds in BC. We used geographic information systems to geocode locations of all hospice and hospital facilities. In-home care data was obtained individually from each of five BC regional health authorities. In addition, we purchased accurate road travel time data to determine service areas around palliative facilities and to determine populations outside of a 1-hour travel time to a facility. With this data, we were able to calculate three critical metrics: (i) the population served within 1 hour of palliative care facilities – and more critically those not served; (ii) a matrix that determines access to in-home palliative care measured by both diversity of professionals as well as population served per palliative team member; and (iii) a ranking of palliative care services across the province based on physical accessibility as well as the extent of in-home care. In combination, these metrics provide the basis for identifying areas of vulnerability with respect to not meeting potential palliative care need. In addition, the ranking provides a basis for rural/urban comparisons. Finally, the protocol introduced can be used in other areas and provides a means of comparing palliative care service provision amongst multiple jurisdictions.

**Keywords:** Canada, community, data integration, geographic information systems, palliative care, regionalisation

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### Introduction

As a result of reform and restructuring priorities, there is a growing trend across health care systems to devolve decision-making and budgeting to the most local level through the process of regionalisation. This has certainly been happening in Canada over the last decade (Lomas *et al.* 1997, Mitton & Donaldson 2002, Larsen Soles 2005, Cloutier-Fisher *et al.* 2006). A benefit of this is that services may be more responsive to local needs and can be designed with local populations in mind (Frankish *et al.*

2002). There are, however, some drawbacks to care regionalisation. Different services are typically made available across jurisdictions and geography, in terms of where one lives, which then determines the services a person will have access to (Allan & Cloutier-Fisher 2006, Cloutier-Fisher *et al.* 2006). Another drawback is that it can become increasingly difficult to have an overall understanding of what services are available, where they are located and the consistency of their provision at a larger scale (i.e. across a number of regions), such as that of the province, state, or nation (Church & Barker 1998,

Fleury *et al.* 2002, Hirdes 2002, Neville *et al.* 2005). At the same time, we need to know what kinds of health care services are available in communities in order to agenda-set at these larger scales and also to assess overall indicators such as accessibility, particularly as decisions related to these issues are typically 'data-driven' (Teng *et al.* 2007). The information to do this, however, can sometimes be difficult to come by. For example, the lack of standardised data coding across jurisdictions can make it difficult, if not impossible, to compare service availability and use (Bowker 2000, Schuurman 2005). Furthermore, some services also do not have their own unique 'budget lines', in that they are subsumed by larger budgetary categories and so become almost untraceable. Dedicated attention is thus needed to address the challenge of figuring out how best to characterise health care service availability within and across regions for comparative purposes.

In this article we report on a protocol designed to assess care consistency and depth that has been tested using the case study of palliative care services in the Canadian province of British Columbia (BC). By consistency we are referring to the degree to which service provision is similar or dissimilar *across* regional jurisdictions within the province (i.e. in a comparative sense), while depth references the availability and diversity of services *within* a regional jurisdiction (i.e. wherein an assessment of depth serves as the basis for comparison). Understanding and characterising palliative care in BC and particularly across regional jurisdictions, is plagued by the problems mentioned above. For example, current challenges being faced in the delivery of palliative care include the lack of accountability in service provision across regional jurisdictions and definitional issues, in that similar types of care are given different names across jurisdictions (Crooks 2009). Demonstrative of this, within the past year members of our investigative team have been asked by federal and provincial-level administrators for a complete listing of hospitals in the province and all the services they provide and also a listing of palliative care hospice residences across the country. That such information is not available to decision-makers when it is needed is further illustrative of the informational problem we have outlined above in general and also specific to palliative care. It is, however, extremely important that we have the ability to assess care consistency and depth as it relates to palliative care provision because of both provincial and national mandates calling for its enhancement (e.g. Carstairs 2005, BC Ministry of Health 2006). If we do not know what is offered on-the-ground, where it is offered and by whom then how accurate can any agenda-setting attempts be? Developing ways not only to assess but also to articulate the present state of service provision are thus needed in order to

address this informational need. In the remainder of this article we introduce a protocol developed by our investigative team to address this problem using multiple methods and datasets and present the findings of its three-part analysis. Before doing so we provide some needed background information about the landscape of palliative care in the case study province.

### The landscape of palliative care in BC

There is no single definition as to what constitutes 'palliative care', but practices and providers often considered to be part of this health service include: long-term and home care, respite and acute care facilities, district health councils, nursing homes, family doctors, nurses, specialists such as oncologists, unpaid caregivers, palliation groups, pharmacists, pastors, spiritual and traditional healers, social services and hospices (Carstairs & Beaudoin 2000, Prince & Kelley 2006). Collectively, these services and providers offer supports to maintain quality-of-life or facilitate quality-of-death in the disease management, physical, psychological, spiritual, practical, death management and loss/grief domains (Ferris *et al.* 2002). The BC Ministry of Health considers palliative care to be 'the specialised care of people who are dying – care aimed at alleviating suffering (physical, emotional, psychosocial or spiritual) rather than curing' (British Columbia Ministry of Health 2006, p. 3). The provision of such care is no small task and thus involves a range of care professionals across a number of community sites (home, hospital, hospice, doctor's office, etc.). The province identifies three broad groups that have a responsibility for providing palliative care: (i) the BC Ministry of Health, which oversees legislative changes and directs funding to the regional level; (ii) the regional health authorities, which are responsible for delivering care and organising services; and (iii) community groups, such as hospice associations, which hold responsibility for providing bereavement and psychosocial support (British Columbia Ministry of Health 2006).

Canada is known internationally for its publicly-funded health care system, which is based upon the ideas that needed care should be administered publicly, be universally provided to those entitled to coverage, be comprehensive, be accessible and be portable within and sometimes even beyond national borders (Canada Health Act 1985). Palliative care services are essential care and thus these principles extend, at least in theory, to their provision (Health Canada 2006). In the province of BC palliative care is considered to be part of primary health care (Bromeling *et al.* 2006), whereby such care is to be delivered equitably (i.e. in a fair and not necessarily even or equal way) and accessibly (i.e. in ways that people can get to it and afford it, among other forms of

access) in communities at the first point of contact (Health Council of Canada 2008). As geographic accessibility is a focus of the protocol reported on herein, it is important to note that there are some challenges inherent in BC's physical landscape that make it difficult for palliative care services to be distributed in a spatially equitable way. More specifically, the province's vastness (it spans just under 950 000 square km), mountainous terrain and coastal areas that are lined by small and frequently lightly populated islands make delivering all forms of essential care difficult. These topographic features and resulting geographic pockets of population growth have resulted in a few highly populated areas and, for the most part, large numbers of highly dispersed rural communities. This rural-urban population differentiation is important context for the following analyses, particularly given the international literature that documents the challenges in providing geographically accessible palliative care services to rural communities (Evans *et al.* 2003, Wilson *et al.* 2006, Crooks & Schuurman 2008, Robinson *et al.* 2009).

A recent report characterising the development of palliative care policy and practice in BC notes that many of the most significant developments have happened since the early 2000s (Crooks 2009). This is significant as it aligns with when five regional health authorities were established in the province, which occurred in 2001. The establishment of these bodies follows the national trend towards health care regionalisation mentioned above. These regional authorities, namely the Vancouver Island Health Authority (VIHA), Vancouver Coastal Health Authority (VCHA), Fraser Health Authority (FHA), Interior Health Authority (IHA) and Northern Health Authority (NHA), are responsible for creating care that is 'equitable, with access to a coordinated range of local, regional and provincial services for all British Columbians, regardless of where they live in the province' (BC Ministry of Health 2008, n.p.). The provision of palliative care falls within their domain and such care is funded using money which, with some exceptions, is transferred first from the federal health care budget to the provincial level, is augmented by provincial funds and then is transferred from the province to the regional authority and sometimes onwards to communities. It has been noted elsewhere that the regionalisation of decision-making regarding palliative care service provision in BC has led to differential prioritisation across these health authorities and thus a marked differentiation in the services that are available across regions (Cinnamon *et al.* 2008, Crooks 2009).

While the regionalisation of health care makes the 'traceability' of service provision somewhat difficult for reasons mentioned above, there are other factors that also have an impact on this. Throughout the 1990s there was

a push in Canada to move health and social care out of institutional settings and into the community (Brackley & Penning 2004). This has meant an increasing reliance on home-based palliative care supported by in-home providers such as home care workers and practice teams (Williams *et al.* 2001, Clemmer *et al.* 2008). A review of the provincial legislative debates for BC from the 1970s onwards reveals that in the early 2000s the province began to think more carefully about how to create initiatives that could support people dying in their homes and home communities for as long as possible (Crooks 2009). Regarding traceability, as the settings for care become increasingly diversified, in this instance with the added push to provide formal supports for those being cared for in their homes, further complexity was added to the task of trying to characterise overall provision, including as it relates to both consistency and depth.

## Datasets

The objectives of the protocol development reported on herein were to: (i) determine how to assess geographic access to palliative care in three different community settings (i.e. the home, the hospice, and the hospital) across regional jurisdictions using spatial analysis and multiple datasets; (ii) determine how to rank access to and the diversity of palliative care across these settings and jurisdictions using spatial analysis and multiple datasets; and (iii) draw upon the findings to characterise the overall consistency and depth of palliative care provision in these community sites across BC in a meaningful way. We focus upon care in three community sites, home, hospice and hospital, as together they account for up to 97% (where this figure accounts for all forms of non-hospital residential care and not solely hospices) of the locations of death for British Columbians (Canadian Institute for Health Information 2008) and are thus important places in the palliative care trajectory. Although we might not always associate the hospital with being a community care site, its inclusion in the present proposal is relevant for two main reasons: (i) palliative care beds in hospitals are not used exclusively for acute care purposes, nor is this care necessarily secondary or tertiary in nature, particularly when it is considered that palliative care is part of the primary health care mandate in BC; and (ii) the majority of hospitals in the province are not major tertiary care centres but, instead, are smaller community hospitals that offer a limited number of services to mostly local residents. It was determined that four datasets were required by the team to achieve the stated objectives. These are summarised in Table 1. Some of the needed data were already available in existing datasets, while others had to be compiled by the team via primary data collection. Approval for the study was granted by

**Table 1** Datasets used to assess relative access to palliative care services in BC

Name	Type	Origin	Format
Road	Line	GIS innovation	Vector
Palliative care facilities	Point	Geocoded	Vector
In-home care catchments	Polygons	Regional health authorities	Vector
Population data	Points	GeoSuite/DMTI	Vector

Simon Fraser University's Office of Research Ethics prior to beginning data collection.

### Overview of existing datasets

As seen in Table 1, much of the data required for this protocol development already existed – but with the exception of the road network database, it had not been compiled in tabular form. The 'road network dataset' was compiled by GISInnovations – a value-added data seller. The GISInnovations road network dataset incorporates both speed limit and travel impedance factors such as stop lights and one-way streets, which, in turn, allow for accurate travel time calculation from one point to another (e.g. from a specific home address to the closest hospital). Our research team subsequently used the road network dataset to calculate catchments around palliative care facilities.

The 'in-home palliative care catchment dataset' was obtained directly from each of the five regional health authorities in the province. This dataset characterises the literal geographic area served by every in-home palliative care team or single provider in BC. A majority of the in-home palliative care catchments were delineated using verbal descriptions given by an administrator in each health authority (e.g. 'their team covers community A to the north, B to the south, C to the east and D to the west'). We also asked for a description of the composition of the provider teams for in-home care within each catchment.

The 'population dataset' was obtained from the 2006 Canadian census gathered by Statistics Canada. Population variables (namely the number of residents) were gathered from the census at the dissemination area (DA) level. Each DA is typically composed of neighbouring streets that host somewhere between 400–700 residents. Because of differences in population density across different kinds of communities, DA level data is highly accurate in urban areas but is less so in more rural settings.

### Overview of newly compiled dataset

In order to gain more detail about the availability of palliative care services across BC communities, we

conducted a detailed telephone survey of all designated palliative care facilities in BC to create the 'palliative care facilities' dataset. This included all hospices and hospitals with palliative care units, as identified by the health authorities. The purpose of the phone survey was to obtain information about the level of service provided by each facility, such as the number of beds in the facility and the number of people to whom services were administered. This phone survey enabled us to access information that was not part of any existing dataset. We were also able to confirm facility addresses, which allowed us to geocode their locations using the locator function in ArcGIS – a common GIS software package.

The phone survey consisted of a brief series of questions that were administered verbally to an administrator at each site. In a few instances, due either to lack of time and/or lack of 'off-hand' knowledge, respondents followed-up the phone conversation by e-mail in order to convey further details. The questions for hospices and hospitals were slightly different in order to be sensitive to the differing nature of these sites. The questions posed are listed in Table 2. They were intentionally limited in number so as to not burden respondents and to increase the response rate. The questions were created by the investigative team and reviewed by two senior palliative care administrators in one health authority in order to ensure clarity prior to data collection.

To enhance consistency, a single investigator conducted all of the phone surveys. Data collection occurred over a 4-month period in 2008. A total of 33 surveys were administered to different hospital and hospice locations. To the best knowledge of the investigative team, this is an exhaustive sample and represents every palliative care hospice and hospital unit in the province. Respondents were identified by health authorities and online listings of personnel and were invited by both phone and e-mail to participate in the study. Verbal consent was given by respondents in advance of completing the survey. The person administering the survey recorded all answers by hand for each site and then compiled the responses into an electronic spreadsheet. A summary of this dataset can be seen in Table 3.

### Analysis methods

We conducted three analyses using the four datasets characterised above in order to achieve our overall objectives. The methods for each of these analyses are distinct and are described in detail below.

#### Analysis 1: geographic accessibility of palliative beds

To determine the geographic accessibility of palliative beds across the province, catchment areas were created

**Table 2** Survey questions for palliative care facilities

Hospital questions	Hospice questions
Do you have a palliative care unit?	Is this a residential hospice?
How many designated palliative care beds are available?	How many beds are available?
Is there a waiting list to get into the palliative care unit?	What is the average length of stay?
What is the average length of stay?	Is this a free-standing unit?
Are there any other palliative care resources available in the community?	Are you a hospice society?
– Hospice society	If you are a hospice society what other services do you provide?
– Residential hospice	Is there a waiting list to get into the facility?
– Other palliative care specialists	What services do you offer for patients?
– Palliative home care programmes	What services do you offer for patients' families?
– Any educational initiatives	Are there any other palliative care resources available in the community?
– Others	– Hospice society
	– Residential hospice
	– Other palliative care specialists
	– Palliative home care programmes
	– Any educational initiatives
	– Others

**Table 3** Palliative care facilities in BC

Name	Type	Regional health authority	Location	Number of beds
St. Michaels	Hospice	FHA	Burnaby	16
Palliative care unit (Burnaby Hospital)	Hospital	FHA	Burnaby	11
Crossroads	Hospice	FHA	Port Moody	10
Queen's Park	Hospice	FHA	New West	8
Surrey Laurel Place	Hospice	FHA	Surrey	20
Langley	Hospice	FHA	Langley	10
Christine Morrison	Hospice	FHA	Mission	10
McKenney Creek	Hospice	FHA	Maple Ridge	10
Cascade	Hospice	FHA	Chilliwack	10
Fraser Canyon Hospital	Hospital	FHA	Hope	2
Peace Arch	Hospice	FHA	White Rock	10
Surrey Memorial	Hospice	FHA	Surrey	10
Rotary Hospice House	Hospice	VCHA	Richmond	10
Home/hospital palliative care programme	Hospice	VCHA	Vancouver	14
Canuck Place	Hospice	VCHA	Vancouver	11
Dr. Peter Day Centre	Hospice	VCHA	Vancouver	24
Marion Hospice	Hospice	VCHA	Vancouver	12
St. James Cottage Hospice	Hospice	VCHA	Vancouver	10
May's Place	Hospice	VCHA	Vancouver	6
Palliative care unit (Kelowna Hospital)	Hospital	IHA	Kelowna	2
M.W. Snowden	Hospice	IHA	Kamloops	12
Vernon Hospice House	Hospice	IHA	Vernon	12
Moog and Friends	Hospice	IHA	Penticton	12
Central Okanagan	Hospice	IHA	Kelowna	24
Palliative care unit (Victoria General Hospital)	Hospital	VIHA	Victoria	17
Palliative Care Unit (Nanaimo Hospital)	Hospital	VIHA	Nanaimo	12
Ty Watson	Hospice	VIHA	Port Alberni	5
Harbour Cottage	Hospice	VIHA	Ladysmith	2

for each palliative care facility using the network analyst extension within ArcGIS. These catchments were created based on estimation of the maximum 'reasonable' driving time for clients and/or their families (Cinnamon *et al.*

2008). A road travel time of 1 hour from home to facility was thus selected. The driving time catchment around each facility was created as a line feature (Schuurman *et al.* 2006). Population counts were estimated using a



buffer of 2500 m from every road within the catchment. In other words, people living anywhere within the catchment and up to 2500 m from roads at the edge of the catchment were included in the population count. The population count was then used to calculate the number of beds per catchment. This ratio was then assigned to the DAs.

### **Analysis 2: geographic accessibility of in-home palliative care**

Boundary polygon files were constructed representing the in-home palliative care service areas within health authorities in order to determine the population count in each. These files are outlines of the service areas created in the database (and ultimately represented on the map) using points, lines and areas. It should be noted that service areas are differentiated from catchments in this study. Service areas are defined by administrative fiat and refer to the geographical area worked by a home care team or individual nurse. A catchment is the area around a service within a specified travel time (e.g. 1 hour road travel time). Based on the information from the survey, we delineated the in-home care service areas defined for each palliative team working within the province. For each service area, the population count and total area were calculated using GIS software.

Home care services are typically delivered by a team of physicians, nurses and/or social workers who visit homes in the service area. However, in some rural areas, home care services are delivered through a single community nurse. In these cases, no specialised services are provided. In order to represent the level of service within each home care catchment area, a matrix was constructed by the investigative team in order to characterise variety in composition and number of service providers within each team. The matrix represents not only the number of professional bodies providing in-home palliative care within each catchment (what we have termed the 'professional diversity score') but also the number of providers per 100 000 people. The only providers incorporated into the matrix were those who were designated solely for palliative care and so community health nurses, for example, and other more 'generalist' providers who may, as part of their practice, be involved in providing some palliative care were not included.

### **Analysis 3: ranking care consistency and depth across BC**

An indexed model was created – based on rankings of access to care and diversity of palliative care provision – for communities across BC using the findings of the previous two analyses. Ultimately, four ranking values for

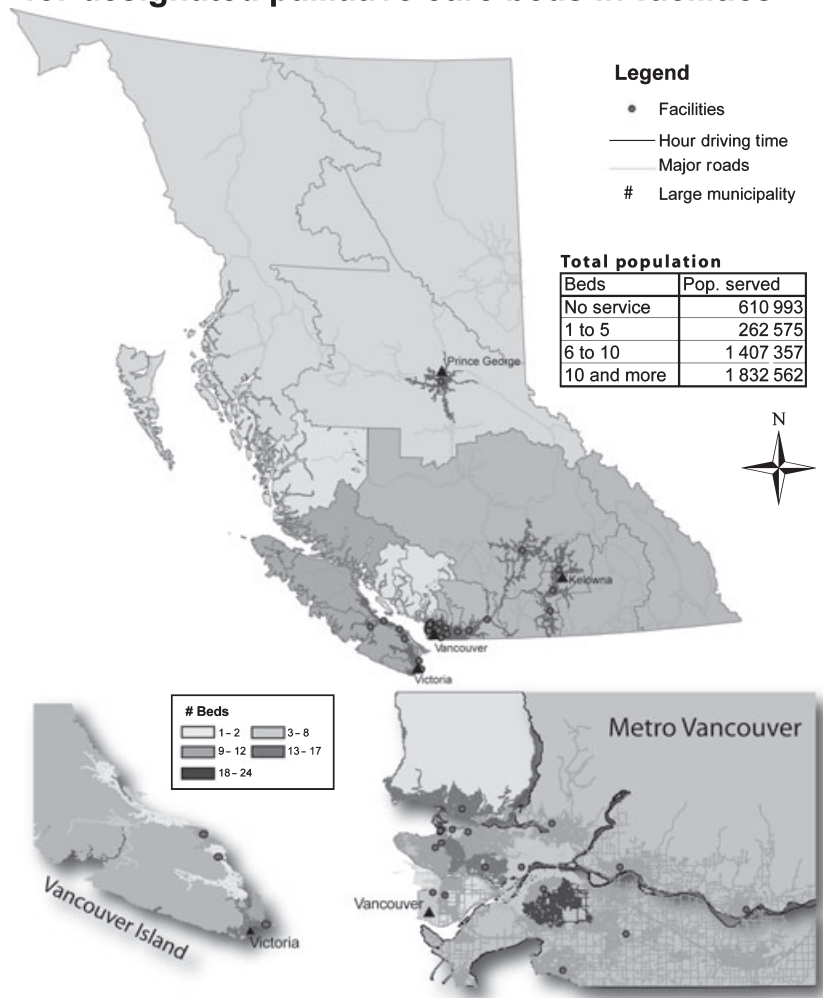
each in-home care service area were tabulated: beds per denominator population, palliative physicians per denominator population, palliative nurses per population and nurses per total geographical area. These were summed to yield a total ranking for each area. These values were assigned to each in-home care service area. Note that the total area served by each in-home care team was factored in so as to acknowledge that in rural areas, large geographic areas with modest to low populations are typically served. The final number provides a relative service ranking for each area of the province that incorporates availability of services per population as well as the extent of the professional diversity to total population.

## **Results**

Results of the analysis to determine geographic access to palliative care beds reveal that over 600 000 British Columbians, primarily those within rural/remote communities, live outside a 60-minute driving time catchment. This is clearly illustrated in Figure 1. It is apparent from this figure that people in these communities have more difficulty accessing, in a geographic sense (i.e. local), palliative beds. By contrast, people living in urban areas have access to a larger number of palliative beds *within* a 60-minute road travel time window. This finding is important as it implies that those living in large metropolitan areas, such as Vancouver, may have greater facility choice with respect to locations and cultures of care (e.g. between hospital- and hospice-based care). The benefit of such choice is not, however, reflected in our analysis.

The results of the second analysis once again point to differences in the consistency of palliative care service provision between urban and rural/remote communities in BC. This is illustrated in Figure 2, where a clear pattern of good to excellent service in the metropolitan centres in the southwest of the province is shown. Service deteriorates radially as one moves from the densely populated southwest to the north and east. Importantly, this pattern documents both the diversity of an in-home care team's composition as well as the number of professionals per 100 000 people in each service area. Also noteworthy is that people in rural/remote communities may face difficulties in realising the access they are afforded due to the large geographic distances, weather challenges and difficult terrain faced by service providers. For example, survey respondents noted in passing that it may take a professional caregiver a full day to visit a single client in a remote area. Another difference in the consistency of access is linked to the depth of professional diversity of the in-home care team. Based on the results of this analysis it seems that urban communities have

### One hour road travel time catchments for designated palliative care beds in facilities



**Figure 1** One Hour Road Travel Time Catchments for Designated Palliative Care Beds in Facilities.

access to more diverse in-home care teams, where up to three different professional groups are represented (i.e. physicians, palliative nurses and social workers).

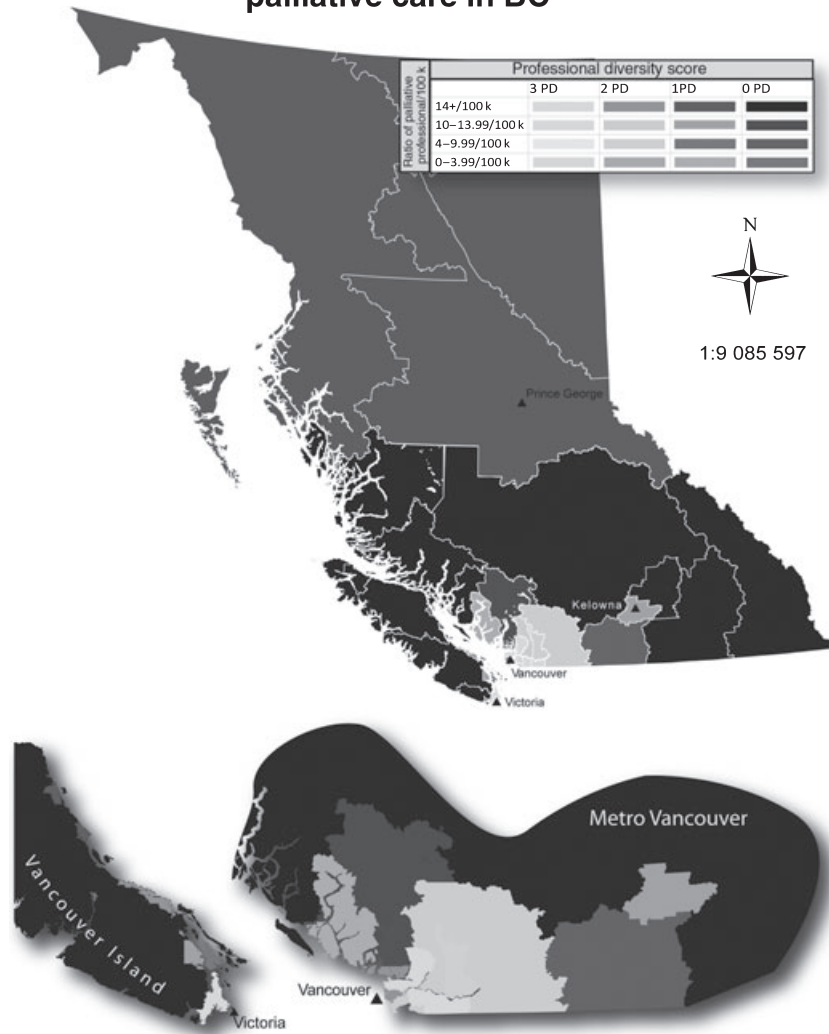
The results of the model designed to characterise overall palliative care service consistency and depth across BC for each of the administrative palliative care service areas are shown in Figure 3. As a reminder, the model accounts for both facility-based and in-home palliative care services, and ranks the combined results of the previous two analyses. Figure 3 illustrates again that rural areas are more poorly served with respect to palliative care – ‘even when population density is accounted for’. The model also demonstrates the familiar pattern of radially deteriorating services as one moves from the southwest corner of the province to the northeast. As expected, the ranking for Metropolitan Vancouver is higher than that of the rest of the province. Rural areas,

including in the interior, have much lower rankings because of the fewer number of providers per population and the larger geographic areas they have to cover. It is important to acknowledge that while the ranking indicates the extent to which services in one area of the province are better or worse than others, it does not reflect how much and in which ways they differentiate.

#### Discussion

The objectives of the protocol development reported on herein were to: (i) determine how to assess geographic access to palliative care in three different community settings across regional BC; (ii) determine how to rank access to and the diversity of palliative care across these settings and jurisdictions; and (iii) draw upon the findings to characterise the overall consistency and depth of

### Community accessibility to in-home palliative care in BC



**Figure 2** Community Accessibility to In-Home Palliative Care in BC.

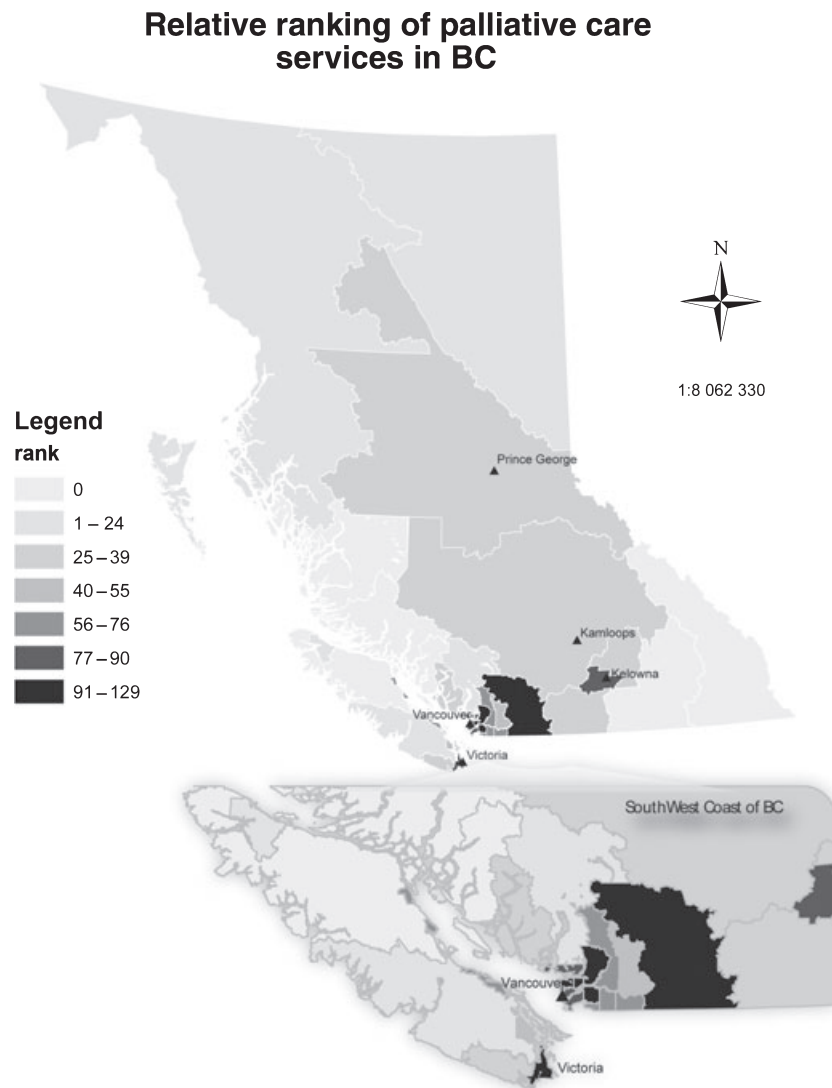
palliative care provision in particular community sites across BC in a meaningful way. To address these objectives we designed a series of innovative multi-method analyses that combined spatial and quantitative data culled from a number of existing and new datasets. The results, shared in Figures 1–3, reveal the depth and distribution of hospital-, hospice- and home-based palliative care across the province. There are a number of noteworthy points to be considered from the findings and also about the protocol design overall, which we expand upon in this section.

**Protocol interpretation**

There is no single way to interpret the findings of the above analyses and resulting model. The intent behind

the creation of this protocol has been to develop a way to address an informational need that decision-makers and administrators are likely to have when determining how and where palliative care services are to be strengthened in their attempts to address calls for service enhancement to meet need. The specific nature of this informational need and the context in which decisions are being made will determine how the findings can be interpreted in a meaningful way. In this sub-section we provide one such interpretation by revisiting the gap between urban and rural care provision outlined earlier, which may serve as a point of interest for decision-makers and administrators alike given the need to provide equitable and accessible palliative care to British Columbians. As was introduced earlier, the challenge of offering equitable health service access in rural and remote communities is





**Figure 3** Relative Ranking of Palliative Care Services in BC.

a logistical one: with fewer people and a necessarily smaller infrastructure, services are typically constrained in capacity and often require travel of some distance to reach (Hotson *et al.* 2004, Wilson *et al.* 2006). There is wide recognition of this challenge, including within the Canadian and BC contexts and also specific to palliative care (Noble *et al.* 2001, Canadian Institute for Health Information 2005, Canadian Hospice Palliative Care Association 2008).

Recent provincial health policies directed towards decentralisation of health services – across different provincial health authorities – have compounded existing differences in palliative care service provision. This is evidenced in the model and ranking where we see lower levels of service provision – with less depth – in the remote and geographically isolated northeast and northwest areas of the province. In the case of the northwest,

there is a predominantly Aboriginal population that is distributed across many small, socially deprived communities with attendant low levels of all health services. In the northeast, there are a number of industrial towns that host oil, gas, steel and forestry industries. These towns, including Fort St. John and Dawson Creek, are isolated from each other and the rest of the province. Through the socio-demographic composition of the northwest BC is quite different from the northeast, neither enjoys high levels of palliative service provision – whether measured by physical access or depth of service provision. By contrast the highly mountainous southern interior of the province, though not an urban metropolis, maintains a higher level of service provision and depth than the north. Reasons for this include greater population density but also connectivity between larger centres (e.g. Kelowna, Kamloops). Ultimately geography matters

for where palliative care services are located, as do historical patterns of settlement and socio-economic indicators.

### Protocol strengths

Protocols such as the one presented herein are essential in order to work towards addressing anticipated palliative care need through providing an assessment and useful visualisation of the current state of palliative care provision, thus identifying strengths and gaps to be targeted. The advantage of measuring access and professional diversity as markers of depth and consistency in one combined model is that it dimensionalises the current state of on-the-ground service provision in BC communities. Rather than focusing on a single axis of care provision, the protocol provides a ranking that accounts for several relevant variables. Furthermore, this model integrates several measures through the incorporation of both spatial and quantitative data.

Importantly, this protocol can be modified to create 'depth of service' models for other health services, including other components of primary health care. For example, it could be usefully extended to capture the state of provision for maternity care, which is another health service that spans various community sites and involves a number of provider groups. This protocol can also be applied in other national jurisdictions where clear relative rankings of palliative care depth and consistency at the regional or community level are needed but are not presently available. For example, like Canada, Australia is facing an increased demand for palliative care, the greying or aging of its population and calls to enhance service provision in rural communities in particular (O'Connor & Pearson 2004, Pereira 2005, Crooks *et al.* 2009). The similarities in experiences of distance and isolation in Canada and Australia, along with the similarities in service demands and contexts, serve as an initial indication that the protocol presented herein is likely to be highly applicable to the Australian context.

### Protocol limitations

The rankings developed for this study do an excellent job of illustrating supply but they are constrained by their failure to weigh supply against demand. In a town with a large steel mill, for instance, the matrix may show poor palliative care service provision but this would be likely be linked to low demand due to a highly working-aged population. Also, the study does not account for qualitative factors that may determine whether a community could support a greater range of palliative facilities or in-home care providers – from an infrastructural or social perspective.

This protocol has, by its very design, focused on particular service provision sites. As such, a key limitation is that it has not considered services that are not place-based. For example, shared care teams that do not provide care in specific community sites but rather are used when front-line providers need to consult with a practitioner with some palliative care specialty expertise are not captured in this analysis. We know that such teams exist, including in the NHA where a multidisciplinary team spread across the entire regional authority is available to consult with those providing palliative care. A toll-free phone line is also available to palliative care providers across the province to consult on an as-needs basis. Because this service is not place-based it is not captured in the present analysis. The exclusion of such services from the present case study analysis and the lack of consideration of factors such as demand and the abilities of communities to host palliative care services provide clear direction for further enhancement of the protocol.

A further limitation is that the data collection process did not specifically inquire about the full-time equivalence (FTE) of each provider serving an area. Thus the data representing the number of palliative professionals per 100 000 people assumes that each works full-time – and that the FTE is not comprised of two workers working half-time. The latter scenario might have an effect on the quality of care.

Finally, the model gives equal weight to all four components: designated beds per denominator population, number of providers per denomination population, diversity of providers per geographical area and geographic extent of coverage of home-care team. Models are abstract representations of the on-the-ground situations and thus subject to interpretation. The components can be differently weighted, depending on need. For instance, in a study that emphasised the role of trained palliative physicians in care provision, that component may be more highly ranked than others. In this instance, however, we chose to emphasise the totality of care components that collectively define levels of service.

### Conclusion

We have designed a series of three analyses that in combination permit an ordinal ranking of provision of palliative care services across the province of BC, Canada. Each of the rankings is based on a composite of data and analysis. The goal of this project was to develop a means of providing information to decision-makers and administrators so that they could determine how to allocate resources most effectively. Interpretation of the significance of differences between levels of access is outside the scope of this paper. However,

visual analysis clearly indicates a rural/urban divide in terms of access to palliative services. This disparity is partly historical in nature, following from the traditional concentration of palliative services in urban areas. Recently, however, there have been concerted efforts to devolve decision-making and regionalise care. The benefit of this study and methodological protocol is that it provides policy makers with information, indeed evidence, on which to base future decision-making. This is particularly significant in an area of health allocation where resource recording and data are limited. A second great advantage of the study is that the methods and analyses can be applied to other regions with respect to palliative service provision as well as to a range of other health services.

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