

Needs-Based Health Human Resources Planning:

The Challenge of Linking Needs to Provider Requirements

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Abstract

Needs-Based Health Human Resources Planning: The Challenge of Linking Needs to Provider Requirements

In 2006, a comprehensive review of existing literature on needs-based health human resource planning (HHRP) was conducted in order to evaluate the current status of research in this field and to provide an overview of documented attempts to apply needs-based HHRP. The review incorporated searches of multiple computer databases for published scientific and professional reports and papers, including PubMed Central and Cumulative Index of Nursing and Allied Health (CINAHL), as well as a broader Internet search and scans of key research websites. Based on the review of these materials it was concluded that, while there is a large and growing consensus that planning for health human resources should be based on the health care needs of the populations they serve, few attempts have been made to translate these health care needs into HHR requirements. However, some recent examples of practical methods for needs-based HHR planning were identified, and the knowledge base to support them in fields such as measurement of health needs is growing. The tools for focusing HHR planning on the levels and distributions of health in populations are available where decision-makers are prepared to accept the challenge of replacing traditional use (or capacity) based approaches to HHR planning with approaches that base planning explicitly on needs for care, independent of the current levels and configurations of the supply of health care.

Introduction

The principle of population health needs as the focus for the funding, management and delivery of health care services can be traced back to the 1984 *Canada Health Act* (Department of Justice, Canada, 2006), where the primary objective of Canadian health care policy was stated to be:

“to protect, promote and restore the physical and mental well-being of residents of Canada and to facilitate reasonable access to health services without financial or other barriers.”

Hence, in the presence of limited health care resources, services were to be produced and delivered in ways that responded to needs for protection, promotion and restoration of health. Despite this clear statement of intention, the policies to support the *Canada Health Act* (CHA) and its five principles largely ignored the distribution of population health needs. The methods of funding health care tended to preserve the existing resource planning and allocation mechanisms. These mechanisms were largely focused on funding facilities and providers, irrespective of differences in population health needs either between communities or over time (Birch & Abelson, 1993). Although planning health human resources in accordance with the relative levels of needs for care among populations and the contributions of human resources in the production of care is more comprehensive than traditional methods of maintaining current (or moving towards target) provider-population ratios, it is also more complex. The aim of this report is to provide an overview of documented attempts to apply needs-based HHR planning in order to provide a reference for researchers and planners seeking to adopt and/or improve upon traditional methods of HHR planning.

Background of Needs-Based HHR Planning

As early as 1985, the World Health Organization (WHO) argued that effective health human resources planning (HHRP) must address the demographics and health status of affected populations, prevailing health problems, environmental risk factors, resource allocation, legislation and policy changes, and the development of qualitative indicators (Long & Mercer, 1987). Despite recognition that solid planning is critical, current approaches to HHRP tend to be intermittent, one-time-only estimates focusing on single disciplines, and are often plagued by faulty assumptions and violate even the most basic measurement principles (Birch, 1985; Birch & Maynard 1985; Lavis & Birch, 1997; O'Brien-Pallas et al., 2001). In particular, planning has typically been geared toward health care system utilization patterns and/or immediate fiscal commitments (Tomblin Murphy, 2004).

Utilization-based HHR planning approaches, which have been adopted in Canada and other countries (Tomblin Murphy, 2004), tend to be based largely on projecting historical utilization patterns according to predicted changes in the demographics of the population (Markham & Birch, 1997; Song & Rathwell, 1994). As Tomblin Murphy (2004) details, such methods have several limitations. First, they tend to rest on the often unfounded assumption that the current distributions of programs, services and health care providers are optimal (i.e., in accordance with the *Canada Health Act* goal of reasonable access to comprehensive care for the whole population). The demand for new health care programs and new roles for health care providers shows that these conditions are in fact less than optimal (Markham & Birch, 1997; Woodward, 1993). Second, utilization-based models assume that the level, mix and distribution of providers deemed to be appropriate remain constant. Third, they do not adequately account for the fact that utilization rates are dramatically affected by factors other than a population's need for health care such as demand and desire for services (Lavis & Birch 1997; O'Brien-Pallas, Baumann, Birch & Tomblin Murphy, 2000). Fourth, the absence of information about requirements for health care providers that are determined independent of existing supply has meant that supply data have routinely formed the basis of projections, implicitly assuming that supply equates with need, thus raising questions about the validity of projections (Markham & Birch, 1997; Woodward, 1993).

The recurrent cycles of over- and undersupply of HHR that continue to plague Canada and other countries can be traced, in part, to the fact that while the stated goal of HHR planning is usually to match human resources to need for services,

the theoretical models and empirical tools used to inform HHR allocation decisions have concentrated primarily on measuring utilization rates and their use of proxies for service requirements (Tomblin Murphy, 2004). There is growing recognition that simple models of supply and demand, based on past and current utilization patterns, are inadequate for determining future HHR requirements (Birch & Maynard 1985; Pong, 1995; Long & Mercer, 1987; Markham & Birch, 1997; Lavis & Birch, 1997; Song & Rathwell, 1994).

In contrast to utilization-based approaches, needs-based planning methods use empirical assessments of the risks to and levels of health in populations as a determinant of the health care services they require. These approaches begin from the premise that the current distribution of health professionals and health services may not necessarily reflect the distribution of health care needs in the population, and that health human resources may have to be redistributed if these resources are to be deployed efficiently and equitably (Markham & Birch, 1997; Roos et al., 1995; Evans & Mustard, 1995).

Review of Recent Literature on Need, Utilization, Service Requirements, and Needs-Based Planning Methods (in Canada and Internationally)

For the purposes of this report, an in-depth review of international, national, and jurisdictional empirical and grey literature survey was undertaken. The review included published scientific and professional publications and unpublished reports from various organizations and governments. These documents were reviewed to identify work that focused population health needs planning and its link to service requirements.

The computer databases searched to identify the related literature included: PubMed Central and Cumulative Index of Nursing and Allied Health (CINAHL). The indexes were searched using the following key words: age specific + measurement; family health teams; health care + provider + productivity; health determinants; health human resources; health services delivery; health status indicators; health surveys + planning; health workforce planning; improvements + productivity + health care; medical manpower planning; need based; need based indicators; need based + planning; population health measurement; primary health care delivery; socioeconomic indicators; temporal + changes + health status.

In addition, an Internet search was carried out using advanced search strategies and a range of search engines and meta-search engines. Key websites searched included:

- The Canadian Institutes of Health Research (CIHR)
- The Health Information Research Unit at McMaster University (HIRU)
- The Canadian Institute for Health Information (CIHI)
- The Manitoba Centre for Health Policy and Evaluation (MCHPE)
- McMaster University's Centre for Health Economics and Policy Analysis (CHEPA)
- The University of British Columbia's Centre for Health Services and Policy Research (CHSPR)
- The Canadian Centre for Policy Alternatives (CCPA)
- The Canadian Council on Social Development (CCSD)

- The London School of Economics (LSE)
- The Canadian Nurses Association (CNA)
- The Canadian Medical Association (CMA)
- The Canadian Association of Occupational Therapists (CAOT),
- The Public Health Agency of Canada (PHAC)
- The main websites of various universities
- The World Health Organization (WHO)
- The Institute for Clinical and Evaluative Sciences (ICES)
- The websites of the departments of health for British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador, and the Territories.

A recent exhaustive review of the literature (Tomblin Murphy, 2004) on needs-based HHR planning (among other topics) is particularly relevant to the subject matter of this paper. Some of the key findings of this work were as follows.

- Past health human resources planning has been based on utilization patterns, the supply of health care professionals, and budgetary capacity, rather than on population health needs and health policies.
- In Canada, HHR planning has been utilization-based, conducted on an ad hoc basis, and has varied among jurisdictions and professions. Until very recently reports on nursing HR planning, for example, from several jurisdictions in Canada indicate that nursing HR planning has been intermittent, with very few resources dedicated to developing ongoing useful and appropriate databases. Furthermore, few reports have linked the supply of nurses to population characteristics.
- Very little empirical testing of HHR planning models has been conducted, and what information is available is mostly restricted to the physician and nursing sectors. As an example, estimates of the number of required seats in entry level nursing education programs are based on supply data alone, without making analytical links to population demographics or health care needs.

- Perhaps the greatest barrier to health human resource planning in Canada has been the absence of coordinated collection and interpretation of data to address and support health human resources planning. This has meant that institutions have struggled to manage their workforces (including, in some cases, making substantial reductions) without the benefit of system-wide strategies or a centralized information system to address population health care needs.
- The three indicators of health status most often used in the planning literature include: 1) mortality and morbidity rates; 2) life expectancy; and 3) infant health indicators.
- The most reliable and valid population-based measures of need for health care services were the MOS 36-item Short Form Health Survey (Ware & Sherbourne, 1992), Health Utility Index or HUI (Furlong, Feeny, Torrance & Barr, 2001), Health-Adjusted Life Expectancy or HALE (Robine, 1993, as cited in Kindig, 1998), self-assessed health status, and Health Related Quality of Life (HRQOL) as measured by the HUI.

Through this more recent review of attempts at needs-based HHR planning, it is clear that there is substantive literature on the measurement of the health of populations and the population distribution of health care utilization, as well as the relationship between them. Most often the focus of such planning was to determine which personal characteristics (e.g., age, sex, socio-economic status, ethnicity, and health status) made a person more or less likely to use certain kinds of health care services (Eyles & Birch, 1993).

Some recent examples of needs-based planning from Canada and other countries are described below.

- Pappa and Niakis (2006) found that in a Greek population, health need, as defined by self-assessed health status, was a very strong predictor of visiting physicians, emergency departments, and in being admitted to hospitals, and that income and education were predictors of visiting public vs. private physicians.
- Stahlacke, Soderfeldt, Unell, Halling and Axtelius (2005) found that self-perceived general and oral health, as well as socio-economic factors such as education and occupation affected utilization of dental care services in a Swedish population.

- A large team of researchers at the Institute of Clinical and Evaluative Services (ICES) (2005, in Laupacis et al.) found that people living in poorer neighborhoods in Ontario were more likely than those in wealthier neighborhoods to have undergone CT scans and certain cardiac procedures, but less likely to have undergone MRI scans or hip or knee replacement surgeries.
- Allin (2006) reports that, among Canadians, those in lower income groups tend to visit both family and specialist physicians, as well as dentists, less often than those in higher income groups, but tend to be admitted to hospitals more often. She also found that self-assessed health, chronic conditions, and activity limitations were associated with greater likelihood of accessing physician, hospital, and dental care.

An important message emerging from the literature is that utilization is the outcome of the interaction of demand for and supply of services. Under systems of health care with first-dollar public funding, need for care is an important determinant of demand. However, the “market” for health care is very different from those for standard commodities. The demand for health care is heavily influenced by suppliers (e.g., physicians prescribe what treatment is required and in many cases supply that treatment based on the patient’s reports of illness or disability). In addition, needs for care only appear as service utilization if services are available and accessible. In this case, observed levels and distribution of use of services in a population do not reflect prevailing levels and distribution of needs for care in that population and so cannot be employed as a valid indicator of population needs in planning or resource allocation exercises. As a result, we need to look for direct independent measures of health or risks to health at the population level to inform needs-based planning policies. However, these need to be validated as variables that represent actual indicators of levels of need for health care services at the population level.

For example, substantial research has been produced on the use of self-assessed health as an indicator of relative levels of need for health care. Self-rated health was found to correlate with a wide range of health and socioeconomic variables at the population and individual level in a U.K. study (Birch et al., 1996). This study confirmed earlier findings of significant correlations of moderate strength between self-rated health and physician assessments, number and/or type of self reported health problems, diagnoses or chronic diseases, number of medications, acute symptoms, and various composite measures of health status based on either self reports or a combination of physician-reported and self-reported. Self-rated health has also been shown to be a good predictor of future mortality (Birch, Eyles, & Newbold, 1996).

There are some important caveats to consider when attempting to apply this research to HHR planning and policy-making. First, care must be taken to distinguish between direct measures of health status (e.g., mortality, morbidity) from indirect measures (e.g., variables with a strong correlation with measures of health status such as poverty, low education, homelessness, etc.). Direct measures will respond to effective policies aimed at improving health (e.g., better health care should reduce levels of mortality) but indirect measures will not (e.g., better health care is not expected to reduce poverty, all other things being equal). Hence, policies based on indirect measures of need will fail to accommodate changes in relative levels of need over time. Second, the validity of a needs indicator cannot be established by comparison with levels of utilization of services since, as was explained above, service utilization is not determined by need alone. If the distribution of services is inequitable, then a proposed indicator of need that correlates closely with service use would be a poor measure of need. Unfortunately, indicators of need adopted in several planning exercises have been justified using this fallacious criterion of their close correlation, either directly or indirectly, with use.

A separate challenge for needs-based planning is how to incorporate information on population health care needs into a policy process aimed at planning for health human resources. This review of the literature turned up few examples of researchers attempting to overcome this conceptual hurdle that requires consideration of the relationship between levels of need and health care service requirements and the health human resources associated with those requirements.

One such example is a study in Ontario, Canada, by Tomblin Murphy (2004), examining the relationship between utilization of nursing services and patient and system outcomes while controlling for patient health needs. In this study, logistic regression methods were used to estimate models for the incidence of utilization and a double-hurdle model was employed to account for heterogeneity in the study sample. Data from a variety of sources, including the National Population Health Survey (NPHS) and administrative databases, were used. After controlling for supply of nurses, workload, community characteristics (community level needs indicators) and hospital type, nursing hours per patient day had a significant effect on patients' length of stay: the more nursing hours recorded in a hospital, the shorter the average length of patient stays in that hospital. These findings suggest that decisions about the deployment of nursing resources are associated with differences in service outcomes. In particular, greater intensity of nursing inputs is associated with shorter lengths of stay. However there was no evidence that this resulted in poorer patient outcomes as measured by higher rates of readmission, lower levels of patient satisfaction or lower levels of self reported health. This

information was important to both health care managers and health human resources planners in their efforts to deploy efficient mixes of health care resources and identify future human resource requirements to support the efficient provision of health human resources.

In an extension of this work in Ontario to Canada as a whole, Tomblin Murphy, O'Brien-Pallas, Birch, Kephart and MacKenzie (2004) estimated the association between the number of hospital days and patient outcomes in acute care hospitals in Canada. Recognizing that utilization is influenced, in part, by non-need factors (local availability of hospital beds, local practice patterns, etc.), they used the difference between reported and expected bed days as the measure of unmet need. Expected days were estimated from data on the presence of chronic conditions and demographic factors, independent determinants of the need for services. The expected use model was estimated at the national level in order to "liberate" expected use from the influences of local availability of resources and practice patterns.

The researchers found no evidence that lower-than-expected numbers of nights of stay were associated with lower levels of health status after controlling for health needs and other population based factors.

The key difference between these two studies and those described earlier in this section is that, while all the studies provide important information on the relationships between various need indicators and utilization of health care services, the two later studies do so within a needs-based conceptual framework in order to directly inform policy makers seeking to incorporate population health needs into their planning methods. However, the authors of both studies acknowledge that the findings and methods they put forth represent a step forward in creating the capacity to perform needs-based HHR planning, rather than a complete solution to this problem.

The Development of Needs-Based Planning in Canadian Health Policy

Recently, several large, national HHR planning research bodies have produced reports supporting the adoption of needs-based planning methods for health human resources planning. These include the final report of Phase I and Phase II of the Nursing Sector Study (Sector Study Corporation, 2005), a framework for pan-Canadian HHR planning (Federal/Provincial/Territorial Advisory Committee on Health Delivery and Human Resources, 2005), the final report of the Canadian Medical Forum Task Force Two (Task Force Two, 2006), and the Canadian Nurses Association/Canadian Medical Association “Green Paper” (2005).

The Nursing Sector Study

- The Nursing Sector Study was directed by a Steering Committee comprised of representatives from the following groups: Registered Nurses (RNs), Licensed Practical Nurses (LPNs), Registered Psychiatric Nurses (RPNs), employers, unions, educators, physicians, and provincial, territorial and federal governments.
- The goal of the project was to create an informed, long-term strategy to ensure an adequate supply of skilled and knowledgeable nurses to meet the health care needs of Canadians.
- The recommendation resulting from the study that clearly indicates a commitment to align requirements for nurses based on needs of people is: *Use a Human Resource Planning Framework based on population health needs to plan for nurse resources.* It is acknowledged that nursing human resources must closely match population health needs through the following strategies:
 - By developing information systems to facilitate the collection of standardized data on population health;
 - By ensuring that nursing HHR and population health databases can be linked for planning purposes;
 - By building capacity in the area of using population health data as a resource for HHR planning in nursing.

The Federal/Provincial/Territorial Pan-Canadian Health Human Resources Planning Framework

- Developed with consultation with stakeholders across the country, the framework proposes a cross-jurisdictional collaborative approach to HHR planning, and outlines an action plan to achieve a more stable, effective health workforce.
- The vision of the framework is one of improved access to appropriate, effective, efficient, sustainable, responsive, needs-based health care services for Canadians, and a more supportive satisfying work environment for health care providers through collaborative strategic provincial/ territorial/ federal health human resources planning.
- The goals of the action plan associated with the framework include:
 1. To improve all jurisdictions' capacity to plan for the optimal number, mix, and distribution of health care providers based on system design, service delivery models and population health needs.
 2. To enhance all jurisdictions' capacity to work closely with employers and the education system to develop a health workforce that has the skills and competencies to provide safe, high quality care, that works in innovative environments, and that responds to changing health care system and population health needs.
 3. To enhance all jurisdictions' capacity to achieve the appropriate mix of health providers and deploy them in service delivery models that make full use of their skills.
 4. To enhance all jurisdictions' capacity to build and maintain a sustainable workforce in healthy safe work environments.
- The most recent version of the Pan-Canadian HHR Framework reinforces that HHR planning occurs within a health system, and is driven by health system design and models of service delivery, which, in turn, are based on population health needs.

Task Force Two

- In 1998, the Canadian Medical Forum created a self-funded working group (CMF Task Force One) to examine the issue of the shortage of physicians in certain disciplines and regions of the country. Task Force Two, a three-phase initiative that was one of the Government of Canada's sector studies in health, was launched in September of 2001.
- To better understand the factors of physician shortage, Task Force Two commissioned a number of studies and consulted with governments, the medical profession, HHR planners, other health care providers and more than 130 delegates at a national conference to carefully consider and apply the findings of their research.
- Task Force Two stressed that appropriate planning and management of health human resources is critical for ensuring that Canadians have access to the health care providers they need, now and in the future. They outlined multiple integrated strategies to be considered over the short- to long-term to strengthen and stabilize Canada's physician workforce. They argue that physician workforce management policies need to be enhanced in order to be more effective in:
 - Recruiting and retaining physicians;
 - Accommodating changing physician practice patterns;
 - Developing physician succession strategies;
 - Being flexible in planning for the most efficient mix of physicians (and other health professionals) required to provide services and support programs;
 - Managing physician growth in line with predicted population health needs; and
 - Developing information systems and human resource impact assessment tools to strengthen planning capacity.

The CMA/CNA “Green Paper”

- The Canadian Medical Association (CMA) and the Canadian Nurses Association (CNA) recently outlined ten core principles and related strategic directions in a policy report.
- The paper argues that approaches to HHR planning and management must be based on needs and people, be interdisciplinary in nature, and carried out in partnerships across both jurisdictions and sectors.
- They suggest 10 core principles and related strategic directions to guide future planning, organized under the following themes: patient centred care, planning, and life cycle, with needs-based planning as the focus on the patient-centred care.
- They reinforce that planners need to adopt a needs-based approach that anticipates the current and emerging health needs of the population that are determined by demographic, epidemiological, cultural and geographic factors.

Jurisdictional HHRP Initiatives

Reports from several provinces on future policy directions include the notion that the goal of health care planning should be to ensure the existence of a health care system that meets and is responsive to these needs (Alberta Healthy Living Network, 2006; British Columbia Ministry of Health Services, 2005; Nova Scotia Department of Health, 2005; Northwest Territories Health and Social Services, 2006). On a smaller scale, several Local Health Integrated Networks (LHINs) in Ontario have indicated a commitment to using population health needs as a guide for allocation of resources for certain initiatives (e.g., Central East LHIN, 2005; Hamilton Health District Council, 2005). However, none of these documents offers details on the methods they intend to use to conduct needs-based HHR planning.

Even though many reports at the Regional Health Authority and community level articulate the importance of planning based on needs, it seems that the measurement of these needs is not usually based on health deficits across the jurisdictions' populations. Instead, *the needs-based approaches* are more often an expression of community desires for service developments and a compilation of the services that they would like to provide. As teams of researchers and research users work to define and measure needs, the application of needs at the regional level may be more apparent.

Summary of Canadian HHR Initiatives

The Nursing Sector Study, the Federal/Provincial/Territorial Advisory Committee on Health Delivery and Human Resources (ACHDHR) Pan-Canadian Framework and Task Force Two are very similar. The reports of all three studies recommend that needs-based HHR planning be established as a national standard. Furthermore, national associations of both nurses and physicians recommend that an infrastructure for HHR planning be established, with the analytical capacity, infrastructure support, and a governance model to coordinate a pan-Canadian needs-based approach to HHR planning.

The need to implement this pan-Canadian approach at the jurisdictional and community level is consistent in all reports. Another theme that is evident in each of the reports is an emphasis on collaborative practice through interprofessional teams. Further, the need for developing comprehensive approaches to recruitment and retention of health professionals is emphasized as one of the critical issues needed to ensure access to quality health care in Canada.

In summary, there is a growing consensus across all jurisdictional levels for the use of needs-based approaches to planning of health care services, including planning for the provision of health human resources required to deliver health care services.

Recent HHR Planning Reports and Methods Acknowledging Needs

There are some in-depth HHR planning reports recently completed in Ontario (Ontario Hospital Association, 2003), Saskatchewan (Elliott, 2003) and New Brunswick (Fujitsu, 2002) that, in addition to offering detailed analysis of multiple factors affecting the health care workforce, recognize that population health needs can have a strong impact on the services required of health care providers. However, none of the reports make use of any methods that explicitly link population health needs to health care service requirements:

- The Ontario report lists population health needs as a data element available to aid HHR planning, but there is no indication that such data were used in the report.
- The New Brunswick model includes a feature that allows for an increase or decrease in provider demand in 10 per cent increments to simulate the effects of what the report terms, “weighted demand factors,” one of which may be changes in population health needs. However, this represents arbitrary shifts in estimated demands that are not based on any explicit relationship between health care service requirements and population health needs.
- The Saskatchewan report notes that recent declines in average hospital lengths of stay have meant increased average acuity among hospital inpatients, which in turn affects the services required of hospital health care providers. However, the model does not directly incorporate this into its estimations.

Although there is increased recognition of the importance of needs-based planning in policy reports, none have directly applied needs as a key planning element.

Australia

O’Kane and Tsey (2004) proposed a method of estimating the service requirements and associated costs of providing mental health specialist care in certain regions of Australia. Specifically, the five steps in their method were:

1. Determining the size and relevant characteristics (for example, age and sex) of the population in the service area;
2. Determining the level of need in the population by applying known mental illness prevalence rates to the population;

3. Determining the number of interventions by mental health professionals required by applying established levels of care to the levels of need determined above;
4. Determining the specific services required of the various types of mental health professionals by applying practice standards to the above value;
5. Calculating total service costs by summing per-service costs and then multiplying by “scale” factors for rural and other unique populations, determined empirically elsewhere.

While the authors acknowledged various shortcomings of their approach, they pointed out that it represented a significant improvement over existing methods. Indeed, their model incorporates the capacity to account for variations in the need for mental health services across populations, as well as changes in established levels of care and standard practice for mental health care providers. Traditional models that focus on provider to population ratios consider neither of these factors. Further, it seems that the methods used by O'Kane and Tsey may be applicable to other jurisdictions and/or other health care fields. However, by using prevalence rates of illness based on best available information the approach fails to include considerations of unidentified illness as well as risk factors for future illness that would be important for planning the levels and distribution of preventive programs.

The Extended Health Human Resources Analytical Framework

Birch et al. (2006) used a similar approach in the development of a formal analytical framework for translating population health needs into health care provider requirements. They identified the implicit assumptions underlying traditional provider-population approaches and expanded the simple model (required providers = provider-population ratio multiplied by expected future population) to produce an integrated framework composed of four distinct elements.

Demography: This captures the size and age distribution of the population being served.

Epidemiology: This introduces the levels and distribution of needs in the population explicitly into the framework. In this way different levels of need are incorporated into the analysis independent of the demographic mix in the population thereby separating the aging of the population from the health of the population.

Level of care: The amount of services required to address a given level of need.

Productivity: The average amount of services produced per provider.

In the traditional approach, by overlooking the influence of epidemiology, level of care and productivity, each of these is implicitly assumed to be equal across communities and constant over time. This leaves only demography which is largely immune to policy influences; as a result, health human resources planning effectively becomes a matter of simply *forecasting* the future population characteristics and responding to the requirements estimated from the simple application of provider population ratios to this forecast.

In this expanded analytical framework, the three new elements – epidemiology, levels of care and productivity – represent variables, the values of which have changed (and can be expected to change further). The framework allows us to accommodate these changes into the planning process and better understand the nature of the challenges faced in health human resources planning. Moreover, each of these three variables can be influenced to varying extents by careful consideration of the determinants of these variables. In other words, the analytical framework provides the tools by which policy makers can begin to influence, as opposed to simply respond to, developments in health human resources requirements arising from changes in these variables. In this way, the nature of the policy development shifts from one of responding to forecasted changes in exogenous (external) factors outside of our control to one of planning changes in endogenous (internal) factors under our influence.

In the case of *epidemiology*, policies that prioritize prevention might be used to reduce the incidence of certain conditions and hence change the level and distribution of needs in a population. The *level of care* for any particular need group will be determined within the economic and political context of the health care system and relates to prevailing or desired standards of service delivery. For example, if we want to institute more frequent screening of various risk factors, this increases the required services per level of need that represents a “weight” to be applied to the product of demography (population size) and epidemiology (population health). So with all other things equal, this increases the required number of providers. *Productivity* considers a variety of factors, including the intensity of work (proportion of paid hours given to patient care), how work is organized, technological inputs, and inputs of other types of professionals.

Although this approach shares many features with the approach followed by O’Kane and Tsey (e.g., both account for population size, health care needs and levels of care), the Atlantic Study is more general, accounting explicitly for provider productivity and focusing on the estimated required number of providers.

The applicability of the Birch et al. analytical framework has been demonstrated in two large HHR planning exercises. First, it formed the analytical basis for the Atlantic Health Human Resources Planning Study (Birch et al., 2005). The goal of the study was to carry out a comprehensive investigation of the regional requirements for health professionals in Atlantic Canada together with the regional requirements for educational/training programs. The analytical framework was used in the design and implementation of an HHR simulation model designed to:

- Simulate the supply of health providers currently in various sectors and those emerging from education/training programs, provincially, regionally, and nationally in the future;
- Model the need for health care providers as measured through population health and other data;
- Model the gap between the supply of and need for health care providers; and
- Test various policy scenarios and conduct sensitivity analyses to compare the effectiveness of various policy scenarios in dealing with the gap.

The model consists of four components linked together.

1. The **training module** focuses on estimating the flow of graduates into the provider stock. Some important variables factored into the training module include the number of seats in training programs, the length of such programs, and the attrition rates of such programs.
2. The **supply module** estimates the future size of the stock of providers available. It depends on such factors as new graduates from training programs, providers arriving from other jurisdictions, and providers leaving practice due to retirement or other reasons.
3. The **work and productivity module** accounts for variation in the activity and productivity of providers by incorporating such factors as the distribution of worked hours by all providers, as well as the average number of services performed by providers, into the model.

4. The **needs module** is, in a way, a mathematical representation of the relationships described by the analytical framework. Implementing the analytical framework in a series of spreadsheet applications, the needs module incorporates data from health surveys and administrative health care databases and translates data on indicators of health needs into actual numbers of services required from various types of health care providers. The health needs indicators used varied according to the type of health care providers being simulated. For example:
- Self-assessed health status was used as an indicator of need for both family physician and acute care nursing services.
 - Prevalence of asthma and other respiratory illnesses was used as an indicator of need for respiratory therapists.
 - Household income adequacy was used as an indicator of need for community care nursing services.
 - Prevalence of speaking difficulties was used to quantify need for speech language pathologists.
 - Combined prevalence of diabetes, cancer, and heart disease (conditions which require frequent use of laboratory services as part of treatment) was used as indicators of need for medical laboratory technicians.
 - Prevalence of hearing difficulties was used to measure need for audiologists.

The module for modeling health care service requirements is designed to be a practical application of the analytical framework developed by Birch et al. (2006). The required numbers of health care services were estimated by the following process.

1. Measuring the size and demography of the relevant population using Statistics Canada population estimates.
2. Estimating the level of need (in a manner of speaking, the number of “cases”) in the population using a variety of indicators (as described above) measured by the Canadian Community Health Survey (CCHS).
3. Estimating levels of care (in a way, the number of services required per “case”) from historical utilization data (with the option to substitute actual care standards where available).

4. Multiplying the estimated level of need by the levels of care, generating an estimate of the total number of health care services required by the population.

At the time the model was designed, some data elements necessary to run simulations were not available and had to be estimated or assumed based on incomplete data, stakeholder consultations, or other methods. However, the model was designed in such a way that updated or improved data could easily be incorporated into its workings. Further, as it was recognized that evolving knowledge on measuring needs could necessitate changing the need indicators used for each profession, this capacity is also a feature of the model.

Canadian Nurse Practitioner Initiative: HHRP Model

In the Canadian Nurse Practitioner Initiative (CNPI) (Tomblin Murphy, 2005) a framework for primary health care nurse practitioner (PHCNP) planning was developed that is responsive to the changing health needs of the population and the particular roles in which nurse practitioners can be deployed as part of primary health care provision. This project involved a series of stakeholder focus groups to establish the planning assumptions for deployment of members of the NP profession. Building on these assumptions, the HHR planning process was simulated using a model that tested the effectiveness of various human resource policies aimed at eliminating the gap between providers supplied and providers required. This needs-based HHR planning model has served to inform policy directions and decisions across the country.

The focus of this work was on primary care and the competencies that made PHCNPs a valuable resource for primary health care service provision. Planning assumptions were used to guide this work. For example, the planning process for emergency department care matched the Canadian Triage and Acuity Scale (CTAS) level of patient groups with the competencies of NPs to determine the proportion of emergency services that could be provided by NPs. The need for emergency care for higher CTAS level patients would then be an appropriate focus for physician planning. In this way different types of providers are viewed in terms of their contributions to an overall program of service delivery within a service sector, in this case emergency care.

A similar approach was used to plan for sharing the primary health care requirements of residents of long-term care facilities between NPs and family physicians. Based on empirical evidence it was deemed that PHCNPs could

assume 80 per cent of the care in long term care that is often delivered by physicians. However, the assumption was made that management would actually deploy PHCNPs to deliver 80 per cent of the care. These assumptions were not the outcome of any shared plans with physician organizations. Nevertheless, the analytical framework provides a methodology for using the outcomes of either or both of these activities as inputs into human resource planning processes. Like the more general models used in the Atlantic HHR Planning Study, the CNPI model takes into account population health needs, productivity and activity levels of health care providers, and migration of health care providers. Because it is more specialized than the Atlantic models, it is also able to incorporate factors unique to nurse practitioners, including a module accounting for training equivalency.

International Collaborative HHR Planning

Tomblin Murphy, Campos et al. (2007) are leading an international team to carry out a four-year innovative program in health systems and health human resources planning that will enhance health systems through health human resources planning for primary health care based on the needs of populations. It is a partnership among institutions, policy makers and researchers from Canada, Brazil, Peru, and Jamaica together with the Health Human Resources program of the Pan American Health Organisation (PAHO) and the World Health Organization (WHO) Human Resources for Health Unit. This program is aimed at building capacity to address critical issues in HHR planning in the partner countries, in the context of the dynamic and complex nature of population health needs. The team will develop and test planning tools customized to reflect values, policies and prevailing circumstances of the individual partner countries to estimate the supply of, and needs-based requirements for, the range of health care providers to support primary health care teams in the short-, medium-, and long-term. By engaging stakeholders in each country, it will build capacity not only to develop, apply and sustain needs-based planning but also to transfer knowledge of needs-based planning to other countries. Each country will determine health status indicators pertinent to both planning for primary health care and evaluating the impact of primary care teams and appropriate governance structures on the health of populations.

It is important to note that the indicators of need we have described here are just that: indicators of need. That is to say, it is recognized that they do not measure the entirety of the health needs of a population. Rather, they are used as a means of comparing the relative levels of need across populations. It is also important to

be aware that these indicators may have other limitations. For example, measures of prevalence of certain illnesses that tend to be under-reported, such as diabetes and mental illnesses, may not fully capture the true burden of these conditions. That said, incorporating these measures into mechanisms supporting HHR planning nonetheless represents a dramatic improvement over traditional approaches. Further, planning methods that account for changes in illnesses that are preventable to some degree allow policy makers to better estimate the potential benefits of health promotion programs and other preventative initiatives.

Summary

While there is a large and growing consensus that planning for health human resources be based on the health needs of the populations they serve, few researchers and research users have attempted to translate population health care needs into HHR requirements. That said, some practical methods for needs-based HHR planning have been proposed, and the knowledge base to support them, in fields such as measurement of health needs, is growing more and more expansive. For policy makers willing to undertake the challenge, the tools with which to focus HHR planning on people's health needs do indeed exist.

The Way Forward: Supporting a Consistent Pan-Canadian Approach to Needs-based Planning

The dynamic nature of both the level and distribution of needs in a population and the means by which these needs are addressed present major challenges for health care planners and policy makers. Under such circumstances we cannot expect “point-in-time” reports on health human resource plans to address the problems facing health care systems either effectively or in a timely fashion. Planning for health systems and the required health workforce based on needs requires a commitment to ongoing inquiry to determine the impact, if any, of changing delivery systems and the deployment and utilization of the workforce on health, system, and provider outcomes. As a result, health human resources planning should be informed by ongoing research in which planning for HHR becomes an iterative process benefiting from feedback from policy learning and the capacity to incorporate unforeseen developments in needs for care and service delivery, as well as unanticipated shocks to the system (e.g., the long-term impact of the SARS outbreak on the delivery of health services). Some argue that the credibility of the research process should be viewed as being “third party,” that is an independent research and evaluation body separate from both government and the professional associations. An independent research unit for health human resources planning with an advisory board of stakeholder groups would provide one possible model. In such a model, the ACHDHR, professional associations (e.g., CNA, CMA, and HEAL [a coalition consisting of over 30 national professional and employer groups]), employers, educators, unions, and consumer groups would be advising this process in an advisory capacity. Even though the authors of many reports have argued for a pan-Canadian mechanism to carry out interprofessional, multi-stakeholder HHR planning, the best mechanism for planning and the leadership and potential partners required to carry out this function have not been well articulated. The Canadian Nurses Association, the Canadian Medical Association, the Canadian Healthcare Association and HEAL have commissioned the Canadian Policy Research Network to investigate options for such a mechanism(s). This work is ongoing.

The unit focus should be national as opposed to provincial/territorial. Mobility of both patient and provider populations means it makes little sense to engage in health human resource planning initiatives at the level of individual provinces. Although jurisdictional responsibilities and boundaries need to be reflected in the nature of policy responses, these responses should be the result of careful evaluation of needs for and supplies of human and non-human resources in a national context. For example, a small jurisdiction within a large country cannot be expected to “manage” health human resources policy alone, given that its ability

to retain locally trained providers is largely determined by the demand for these providers by its larger neighbours. Moreover this simply increases costs to all jurisdictions as remuneration rates are increased as available human resources move over time to the highest bidder. In the same way, training of health care providers might be more effectively managed through a national program as opposed to leaving multiple jurisdictions to fulfill their own requirements, either through training programs within the jurisdiction or through purchasing arrangements with training programs in other jurisdictions.

The current Canadian model for planning health human resources is atypical in a broader international context. The international analogy for the current Canadian approach would be the development of health human resources planning for Maine (U.S.A.) or Manchester (U.K.).

It is important to acknowledge that a key feature of health human resources planning is the “derived” nature of the requirements for health human resources. Health human resources are required as a result of (1) their contribution to the provision of health care services and (2) the role of those health care services in meeting the health care needs of populations. However, these two elements of health human resource requirements are dynamic concepts:

- Health care systems are not static institutions that remain fixed over time. Instead, the ways in which health care resources are deployed and health care services delivered develop continually over time in response to ongoing research and development and fiscal pressures to make best use of the resources devoted to health care. For example, the introduction of laparoscopic surgical techniques has changed the process of care, and hence the resources required to provide care for particular types of surgical patients.
- The levels, nature and distribution of the health care needs of populations change over time. In some instances, these changes will evolve slowly with the incidence of conditions responding to changes in the level and distribution of health determinants (e.g., the prevalence of smoking). In other cases new conditions may occur in populations and spread through those populations at a rapid rate (e.g., HIV/AIDS, influenza strains, etc.).

As a result, planning frameworks need to be responsive to change in a timely way. The principal concept that brings together provider supply and population need is health care services. Given constant changes in both the nature of service requirements and developments in service delivery and advances in medical

technology, it is important that planning and management processes be sensitive to these changes and provide the appropriate capacities to enable the health care system to respond to change rather than constrain it. The failure of one aspect of planning or management to accommodate change in a timely way will compromise system response to change, even though other aspects might accommodate change to some degree. For example, the potential productivity gains offered by training providers to work in collaborative teams will not be realized if regulatory frameworks do not support collaborative practice. Similarly, the onset of new ways of treating diseases generated by technological advances requires the capacity to change training programs and regulatory provisions to enable appropriate responses to the advances in medical knowledge.

The derived nature of human resource requirements also implies that the planning mechanisms for HHR need to be harmonized, both across different human resource categories involved in the provision of health care services as well as across human and non-human health care resources. Planning for a particular human resource in isolation has no value where that human resource relies on other resources, both human and non-human, to deliver care efficiently and equitably.

Similarly, planning must be harmonized across jurisdictions. Constitutional arrangements set out in the 19th century apportion responsibility for health care primarily to provincial and territorial governments. Jurisdiction-specific policies are only appropriate where systems of health care are completely separate. Canadian health care systems have a high level of interdependency. For example, larger, more prosperous provinces have greater capacity to train, attract and retain providers from smaller jurisdictions. The ability of smaller provinces/territories to recruit and retain health care providers depends not only on their own policies, but also on the policies of other provinces/territories. Jurisdictional interdependence is not simply an external constraint on provinces. On the contrary, the defining federal legislation covering health care provision (the *Canada Health Act*) identifies inter-jurisdiction relationships as a key principle (portability of benefits). However, only limited attention has been given to harmonizing policies across jurisdictions in recognition of this interdependence to deliver the promise of portability.

The importance of harmonized planning among jurisdictions is particularly important in order to create capacity to respond to pandemics or other emergencies. In these cases it is not just the population of that province that is exposed to risk. In this way delivering health care under fourteen or more independent health care systems as observed in Canada may be inconsistent with the efficient use of health care resources. Such harmonization of planning and management is already occurring in the European Union in recognition of these challenges.

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