

**PHYSICIAN ASSISTANT UTILIZATION IN THE WWAMI REGION AS A MODEL  
FOR THE POTENTIAL ROLE OF PHYSICIAN ASSISTANTS IN NORTHERN  
BRITISH COLUMBIA: A LITERATURE REVIEW**

by

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## ABSTRACT

**Background:** Physician assistants (PAs) have gained popularity in British Columbia (BC) as potential healthcare providers to help meet the needs of rural communities, however, the profession is still not acknowledged.

**Purpose:** A literature review on PAs in WWAMI (Washington, Wyoming, Alaska, Montana, and Idaho) was performed to explore the potential role of PAs in northern BC.

**Methods:** A search of the literature in the English language without publication date restrictions was performed. Only primary publications on rural PAs in the WWAMI region were selected. The articles were assessed and grouped into 4 themes.

**Results:** A total of 8 articles were selected for pre-screening. Only 4 papers met the criteria of original research on rural WWAMI PAs, including PA characterization and utilization.

Generally, the literature indicates that WWAMI PAs work primarily in rural primary care, with others in acute-care environments. Depending on the setting of practice, WWAMI PAs were found to perform a broad range of clinical tasks and services, skills that are essential for when they are the sole providers. And with the concurrent guidance of a template for PA development, the WWAMI experience could be used as a model for PA implementation in BC.

**Conclusions:** This literature review sheds light on the potential role of PAs in British Columbia. Overall, PAs have helped stabilize healthcare in rural and underserved communities. The lack of current publications, and research in general, was regarded as a major limitation.

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## **INTRODUCTION**

### **Purpose**

The purpose of this paper is to explore the potential role of physician assistants in northern British Columbia through a review of the literature on PA utilization in the five Northwest states often referred to as WWAMI (Washington, Wyoming, Alaska, Montana, and Idaho). Despite differences in the U.S. and Canadian health systems; the aim is to understand the utilization of WWAMI PAs and best practices for the implementation of PAs in British Columbia.

### **Background**

#### **Healthcare access in northern British Columbia**

Northern British Columbia is home to about 6%<sup>[1]</sup> of an estimated 5.1 million<sup>[2]</sup> population in the Canadian province of British Columbia (BC), encompassing approximately two-thirds of the total provincial land area of 922,503km<sup>2</sup> (Figure 1).<sup>[3]</sup> Except for Prince George, northern BC is considered mostly rural or remote (Table 1).<sup>[4]</sup> Compared to their urban counterparts, rural residents often have poorer socio-economic status, higher infant mortality rates, higher death rates, and shorter life expectancies. These same health status indicators are more pronounced in Indigenous people compared to the national average with twice the infant mortality rates, three times the suicide rate, and 6-14 years shorter lifespan.<sup>[5]</sup>

For rural British Columbians, access to healthcare can present unique challenges due to geographic remoteness, harsh weather, long distances, small and dispersed populations, and shortages of medical staff.<sup>[4]</sup> These challenges have been exacerbated since the turn of the century with the closure of small rural hospitals in an effort to restructure and centralize health

services. While some studies have reported that regionalization has had little or no effect on rural patients' health status<sup>[6]</sup> and acute care outcomes,<sup>[7]</sup> others have suggested that the redistribution has had psycho-social impacts<sup>[8]</sup> and adverse perinatal outcomes<sup>[9]</sup> on rural residents. The consequences of regionalization, nonetheless, may remain unclear due to the lack of a universal definition of *access*. MacKinney *et al.* suggested that the accurate conceptualization of *access* to healthcare requires the consideration of four approaches: definitions, measures, barriers, and frameworks.<sup>[10]</sup> Herein, MacKinney's conceptualization of access will be used when referencing access to healthcare (see Table 2).

Irrespective of the findings reported on the impacts of centralization, cancer survivors in northern BC have experienced problems with timely access to medical services close to home due to staff shortages, lack of continuity, extensive travel distances, and financial constraints.<sup>[11]</sup> In 2006 the government of BC launched a provincial-wide initiative, *Conversation on Health*, to understand how British Columbians felt about healthcare. Rural residents felt a “disparity between southern British Columbia healthcare and what is available in the north” and that “hospitals in small communities have been closed, leaving the closest hospital sometimes hours away.”<sup>[12]</sup> Similarly, a 2020 online survey showed that 64% of British Columbians believe that despite some good things in the health system, changes are needed. Long wait times and shortages of healthcare workers are the top two concerns of British Columbians (27% and 24%, respectively); for northern residents, shortages of medical staff and inadequate resources and facilities are their main concerns (55% and 19%, respectively).<sup>[13]</sup> For other rural communities, the inclusion of health services contributes to a sense of identity and feeling of security, and so the closure of local hospitals has challenged not only their access to health services but their *sense of place*.<sup>[8]</sup> During the *Conversation on Health* campaign, rural residents suggested that the



province address access to medical staff by recruiting generalist healthcare providers.<sup>[12]</sup> In the 2015 *Rural Health Services in BC: A Policy Framework to Provide a System of Quality Care*, the BC Ministry of Health acknowledged the various challenges these rural and remote communities face when attempting to access medical services and suggested actions at the different levels of the health system to improve the same. At the practice and organizational level, there is strong support for the implementation of multidisciplinary teams in rural primary and community care; at the provincial level, the strategy aims to develop and implement funding models for generalist healthcare professionals in rural communities throughout BC.<sup>[4]</sup>

### **Need for physician assistants in British Columbia**

For over two decades, British Columbia has considered alternative models of healthcare providers, including physician assistants (PAs).<sup>[14]</sup> Physician assistants are medical generalists who support and extend the services of physicians through a broad range of medical tasks. In the U.S., the PA profession is well established where PAs have been working since the mid-1960s.<sup>[15]</sup> In 2005, the British Columbia Medical Association, now Doctors of BC, reported that the Justice Institute of British Columbia had signed an agreement with MEDEX Northwest, based out of the University of Washington (UW), to adopt their program of physician assistant studies in BC.<sup>[16,17]</sup> In 2013, the same association released a policy statement on physician assistants highlighting that the remote supervision of PAs made them a good fit to help meet the medical needs of rural communities through the *extension* of physician services.<sup>[18]</sup>

Wong interviewed provincial key stakeholders to identify opportunities for PA implementation where Health Authorities alluded to the potential roles for PAs in acute settings.<sup>[19]</sup> Additionally, the same author suggested that if PAs were introduced in the province,

their “most likely purpose would be to improve physician efficiency.”<sup>[19]</sup> A computer simulation study based on the pediatric emergency department at BC Children’s Hospital found that the addition of PAs reduces waiting times, length of stay, and leaving without being seen.<sup>[20]</sup> Another paper reported that  $\geq 96\%$  of British Columbians are willing to see a PA over a physician based on the wait time trade-off.<sup>[21]</sup>

In a 2015 policy framework, *Future Directions for Surgical Services in British Columbia*, the province sought to develop a surgical workforce that included PAs to improve timely access to surgical services by assessing regulations and scope of practice set by provincial health colleges.<sup>[22]</sup> Although BC had seen improved wait times for medically necessary elective procedures over the past couple of years, the COVID-19 pandemic in 2020 caused major setbacks, prompting the province to propose a recovery plan that, again, called for the utilization of PAs (Figure 2).<sup>[23]</sup> Now, it is evident that the introduction of a new profession like physician assistant will require role clarification, regulation, formal training, and funding sources<sup>[19]</sup> but more irrefutable is the absolute need for additional providers to help meet the medical needs of British Columbians. Despite all the advocacy efforts by multiple government and non-government entities over more than a decade, PAs have yet to be integrated into the health system in BC.

### **History of physician assistants**

Before to the conception of the *physician assistant*, several physician extender prototypes had already existed around the world. For instance, the *feldsher* in Eastern Europe; the *barefoot doctor* in China; and the *officier de santé* in France.<sup>[24]</sup> These prototypes would later serve as models for the development of the contemporary physician assistant.

### *Physician assistants in the U.S.*

In the 1960s, events such as the enactment of government-funded healthcare programs and the return of experienced corpsmen from the Vietnam war propelled the PA movement.<sup>[25]</sup> At Duke University, Dr. Eugene A. Stead, Jr. worked to establish the first PA program while on the opposite coast at the University of Washington, Dr. Richard Smith advocated for a similar concept through the MEDEX program. With more than 131,152 certified,<sup>[26]</sup> PAs are highly skilled clinicians who work within a formalized agreement with physicians and are equipped to conduct medical histories and physical exams, request diagnostic studies, perform select procedures, prescribe medications, and provide patient education. A systematic review on PAs in the emergency department (ED) found that PAs manage and perform a wide range of clinical conditions and procedures from skin rashes and chest pain to wound suturing and lumbar punctures.<sup>[27]</sup> In the same review, the majority of physicians in the ED reported that PAs are good medical history takers and provide care that is appropriate to the clinical setting.<sup>[27]</sup> In a study involving 26 academic medical centers, Moote reported that PAs and nurse practitioners (NPs) are primarily hired to help meet the resident work hour restrictions.<sup>[28]</sup> Additionally, PAs and NPs help improve patient safety/quality and continuity of care, increase patient throughput and patient access while reducing the length of stay.<sup>[28]</sup> A cost analysis simulating PA and NP scope of practice expansion in the state of Alabama suggested a net savings of US\$729 million over a period of 10 years in expenditures related to primary care visits.<sup>[29]</sup>

Out of the whole PA workforce, about 12% of PAs work in rural America with 77% in a primary care specialty.<sup>[30]</sup> PAs who grew up in small towns are more likely to practice in rural settings compared to PAs from large cities.<sup>[31]</sup> PAs in rural communities tend to have a broader scope of practice and a slightly higher degree of autonomy than their urban counterparts.<sup>[31]</sup>

Rural PAs also help create local job opportunities and revenue between \$280,476 and \$940,892.”<sup>[32]</sup>

**Physician assistants in the WWAMI region.** The chronic shortage of primary care providers has affected rural communities for many years, in particular, five Northwest states often referred to as WWAMI (Washington, Wyoming, Alaska, Montana, and Idaho), which are considered one of the most rural regions in America.<sup>[33,34]</sup> Additionally, factors such as geographical remoteness, vast distances, and adverse weather conditions contribute to challenges in the delivery of medical services. These five states combined make up 27% of the landmass in the U.S. and consist of only 3.5% of the nation’s population.<sup>[33,35]</sup> To help address the region’s needs for rural healthcare providers, Dr. Smith sought to extend “physician labor” by training and deploying clinicians through the MEDEX program.<sup>[36]</sup> By 2012, more than 70% of MEDEX graduates were distributed in the WWAMI region, with about 35% of them working in rural settings.<sup>[35]</sup> In 2018, 31.4% to 50.4% of WWAMI PAs worked in primary care, well above the national average of 25.8%, with three states ranking in the top seven for the largest ratio of PAs per capita (Figure 3).<sup>[26]</sup>

The MEDEX program’s successful model for training rural clinicians is attributed to its strong regional focus, which includes the involvement of community-based preceptors from the very beginning, development of competency-based educational programs, a deployment system targeted to communities of need, and a receptive framework addressing legal and insurance matters.<sup>[17]</sup>

### ***Physician assistants in Canada***

At the turn of the century, Canada also experienced a change in the demand for health care due to factors such as medical staff shortages, an aging population, and a global recession.

Then, the role of the physician assistant emerged as an attractive option.<sup>[37]</sup> Although the concept of a non-physician provider existed in the Canadian Armed Forces even before WWII,<sup>[38]</sup> it was not until 1999 that PAs were introduced into civilian settings in Manitoba.<sup>[39]</sup> Since then, Ontario, New Brunswick, Alberta, and most recently Nova Scotia have either implemented the PA role or initiated pilot programs (Figure 4).<sup>[40]</sup>

To date, physician assistants remain widely unregulated across Canada. A 2017 census survey of 314 PAs showed that the majority of respondent PAs practice in Ontario and Manitoba,<sup>[41]</sup> and outside of the aforementioned five provinces physician assistants work in military bases and occupational health. The majority of PA respondents (30%) spend more than 80% of their time working in family practice followed by hospital and military settings, respectively.<sup>[41]</sup> In the same census report, the geographical distribution for about 60% of respondents is urban centers with populations greater than 50,000 compared to less than 30% of participants who work in communities of 50,000 or less.<sup>[41]</sup> At the time of writing, the Canadian Association of Physician Assistants (CAPA) reported 892 certified physician assistants in Canada.<sup>[42]</sup>

The impact of physician assistants in the Canadian landscape has been studied in settings like emergency departments where PA integration improves patient flow by decreasing the length of stay and reducing the number of patients who leave without being seen.<sup>[43]</sup> In general surgery, PA utilization significantly decreases late discharges from 20% to 0.5%, increases early discharges by 16%, and decreases resident workload.<sup>[44]</sup> Similarly, Bohm et al. reported that the utilization of physician assistants in a double operating room model increases surgical throughput of primary joint arthroplasty by 42% while decreasing wait times for surgery from 44 weeks to 30 weeks.<sup>[45]</sup> In a 2016 paper, Bowen et al. evaluated the role of PAs at the first six

primary care locations in Manitoba and reported an increase in patient access resulting in reduced emergency department and walk-in clinic visits, decreased hospitalizations, and improved satisfaction by staff and patients.<sup>[39]</sup> In that same year, the Conference Board of Canada modeled potential cost savings to the Canadian healthcare system of up to a billion dollars if PAs were utilized at full scope and shared across all practice areas.<sup>[46]</sup> Since its introduction in Manitoba two decades ago, the PA profession has both grown in numbers and evolved to include more entrusted responsibilities, however, factors such as the lack of remunerative models may limit their full utilization<sup>[47]</sup> and hinder the expansion of physician assistants in Canada.<sup>[48]</sup>

## **Healthcare system**

The World Health Organization states that the main goal of a health system is “to produce a health in the population, that is equitably distributed.”<sup>[49]</sup> As most industrialized nations pour their resources into a health system that offers universal coverage, the U.S. has yet to adopt one that ensures healthcare for all Americans. Types of universal health systems include a national health insurance (e.g. Canada) and a national health system (e.g. Great Britain), both publicly financed, and a socialized health insurance (e.g. Germany) which is financed by contributions from employers and employees.<sup>[34]</sup>

### ***No unified health system in the U.S.***

In 2018, the Organization for Economic Co-operation and Development (OECD) found that the U.S. spent \$10,586 per person or 16.9% of its gross domestic product (GPD) on healthcare, far higher than the 8.8% average of all 36 OECD countries.<sup>[50]</sup> These expenditures are financed by uncoordinated public and private insurance programs, as there is no unified health

system in the U.S. In 1965, Congress established two publicly funded health insurance programs, Medicare (for 65+) and Medicaid, for the disabled and/or impoverished. A few years later, in 1973, the Civilian Health and Medical Program of the Department of Veterans Affairs (CHAMPVA) was introduced to provide health coverage to eligible survivors and dependents of veterans.<sup>[51]</sup> By contrast, most Americans are covered through private insurance either through employment, direct purchase, or TRICARE if a military member, with the first being the most prevalent.<sup>[52]</sup> The U.S. operates under a multi-payer system where governmental and commercial companies reimburse providers on a fee-for-service (FFS) basis.<sup>[53]</sup>

In 2010, the passage of the Affordable Care Act, a comprehensive health reform, included provisions to expand healthcare access, increased funding for PA training,<sup>[34]</sup> prohibited insurance plans from excluding individuals with preexisting conditions, established an individual mandate that required all residents to obtain insurance, amongst others (the latter was rescinded by President Trump in 2019).<sup>[54]</sup> Since the enactment of the same legislation, the uninsured rate dropped from 16% in 2010<sup>[54]</sup> to 8.5% in 2018<sup>[52]</sup>; and the number of uninsured individuals declined from 49 million<sup>[54]</sup> to 27.5 million<sup>[52]</sup>, respectively. In 2018, 91.5% of Americans had insurance coverage with 67.3% from private plans and 34.4% from public programs.<sup>[52]</sup> Even with such significant expansion in the last decade, healthcare coverage in the U.S. remains far less than the OECD average of 98.4%.<sup>[50]</sup>

**Physician assistant funding in the U.S.** Remuneration for medical services provided by physician assistants from Medicare, Medicaid, and TRICARE is through a FFS model, at 85% of the physician fee, and covers all practice settings.<sup>[55]</sup> Most private payers also cover services by PAs at similar rates. Physician assistants see patients even if the physician is not physically present (unless required by state law) and bill the insurance company under their own name by

using a National Provider Identifier (NPI).<sup>[55]</sup> PAs cannot receive payment directly or “direct bill” for their services.

### ***National health insurance in Canada***

The development of the Hospital Insurance Act in 1957 and the Medical Care Act in 1966 offered provinces funding for medical services provided by hospitals and physicians. Within six years, residents across Canada benefited from a national insurance program that was sponsored by the government, offering universal coverage.<sup>[56]</sup> The Canada Health Act (CHA) of 1984 replaced the aforementioned insurance acts, defining the current healthcare system. The same act also set minimum requirements for the coverage of services and procedures and established criteria for portability, universality, accessibility, comprehensiveness, and public administration.<sup>[57]</sup> The CHA aims to ensure reasonable health access for all; however, this principle has been interpreted as “where and as available.”<sup>[58]</sup> In the case of rural communities, residents often encounter difficulties in accessing health services due to limited resources and longer travel distances. “If there is a two-tiered medicine in Canada, it’s not rich and poor, it’s urban versus rural.”<sup>[5]</sup>

In 2018, Canada spent \$4,974 per person or 10.7% of its GDP on health, close to the OECD average of 8.8%.<sup>[50]</sup> Healthcare is funded from revenue raised through taxation at the provincial/territorial and federal governments. Provinces and territories are responsible for the delivery of medically necessary and social services with no out-of-pocket payments.<sup>[56]</sup> Most physicians are independent contractors and are compensated through FFS schedules and alternate payment programs (e.g. salaries or blended payment).<sup>[53]</sup> British Columbia uses additional funding systems such as the Rural Practice Program which is directed at the recruitment and retention of practitioners in rural practice.<sup>[59]</sup>



**Physician assistant funding in Canada.** The assignment of a billing number (NPI) to PAs in the U.S. facilitates their retrospective payment under the most common funding system of FFS. This, however, is not done in Canada where PAs cannot bill for their services, also limiting the PAs' potential to practice at full scope.<sup>[47,60]</sup> Thus, the FFS system and the lack of a sustainable funding model are by far the most significant obstacle to PA integration.<sup>[61,62]</sup> In Canada, most PAs are salaried and their funding comes from several sources such as physician groups in Manitoba, clinical services and career start grants in Ontario, and regional health authorities in Alberta.<sup>[62]</sup> While Manitoba's and Alberta's funding approach is the most stable, Ontario's funding system is short-term and fluctuant. Jones proposed three conceptual funding frameworks which include FFS, blended, and salary:

1. FFS model: Amend the current FFS schedules to allow PA billing or modify the application rules to enable provider billing for the PA, both at reduced rates, similar to the American reimbursement model.
2. Blended model: A system that includes both retrospective and prospective payments with physician billing caps and limits in billing codes to prevent ballooning costs from PA billing.
3. Salary model: Based on governmental annual budget allocations, PAs would be paid by the health facility, similar to the current systems in Manitoba and Alberta.<sup>[60]</sup>

### **Problem Statement**

With 11.6% of British Columbians spread throughout 86.7% of the provincial land area,<sup>[63]</sup> access to healthcare is complicated by multiple factors, including shortages in medical staff. For over a decade, the province has considered alternative practice models that include

physician assistants to help meet the medical needs of British Columbians;<sup>[22]</sup> however, the PA profession is still not recognized in the province.

### **Research Question and Objectives**

Since the conception of the profession over 50 years ago, physician assistants have been sought by early WWAMI adopters<sup>[64,65]</sup> to fill gaps left by the decline in generalists, particularly in rural and underserved communities. Given WWAMI's success with PA integration and regional similarities with British Columbia, could the WWAMI experience be used as a model for the introduction of physician assistants in British Columbia?

The objectives of this literature review are to 1) Characterize physician assistants and their utilization in the WWAMI region and 2) Use WWAMI as a model for the introduction of physician assistants in British Columbia.

### **METHODOLOGY**

This paper undertook a mixed methods approach, using a convergent design to analyze inferential statistics and themes on PAs in the WWAMI region. The information was collected by performing a search of the literature in the English language without publication date restrictions given the anticipated limited availability of pertinent research. Computerized bibliography databases like MEDLINE and Google Scholar were employed to look for MeSH terms that included “physician assistant(s),” “physician extender(s),” “non-physician(s),” “PA(s),” and matched with “WWAMI,” “Washington,” “Wyoming,” “Alaska,” “Montana,” “Idaho,” or “Pacific Northwest,” Also, the collection of data included a hand search through internet sources for publications on PAs in the WWAMI region.

Primary and secondary sources as well as literature review articles and “gray literature” were pre-screened for data published on rural physician assistants in the WWAMI region. Only original papers that reported PA characterization and utilization were analyzed and grouped into the following themes: demographic characteristics, community size, specialty practice, and clinical tasks and services. Furthermore, the findings from the literature review were used to assess the feasibility of introducing physician assistants in British Columbia based on both similarities and differences between the WWAMI region and BC and the successful deployment of physician assistants to rural primary care practices in the WWAMI region.

## **RESULTS AND DISCUSSION**

A total of eight articles were selected for pre-screening. Four papers, all with level VI of evidence, met the criteria of original research on rural physician assistants in the WWAMI region, including PA characterization and utilization (Table 3). Non-primary articles and those outside the objectives of this paper were excluded. The range of publication dates for this literature review was from 1975 to 2021. Half of the articles were published after 2000. The methodology used in the selected articles includes an overlap of three mailed surveys and student files or state board statutes and regulations, and one telephone interview and in-person visits. The peer-reviewed papers were published in the Journal of Physician Assistant Education, Alaska Medicine, The Western Journal of Medicine, and the Journal of the American Academy of Nurse Practitioners.

### **PA characterization and utilization**

#### **Demographic characteristics**

The returning Vietnam-era trained medics, mostly males, were the ideal candidates for helping meet the shortages of primary care physicians in the mid-1960's and 1970's. The corpsmen's ability to deal with "conflict and controversy"<sup>[36]</sup> made them excellent assets to assist physicians. Three articles reported the gender of PA respondents while 2 papers assessed the previous clinical background of PA participants.

Early PA graduates were mostly men, and even the first class of PAs consisted of four Navy corpsmen. In 1983, Harmon surveyed 201 MEDEX graduates from 1970-1979, receiving a 71% response rate (n = 142), and reported that close to 75% (n = 150) of PA graduates were men<sup>[64]</sup> In 1994, Hummel stratified Alaskan PAs into Indigenous (n = 16) and non-Indigenous (n = 21), obtaining data from MEDEX student files from 1980-1990 and a 1991 MEDEX graduate survey. Out of 16 Alaskan Indigenous students, 13 completed the program and only 10 graduated on time to participate in the survey; the response rate was 70%. Of 21 Alaskan non-Indigenous students, all completed the program, 19 graduated in time, 14 returned to Alaska but only 13 were practicing as PAs. Additionally, other Alaskan non-Indigenous PAs (n = 27) working in Alaska in 1991 were also included in the survey. For the entire Alaskan non-Indigenous group (N = 41), the survey response rate was 68.3% (n = 28). The Hummel study found that > 80% of practicing professionals in the Alaskan Indigenous group were females compared to > 70% in the Alaskan non-Indigenous group who were males.<sup>[65]</sup> In 2002, Larsson obtained data from State board statues and a mailed survey to administrators of Montana rural hospitals. With a response rate of 74% (N = 46), these hospitals represented 31 of the 163 (19%) licensed PAs in Montana, reporting that 53% (N = 31) of the PA workforce was made up of males.<sup>[66]</sup> Except for Alaskan Indigenous PAs, this data is consistent with historical trends where the PA profession had been dominated by males. Regarding the Alaskan Indigenous group, all respondents had previous

experience as community health aides, which is a program that trained mostly Alaskan Indigenous women for primary care services in remote communities, thus, the likely reason for the higher female ratio in Hummel's study. Today's trends, however, demonstrate a shift in gender where more females are joining the medical workforce.<sup>[67]</sup> In 2018, 68.9% of American PAs were female compared to 36% in 1980, suggesting that today's PAs are primarily female.<sup>[26,67]</sup>

One major difference between the first two PA training programs at Duke University and the University of Washington (UW) was the requirement for previous healthcare experience at the UW. Harmon showed that 84% of PA respondents came from military (n = 148) or registered nurse (n = 41) backgrounds<sup>[64]</sup> compared to 19% (n = 1, n = 6, respectively) in Hummel's study.<sup>[65]</sup> In the latter article, 57% (n = 21) of PAs had experience as community health aides while other individuals had previously trained as licensed practical nurses, paramedics, medical assistants, midwives, or lab/x-ray techs. These results provide insight into the professional background of PA participants, pointing to a stronger correlation of military and nursing experience during the first decade of the MEDEX program compared to a more diverse training background in the second decade of the same program. Although these studies showed a shift in clinical experience in the first two decades of the MEDEX program, Hummel's research focused solely on Alaskan PAs compared to Harmon's study which surveyed all MEDEX graduates, thus, making it difficult to assert such a conclusion. Today, the MEDEX program still holds strong onto its core entrance requirement of previous healthcare experience. The areas of suggested clinical training have not changed over the past five decades but have been expanded to include military medicine, emergency medicine, nursing fields, medical assistants, allied health technicians, athletic/rehabilitation practitioners, amongst others.<sup>[68]</sup>

## Community size

Physician Assistants have helped increase access to health care, particularly in underserved communities. Given the selection criteria for rural practice settings, all four papers in this review described the communities where PAs practiced. Harmon reported that 61.7% (n = 79) of PA respondents served in communities of < 50,000. These communities were located in states such as Washington (n = 84), Alaska (n = 6), Idaho (n = 5), Oregon (n = 6), California (n = 2), and other (n = 17).<sup>[64]</sup> In Hummel's study, 91% (n = 10) of Alaskan Indigenous and 54% (n = 7) of returning Alaskan non-Indigenous graduates worked in communities of < 2,000 people.<sup>[65]</sup> Larsson's article only described PAs working in counties with populations of < 100,000 or in counties with cities of ≤ 50,000 people.<sup>[66]</sup> In 2016, Nelson collected data from the Washington State Department of Health and interviewed PAs in 13 of the 18 emergency departments east of the Cascade Mountains, reporting that PAs practice in "more agriculturally remote areas of the state and where the population is least dense."<sup>[69]</sup> These emergency departments collectively employ 31 PAs where they are often the sole providers. While the definition of *rural* by Larsson can appear broad due to the use of counties instead of single communities, the overarching principle points towards a strong role for PAs in communities with populations < 50,000. A caveat regarding Harmon's study is that all MEDEX graduates from 1970 to 1979 were surveyed even if they were practicing outside the WWAMI region or had opted to become NPs after completing the PA curriculum. The same article did, however, break down the distribution of PAs/NPs by state where more than 79% (n = 95) of respondents are employed in Washington, Alaska, and Idaho. The findings by Hummel were difficult to replicate or follow, and thus, the reporting should be taken with caution. The same paper stated that all (n = 13) Alaskan

Indigenous graduates returned to and found work in Alaska with the exception of 1 who had abandoned the profession, resulting in 91% of Alaskan Indigenous still practicing as PAs in 1991. From the article's reporting it is unclear how the author arrived at such conclusion. Furthermore, the same study indicates that the attrition rate for Alaskan Indigenous students was 18.3%. If 13 out of 16 students completed the program, the attrition rate should be 18.75%. Lastly, the lack of a universal definition for *rural* makes the comparison of studies difficult.

### **Specialty practice**

Physician assistants are trained medical generalist with transferable skills that enable them to practice in various roles and specialties. All four papers in this review explored the areas in which the PAs practice. Harmon reported that 83.9% of MEDEX graduate respondents practice in primary care (family practice, internal medicine, and pediatrics)<sup>[64]</sup> compared to 100% of Alaskan Indigenous and 60% of Alaskan non-Indigenous graduates in Hummel's study.<sup>[65]</sup> The latter paper also included emergency medicine and OB/GYN in its definition of primary care. The articles by Larsson and Nelson investigated PAs specifically in hospital settings, reporting that 77.4% of PAs provide services in emergency rooms<sup>[66]</sup> and that 75% of PAs see patients independent of the level of acuity,<sup>[69]</sup> respectively. These findings shed some light on the specialty environments where PAs have been utilized in the WWAMI region suggesting cornerstone roles for PAs in primary care and acute-care settings, though such suggestions should be taken within the context of an inconsistent definition for *primary care* by the earlier two studies. No articles on Wyoming PAs were found during the search of the literature; however, a 2009 survey by the Wyoming Healthcare Commission shows that 60.4% of Wyoming PAs respondents work in primary care (family practice, internal medicine, pediatrics,

OB/GYN), further supporting the evidence in this review.<sup>[70]</sup> Also, in 2018, PAs in primary care accounted for 31.4% in Washington, 44.9% in Wyoming, 50.4% in Alaska, 33.8% in Montana, and 37.1% in Idaho, all well above the national average of 25.8% (Figure 3).<sup>[26]</sup>

### **Clinical tasks and services**

Physician assistants work within a formalized relationship with physicians, and thus, the PA's scope of practice mirrors that of the physician's, with specific tasks determined by an agreement by both parties and state law. The three most recent publications reported clinical tasks or services performed by PAs. Common duties include casting, suturing, ambulatory clinic, nursing home visits, prenatal care, psychiatric services, admitting and discharging privileges, hospital rounds, emergency work, overseeing acute STEMI/cardiac events, prescription privileges, and ordering labs/imaging.<sup>[65,66,69]</sup> This data shows a skillful PA workforce with the ability to perform diverse procedures and participate in various clinical services. A physician's perspective on PAs highlights the high-quality care that physician assistants provide and their contributions to a collaborative team.<sup>[71]</sup>

### **WWAMI experience as a model for BC**

The successful integration of PAs in the U.S. has helped stabilize healthcare in small communities that cannot otherwise justify the employment of additional physicians.<sup>[35]</sup> In geographically remote regions like WWAMI, PAs have helped increase access to healthcare, in particular, primary care.<sup>[31]</sup> In considering the need for healthcare providers in northern British Columbia,<sup>[16,18]</sup> the province could look at the experience in the WWAMI region,<sup>[64-66,69]</sup> an area that shares various similarities with BC (see Table 4), for the introduction and the potential role



of physician assistants. Although there are barriers to integrating a new profession into any healthcare system, BC could also turn to eastern provinces that have both welcomed and adopted strategies for funding PAs.<sup>[37,48,60,72]</sup> Similarly, the province could learn from the challenges faced by the “early adopters” in Canada.<sup>[39]</sup> Ballweg suggested the following template for the full implementation of PAs, which British Columbia could consider:

- 1) Professional role definition and task analysis, including the endorsement of key stakeholders such as medical associations, physicians, and health organizations
- 2) Creation of a training program and continuing education
- 3) Regulation, accreditation, certification, and licensure
- 4) Reimbursement structure<sup>[17]</sup>

## **CONCLUSION**

The purpose of this paper was to explore the potential role of physician assistants in British Columbia by reviewing the literature on the use of PAs in the WWAMI region. The major findings in this paper are consistent with those in the literature,<sup>[73]</sup> suggesting that PAs possess a diverse skillset that can be used to help meet the needs of rural residents in settings like primary care and acute care. Additionally, using the experience in the WWAMI region concurrent with the template for PA development by Ballweg<sup>[17]</sup> could guide British Columbia in the implementation of PAs.

Except for Washington, there was limited to no relevant research on PAs out of the other four WWAMI states, and even half of the papers used in this review were quite dated. Other limitations included the lack of PA-only research since studies often grouped PAs in conjunction

with other non-physician providers. Also, the absence of universal definitions for *primary care* made it difficult to compare and analyze data.

The findings in this paper provide proof of concept for the implementation of the PA profession in British Columbia, and as such, they should only be used for preliminary research. Future studies could expand on Ballweg's template for PA development and investigate current perspectives of key stakeholders on the PA profession or explore existing provincial funding models and how they could be amended to allow for PA reimbursement. Other areas of interest include the potential impact of PAs in remote healthcare assistance (e.g. telehealth) in BC.

## FIGURES AND TABLES

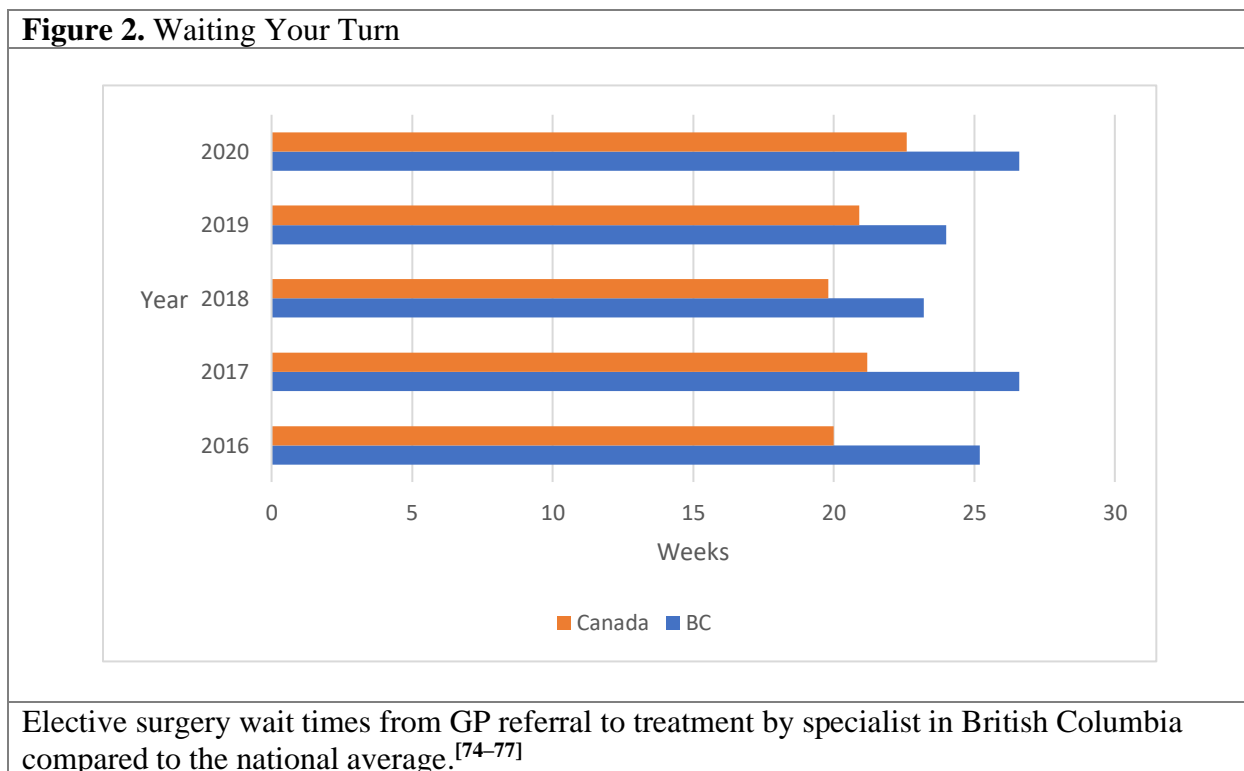
**Figure 1.** Map of British Columbia



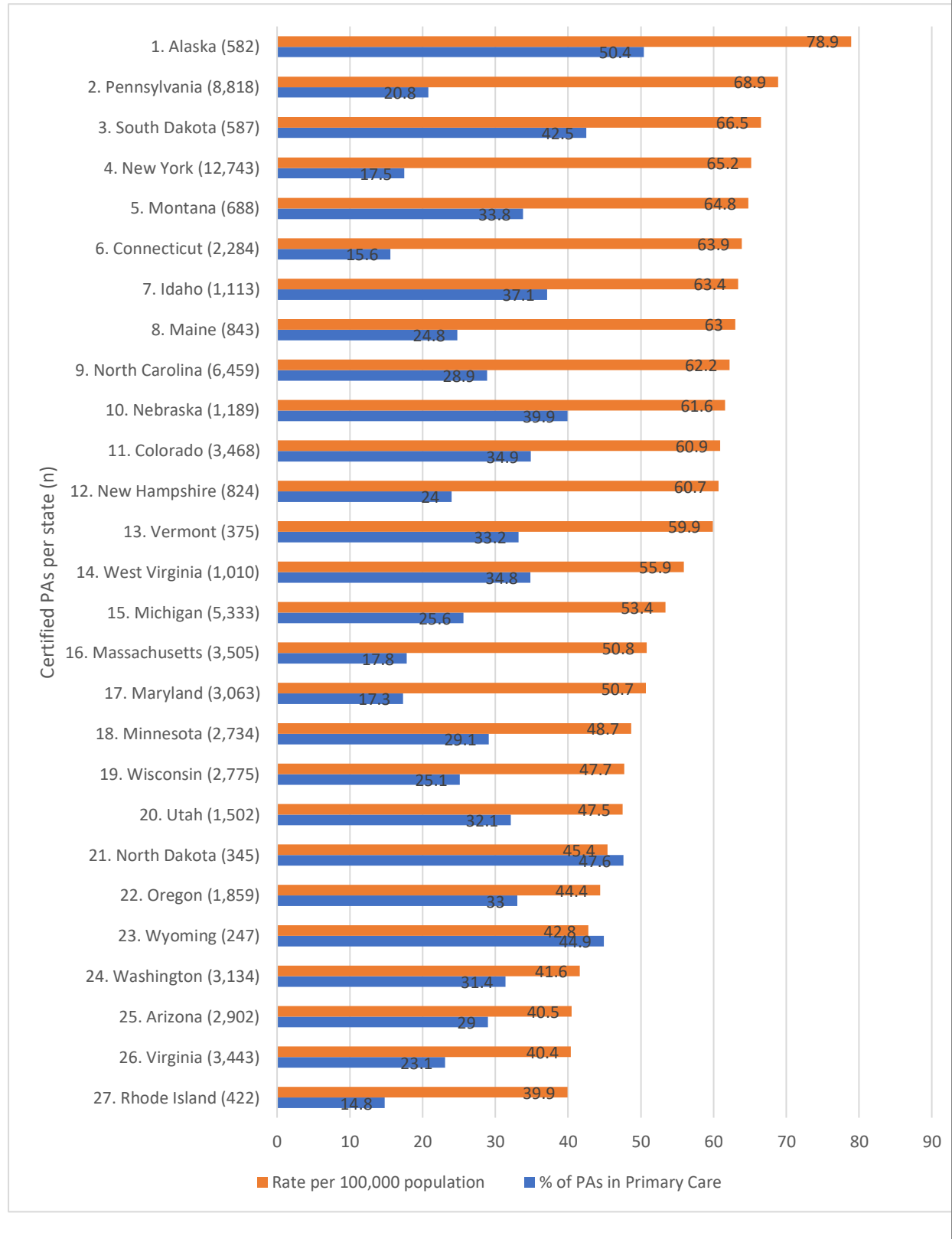
The geographical region of Northern British Columbia (yellow) is home to about 6%<sup>[1]</sup> of British Columbians, expanding over two-thirds of the total provincial land area of 922,503km<sup>2</sup>.

<b>Table 1. Community Classification and Hospital Services<sup>a</sup></b>			
	<b>Community</b>	<b>Population</b>	<b>Level of Care</b>
<b>Remote</b>	Fraser Lake Hudson Hope Houston Stewart Dease Lake Granisle Atlin Southside Valemount Tumbler Ridge	0-1,000	First aid and nurse-led care to meet immediate needs of remote population. May include facilities for itinerant primary and community care that meets basic health needs. Community too small and dispersed to sustain local health services. Health service needs addressed in neighboring communities. <hr/> Community too small and dispersed to sustain local health services. Health service needs addressed in neighboring communities.
<b>Small Rural</b>	Mackenzie Fort St. James McBride Chetwynd Masset Queen Charlotte City Burns Lake	1,000-3,500	Primary and community care that meets most health needs of the population, with potential for urgent and basic emergency care in some locations. Emergency transportation mechanisms are crucial. Visiting child, youth and family and mental health and addictions outreach services.
<b>Rural</b>	Quesnel Prince Rupert Fort St. John Dawson Creek Terrace Vanderhoof Smithers Fort Nelson Kitimat Hazelton	3,500-20,000	Some specialized acute services (such as perinatal and day surgery), residential care and assisted living generally available in all communities. <hr/> Limited general inpatient care to meet basic acute care needs of local population, public health, mental health and substance use services available in community, residential care and assisted living services available in some communities.
<b>Small Urban</b>		20,000-75,000	General inpatient care and some specialized services (such as general surgery, critical care, and inpatient psychiatry), diagnostics, mental health team available.
<b>Urban</b>	Prince George	75,000-175,000	Specialty medical, surgical, and intensive care to meet regional care needs of broad referrals from across a large health area.
<b>Large Urban</b>		175,000+	Highly specialized care, with subspecialties, to meet tertiary care needs of surrounding community and health-authority wide referrals.
<sup>a</sup> Data adapted from the Rural Health Services in BC: A Policy Framework to Provide a System of Quality Care <sup>[4]</sup>			

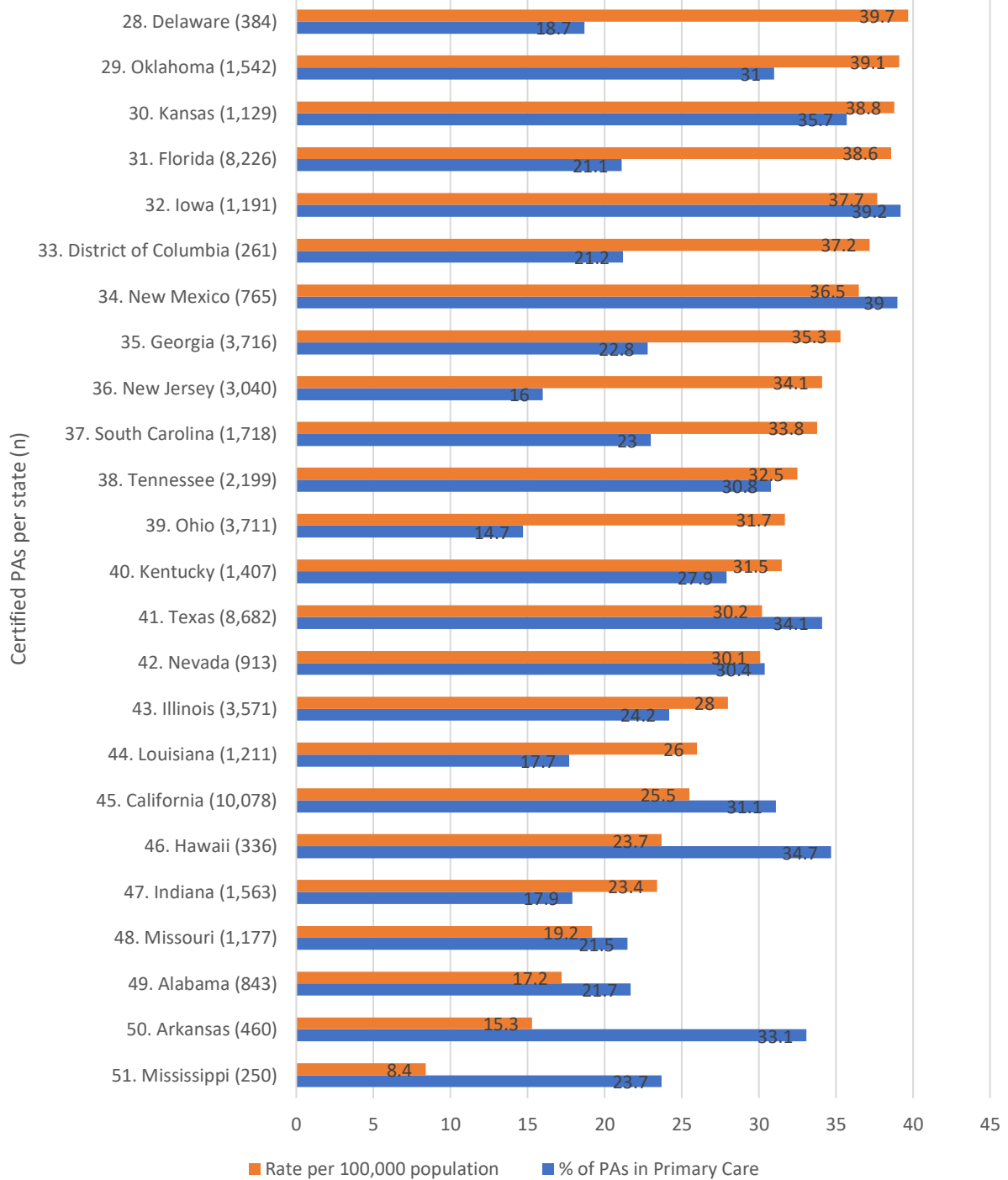
<b>Table 2.</b> Description of <i>access</i> <sup>[10]</sup>	
<b>Definition</b>	Multiple definitions of access have been used in the literature but in 1993 the National Academy of Medicine defined access as “the timely use of personal health services to achieve the best possible health outcomes.”
<b>Measures</b>	Measures evaluate the performance to access through process and outcome.
<b>Barriers</b>	Barriers to access include structural, financial, and personal/cultural.
<b>Frameworks</b>	Access frameworks that account for mutable and immutable factors.



**Figure 3. 2018 American Certified Physician Assistants by State**



**Figure 3. Continuation**



Alaska, Montana, and Idaho are in the top 7 states with the largest ratio of PAs per capita. The percentage of WWAMI PAs working in primary care (family medicine/general practice, general internal medicine, and general pediatrics) exceeds that of the national average of 25.8%.<sup>[26]</sup>

**Figure 4.** Canadian Provinces with Practicing Civilian PAs



Civilian PAs currently practice in 5 provinces, however, only Manitoba, New Brunswick, and Alberta regulate PA through their Provincial College of Physician and Surgeons.



<b>First Author Year Reference</b>	<b>Journal</b>	<b>Location Year Studied</b>	<b>Methods</b>	<b>Results</b>
<b>Harmon (1983)<sup>[64]</sup></b>	The Western Journal of Medicine	Pacific Northwest 1980	Data from MEDEX Northwest files 1969-1978 & Mailed survey	Reports that the majority of MEDEX Northwest graduates in Seattle from 1970-1979 work in Washington state, in a rural family practice
<b>Hummel (1994)<sup>[65]</sup></b>	Alaska Medicine	Alaska 1991	Data from MEDEX student files 1991 & Mailed survey	Reveals that nearly all Alaskan Indigenous <sup>a</sup> vs non-Indigenous PAs work in primary care
<b>Larsson (2002)<sup>[66]</sup></b>	Journal of the American Academy of Nurse Practitioners	Montana	Data obtained from State board statues and regulation & Mailed survey	Identifies services and privileges by PAs and NP & their level of autonomy
<b>Nelson (2016)<sup>[69]</sup></b>	Journal of Physician Assistant Education	Washington 2014	Data collected via telephone interviews or in- person and from Washington State Department of Health	Reveals that in most cases, PAs are the sole providers in rural Washington emergency departments
Abbreviations: PA, physician assistant; NP, nurse practitioner.			<sup>a</sup> Where appropriate, the author's description of Natives was replaced for Indigenous.	

	<b>WWAMI<sup>[35]</sup></b>	<b>Northern BC<sup>[11]</sup></b>
<b>Population</b>	3.5% national	6% provincial
<b>Land Area</b>	27% national	66% provincial
<b>Area Classification</b>	Predominantly rural	Mostly rural or remote
<b>Terrain</b>	Arid or mountainous	Mountainous
<b>Climate</b>	Maritime and continental	Subarctic & dry-summer subarctic
Abbreviations: WWAMI, Washington, Wyoming, Alaska, Montana, Idaho; BC, British Columbia		

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