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Health Human Resources Modelling: Challenging the Past, Creating the Future

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KEY IMPLICATIONS FOR DECISION MAKERS

PROJECT 1

- Health human resources planning must be needs-based and outcomes-directed.
- Health human resources planning should not assume that healthcare needs in the population remain constant by age and sex, even for forecasting models that focus on short 10-year planning horizons. These results clearly show that the planning models that assume future need for health human resources can be estimated solely on the basis of projected size and age-sex distribution of the population are based on faulty assumptions.
- Changes in population health needs over time are complex. The changes observed in the level and age progression of need for health services by age varied depending on indicator of need used. Some types of needs are decreasing while others are increasing. Patterns of change in health needs vary by sex, age group, education and place of residence.
- Consistently measured indicators of health needs that are systematically collected through period population health surveys are required to model changes in population health needs over time. Ongoing changes in the content, question wording and coding of population health surveys dramatically limited the range of health need indicators that can be used to guide planning.

PROJECT 2

- Levels of employment of other hospital staff was significantly associated with nursing productivity, suggesting that the required number of nurses will depend on other hospital inputs.
- In the case of nursing inpatient care over a three-to-four-year period, the rate of service output has changed, with both the direction and rate of change differing among provinces.

PROJECT 3

- Individual, job and employer characteristics lend insight into nurses' career intentions.
- *One size fits all* retention strategies may not be preferred by nurses along different career paths, in different jurisdictions and of various ages. Policy initiatives need to be tailored to re-attract former nurses and to retain current nurses.

EXECUTIVE SUMMARY

Governments and managers are challenged to ensure that adequate and efficient nursing services are delivered to meet the health needs of Canadians and to support health-system goals. Concerns about nurse supply need to be analyzed with consideration of changing population health needs, the efficient delivery of health services and the workplace concerns of providers. Traditional approaches to health human resource planning have relied on applying current provider-to-population ratios to projected future populations; however, these approaches fall short as changes in population health needs and in provider productivity are not taken into account. Guided by the conceptual framework for health human resource planning developed by O'Brien-Pallas, Tomblin Murphy and Birch (2005), this program expands existing demographic-focused approaches to health human resource planning by moving beyond considerations of supply and utilization towards an examination of the broader social, political, economic, geographic and technological influences on the health system.

Three separate but related projects were undertaken to link population health needs to health human resource planning, to illustrate the value and challenges in using health human resource data to inform policy decisions on nursing productivity and to generate evidence based retention policies to guide nursing workforce sustainability. Using health survey data, project 1 explored the level, distribution and patterns of health indicators by demographic and social strata. In project 2, productivity was studied by analyzing select acute care nursing services using Management Information Systems data for nursing hours and other inputs and Discharge Abstract Database data for inpatient episodes of care and severity. Project 3 surveyed former nurses and registered nurses across six Canadian jurisdictions.

Project 1 demonstrated that, not only have years been added to life, but also life to years. The effect of age on health has changed over time. Regression results showed significant differences in the level and age progression of health status and health risks, even over a period of 11 years. For example, 65 year olds *on average* today can expect to be healthier, and hence have fewer healthcare needs, than 65 year olds *on average* 11 years ago. To assume that health needs by age remain constant is incorrect, even for forecasting models which are often limited to a 10-year time horizon. The results also revealed considerable

complexity in the patterns of this change. The effects of year of birth varied by health indicator and by risk factor. In younger cohorts, rates of mortality, mobility, pain and smoking were decreasing, but chronic conditions and blood pressure were increasing. Those with less education were more likely to experience health problems. Although older cohorts showed a widening gap between those with low and high levels of education, the difference for younger cohorts remained fairly stable. Understanding the complex relationships between health, age and birth year as well as social indicators is vital to ensure accurate and efficient planning for future health human resources requirements. Direct independent measures of health and health risks at the population level are needed to adequately inform health human resource planning approaches.

Project 2 examined the role of productivity in health human resource planning. Productivity refers to service rendered per unit of time worked by the healthcare provider. Productivity does not mean that providers work more hours; rather, it means that providers generate more service per hour worked. Improvements in the productivity of health human resource provide a source of increased output in the healthcare sector. Findings indicated that, in the case of inpatient nursing care over a three-to-four-year period, the rate of service output has changed (as measured by severity-adjusted inpatient episodes of care) and that the direction and rate of change have differed between provinces. The employment levels of other staff were also significantly associated with the average productivity of nurses. As such, the required number of nurses to deliver a planned level of service (or manage a particular patient mix) will depend on the configuration of other hospital inputs (it is context specific) and on the methods of production. Plans to change other inputs (such as number of beds) must consider implications for nurse human resources requirements to achieve desired levels *of services*.

In Project 3, individual, job and employer characteristics that influenced job satisfaction, intent to retire early and risk of leaving the profession among registered nurses were examined. Nurses identified preferred policies that would attract and keep them in the profession longer. Appropriate workload, benefits packages, better salary, support for continuing education and improved work environment were very important policies for all nurses. However, policies need to be tailored to particular sub-groups. For instance, nurses over age 50 and those intending to retire early highly valued managerial support. Ontario

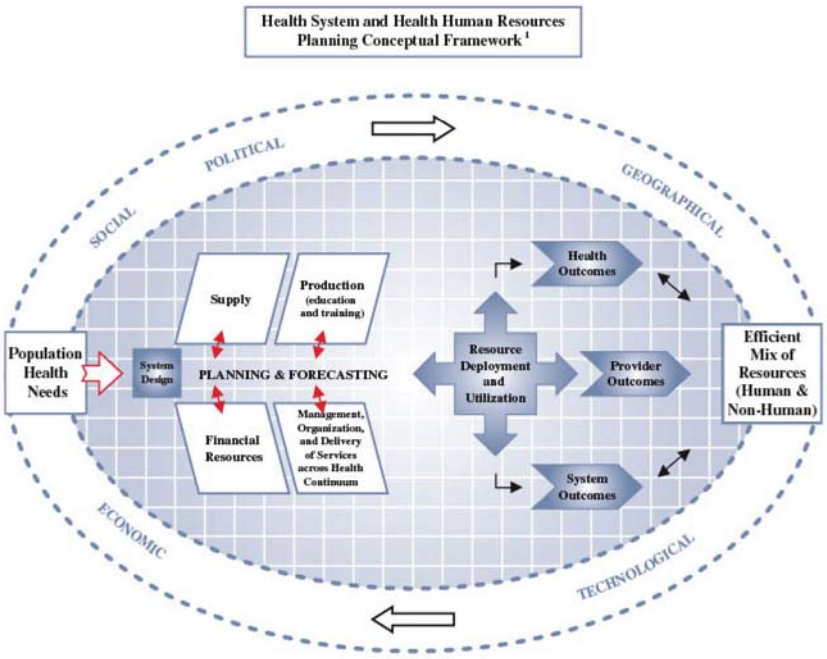
nurses at risk of leaving would welcome greater availability of the types of positions they were seeking. Nurses under age 35 in Saskatchewan and the Atlantic region valued full-time employment. Former nurses reported leaving the profession as a result of poor work environments, personal health issues and career opportunities outside of nursing. Almost one-third of former nurses continued to work in healthcare. Policies that would attract former nurses back into nursing included appropriate workload, better salary and improved work environment. Those under age 35 particularly valued full-time employment whereas those in mid-career prioritized workplace safety.

Policy makers can improve estimates of required health human resource by incorporating population health needs, productivity analyses and evidenced based policy strategies tailored for providers. Models, practices and strategies for health human resource planning that are needs-based, outcome-directed and that recognize the complex and dynamic nature of the factors that impact these decisions need to be supported. To do so requires partnerships, analytical capacity, ability to access and link data with sustainable infrastructure, as well as ongoing evaluation to determine how changes in system delivery and in roles for healthcare providers influence health, system and provider outcomes.

OVERALL CONTEXT OF THE PROGRAM

This program involves partnerships between decision makers, policy makers and researchers from Ontario, Nova Scotia, Newfoundland and Labrador, Prince Edward Island, New Brunswick and Saskatchewan. Our goal was to enhance existing demographic-focused approaches by explicit consideration of the following interrelated sub-themes: 1) **population health**: changes in the levels and distribution of health over time; 2) **nursing and the healthcare production function**: changes in the contribution of nursing inputs to healthcare delivery over time; and 3) **nurse retention**: changes in the opportunities and constraints facing qualified nurses and understanding decisions and intentions to leave or remain in the nursing profession. This program was guided by the conceptual framework for health human resource planning developed by O'Brien-Pallas, Birch and Tomblin Murphy (see figure 1 below). Three constructs of the framework are examined. Population health needs were examined in project 1. Nurse utilization was the focus of project 2. The relationships of management, organization and delivery of services across the health system and provider outcomes were examined in project 3. This research advances what is known about understanding the health needs of people, the productivity of workers and evidence-based policies for retention of workforce stability. Traditional approaches to health human resource are challenged and future courses for action are provided.

FIGURE 1. HEALTH SYSTEM AND HEALTH HUMAN RESOURCE PLANNING



[1] O'Brien-Pallas, Tomblin Murphy, Birch, 2005 (adapted from [1] O'Brien-Pallas, Tomblin Murphy, Birch & Baumann, 2001, and O'Brien-Pallas & Baumann. 1997)

PROJECT ONE

CONTEXT

Health human resource planning has typically been a demographic exercise focusing on the size and age-sex mix of provider and patient populations.[1,2] This approach does not explicitly account for healthcare needs but simply assumes that the size and age structure of the population adequately determines service needs. Is this a reasonable assumption?

Although the prevalence of health problems and risk of mortality increase with age, evidence indicates that the progression of health problems with age and the average age of death is changing. The distribution of health status by age in part reflects the life experiences of persons born at different points in time (cohorts). Different cohorts experience different patterns of exposure to social conditions, infection and lifestyle risks (such as smoking) over their lives, resulting in differences in longevity, morbidity and disability experiences in adulthood and old age.[3-7]

However, the time horizon for most health human resource planning models is generally no more than 10 years, which is much shorter than the cohort effects that have been investigated in the population health literature. Is it reasonable to assume that healthcare needs by age are constant in such models? This project investigated this question by examining whether health status by age is changing across different birth cohorts over the much shorter timeframes routinely used in forecasting models. For example, are people born more recently healthier at age 70 than those born in earlier years? Are people born more recently aging more slowly than those born earlier, as measured by the rate of progression of health problems with increasing age?

Research Questions: 1) What are the changes in levels of health by age and sex over time? 2) How do these changes compare across social groups? 3) What are the determinants of change that can be used to estimate changes in healthcare needs?

IMPLICATIONS

1. Health human resource planning should not assume that healthcare needs in the population remain constant by age and sex, even for forecasting models that focus on short 10-year planning horizons. These results showed that health human resource planning models which assume that future need for health human resource can be estimated solely on the basis of projected size and age-sex distribution of the population are based on faulty assumptions.

2. Changes in population health needs over time are relatively complex. The changes observed in the level and age progression of need for health services by age varied depending on indicator of need used. Some types of needs are decreasing while others are increasing. Moreover the patterns of change in needs varied by sex, age-group, education and place of residence.

3. To model changes in population health needs over time requires consistently measured indicators of health need that are systematically collected through periodic population health surveys. Ongoing changes in the content, question wording and coding of population health surveys dramatically limited the range of need indicators that can be analyzed.

APPROACH

To test whether the level and progression of health status with age between birth cohorts (people born in different years) are changing significantly over a decade, survey data from various years were used. The National Population Health Survey and the Canadian Community Health Survey, both population-based health surveys released by Statistics Canada, were the main data sources. Although separate surveys, the community health replaced the population health survey for cross-sectional analysis of health indicators across Canada. Utilizing the population surveys for 1994 and 1998 and the community surveys for 2001, 2003 and 2005,

this study spans an 11-year, relatively recent time period. These survey data were supplemented with mortality information from Vital Statistics through Statistics Canada.

By using multiple health surveys, the level and age progression in health between 11 single-year birth cohorts were compared. This is illustrated in figure 1 of Appendix C. The columns with bolded labels indicate the years for which survey data were usable. Birth cohorts (people who were born in the same year) are represented by diagonals in the figure. To determine the "level" of health status, and how this differed by age across health cohorts, comparisons were made across the rows in figure 1. For example, are 65 year-olds in cohort B healthier than 65 year-olds in cohort A? To determine if the age progression of health varied across cohorts, comparisons were made across diagonals. For example, is the rate of progression of health problems between the ages of 65 and 70 in cohort A faster or slower than the rate of progression for cohort B?

Changes in the level and age progression of both health status (research question 1) and direct determinants (risk factors) of health status (research question 3) were compared across birth cohorts. The population and community health surveys provided a broad range of information with which to measure health status and risk factors, but indicators were limited to those that were measured in an equivalent way across all of the surveys. Many measures could not be used because of changes in the wording of questions or because questions were not asked in some years. As a result, the list of indicators was relatively short. Health status indicators included mortality, mobility problems, pain, poor self-reported health and diagnosis of one or more of four chronic conditions (diabetes, chronic obstructive pulmonary disease, cancer or heart disease). The diagnoses of high blood pressure, smoking and hazardous drinking were included as health risk factors. Detailed definitions of these indicators are in Appendix D.

Changes in the level and age progression of health status and health risks between birth cohorts by social groups (research question 2) were also investigated. The analysis was limited to two measures of social group because of changes or lack of comparability in variable definitions between surveys and sample size requirements. The two measurements analyzed were education and residence in a census metropolitan area.

Appendix A includes a detailed description of the methods of analysis. In summary, data were used from all of the surveys to create a dataset that contained information corresponding to figure 1 in Appendix C for each health indicator. The data were analyzed using linear regression models to isolate changes in levels from changes in age progression. The analyses described how the mean of each health status or health risk indicator varied by age, birth cohort and social group. The dependent variable in each regression was an indicator of health status or health risk factor. For research questions 1 and 3, the independent variables included age and birth cohort. For research question 2 an indicator for social group (education status or metropolitan residence) was also included as an independent variable. Separate regression models were estimated for males and females and for each health status or health risk indicator.

Since health problems are relatively rare in younger adults, and sample sizes for those 85 and older are small, the analysis focused on 55-84 year olds. Separate models were run for 10-year age groupings of 55-64, 65-74 and 75-84 to test for differences in those relationships. For the health risk models, the analysis examined those aged 25-55 as the negative health effects of smoking and excessive drinking are often not felt until decades later.[8]

RESULTS

Tables 1-15 in Appendix B show the health and health risk indicators by age, sex and cohort. Health problems increased with age, but health risks (smoking and hazardous drinking) decreased with age. While these tables give an overall picture, the effects of aging are not disentangled from effects of cohort, like in regression models.

Overall, the regression results showed significant differences in the level and age progression of health status and health risks, even over a period of 11 years. Thus, to assume that needs by age remain constant is incorrect, even for forecasting models which are typically limited to a 10-year time horizon. These results also revealed considerable complexity in the patterns of this change.

Not surprisingly, the level of mortality and the rate at which mortality increases with age is slower in cohorts born more recently. This is consistent with increases in life expectancy and concentration of mortality at the oldest ages. Figure 2 in Appendix C shows the regression results revealing this trend. The bottom panel shows the relationship between age and mortality for those born in 1924 is steeper than those born in 1935, although both increase with age. For the older cohorts, the age progression is stronger than for those born more recently.

Figures 3 and 4 in Appendix C illustrate the results for mobility problems and pain which show a very similar pattern. Changes in the level are fairly flat, particularly for the 65 year olds. The bottom panel indicates that older birth cohorts are aging faster than those who are younger. With each year of age, those born more recently are less likely to report mobility problems or pain which may suggest less patient-initiated healthcare visits. Figure 5 in Appendix C shows the same age progression of reporting poor health for those born in 1935 as for those born in 1924. Unlike mobility problems and pain, those born more recently are equally as likely to report poor health as they age.

The analysis indicates that those born in more recent years are more likely to report having been diagnosed with a chronic condition and high blood pressure. There are increases in the levels over time and in the age progression. It is important to note that these are diagnosed conditions implying that utilization of the healthcare system is getting mixed in with need. Older birth cohorts may be less likely to see a healthcare provider and, therefore, may be less likely to be diagnosed. As well, individuals are living longer with chronic conditions and high blood pressure which results in higher prevalence rates for these conditions in more recent years. Finally, obesity is on the rise along with increased efforts to have blood pressure monitored, leading to higher detection rates.

Rates of smoking and hazardous drinking are both declining with age for our 25-54 year old sample. However, if those born in 1954 are compared to those born in 1965, the decrease in smoking with age is faster for those born in 1954. Males show a similar pattern for hazardous drinking with younger birth cohorts showing a steeper progression with age. Hazardous drinking is declining with age for females but at the same rate across birth years.

This study indicates that those with less education are more likely to experience health problems. However, is the relationship between these social groups and health changing over time? Even over a short 10-year period, results for mobility problems and pain suggest a shifting relationship as indicated in figures 10 and 11 in Appendix C. Older cohorts show a widening gap between low and high levels of education while the difference for younger cohorts remains fairly stable. Residence in a census metropolitan area, the second social indicator, has its strongest effect in the risk behaviour models. Those 25-54 years of age are less likely to smoke or engage in hazardous drinking if they live in a census metropolitan area. Further, the gap across ages between these groups differs among birth cohorts as indicated by figures 12 and 13 in Appendix C.

The analysis shows that health needs are changing over time in Canada. Understanding the complex relationships between health, age and birth year as well as social indicators is vital to ensure accurate and efficient planning for health human resources requirements in the future.

PROJECT 2

CONTEXT

Health human resources planning has traditionally been based on the extrapolation of provider-population ratios to expected future populations[9] with analyses focusing on the impact of demographic change on individual healthcare professions.[10-17] As a result, the process is restricted to analyzing the impact of demographic change on the capacity of the health workforce relative to the size of the population being served and involves implicit assumptions of constant levels of both healthcare productivity and age-specific health status. Birch et al.[18] argued that healthcare services are produced by the combination of various human and non-human resources (or factor inputs), and that the quantity (and quality) of healthcare services will depend on the level and mix of inputs used and the methods of production (or technologies) employed.

IMPLICATIONS

Two important implications emerge from analyzing health human resources as part of the healthcare service production process:

1. The rate of productivity of a particular input will depend on the levels of other types of inputs. For example, changes in the use of dental auxiliaries in the U.K. were found to be associated with[19] substantial increases in dentist productivity.
2. The required number (and type) of health human resources is derived from the required level of services and the availability of other human and non-human resources. For example, Richardson et al.[20] considered the implications of employing non-physician personnel for the required number of physicians.

Birch et al.18 found that hospital-based nurse productivity, measured by the average number of inpatient episodes of care per full-time-equivalent nurse, was determined by both the bed capacity of the hospital and the average severity level of the inpatients. Production functions, which set out the mathematical relationships between the levels and mix of different inputs and the levels of service outputs, have been largely overlooked for the purpose of deriving health human resource requirements and developing plans for meeting those requirements. For example, over the last decade a substantial literature has emerged on the application of advanced estimation techniques (Data Envelopment Analysis and Stochastic Frontier Modelling) to the measurement of performance of healthcare systems[21-8] or individual elements of those systems.[26,29-40] Unlike regression models which are designed to explain observed variations in the dependent variable (such as outputs) in terms of variations in independent variables (such as inputs), these advanced methods are concerned with identifying the maximum level of outputs for given levels and mixes of inputs (or the minimum level of outputs required to produce a given level of outputs). In this way the level of inefficiency can be measured for individual production units (such as hospitals). However, to date these approaches have not been used in the context of health human resources planning. Yet such approaches would offer an opportunity to identify health human resource requirements within the context of the planned service levels and the availability of other healthcare inputs.

APPROACH

Research question 1: Has the average rate of nurse productivity changed over time by province and are these changes the result of changes in average needs of patients? The Discharge Abstract Database was used as the source of data on inpatient episodes of care. No data were available for patient severity for emergency department and outpatient/clinic visits, so the analysis was restricted to inpatient services. Nursing hours for inpatient care were taken from the Management Information System database. Data were not available for nursing hours separately for registered nurses or registered practical nurses for the earlier years of the study period, so the analysis is based on the combined nursing inputs. Data on worked hours were used, since benefit hours do not represent time that nurses are available

for service delivery. Inpatient nursing hours were given by the aggregate of hours across medical/surgical, obstetrics, pediatrics, intensive care and psychiatric units. Separate measures of nursing inpatient administration, housekeeping and diagnostic and therapeutic services were used for non-direct nursing care inputs. Total worked hours per year by were divided by 1,950 to provide an estimate of full-time-equivalent nursing hours. Capacity was measured as the number of beds for each hospital. The number of inpatient episodes was weighted by the Resource Intensity Weight score for inpatient cases. Average weight scores were calculated for each of five age groups (0-4, 5-19, 20-64, 65-74, 75+) and then multiplied by the total number of inpatient stays by patients in each of these age groups to allow for inter-provincial and inter-temporal differences in the age and severity mix of inpatients. Problems with data availability and quality meant that the analysis was restricted to three provinces: New Brunswick, Ontario and Prince Edward Island.

Research Question 2: What factors (inputs) explain the observed variation in adjusted episodes of care among hospitals and over time? Variations in average nurse productivity were explained in terms of the levels of other hospital inputs using regression models. The other inputs considered as possible determinants of nurse productivity include the hours of administration, the hours of diagnostic and therapeutic staff and the number of funded hospital beds.

Research Question 3: What is the number of full-time-equivalent nurses required to support the efficient production of a planned level of service delivery for a given availability of other human and non-human resources? Data Envelopment Analysis is used to estimate the efficiency of hospitals across provinces by comparing performance with a best practice frontier, made up of those hospitals performing efficiently relative to others in the sample.[41] Because of large variation in hospital sizes a variable returns to scale model is used. In order to derive target levels of nursing inputs for particular levels of throughputs we would require data on the inputs and outputs for an extended study period. Unfortunately more recent data on outputs were not available. Moreover, it was not possible to include P.E.I. in the analysis for this stage because of the small number of hospitals in the province. Given these data limitations we were limited to estimating overall efficiency scores for acute hospital inpatient services over the period 1998-2001.

RESULTS

Table 1 in Appendix E reports the levels of and changes in inpatient episodes and service inputs over the four-year period 1998-2001. Episodes per full-time equivalent nurse fell in all three provinces over this period. However, adjustment for severity reveals that the reduction in episodes per nurse was largely the result of an increasing severity level of patients admitted to hospital. In Ontario, adjusted episodes per nurse fell by less than one percent over the four-year period, while in New Brunswick, productivity of nurses increased by more than five percent. Although productivity was four-percent down in P.E.I. over the three-year period to 2001, this was only 50 percent of the unadjusted change in episodes per nurse, indicating that all three provinces had to accommodate a substantial increase in patient severity over this period.

The study timeframe was a period of economic growth and loosening of the fiscal constraints of the mid-1990s. In Ontario, hospital bed closures of around 20 percent had led to pressures on nurses to deal with a smaller but more resource-intensive inpatient population while reducing average length of stay. The increase in nursing inputs in Ontario of almost 10 percent over the study period may therefore reflect the relaxation of this pressure to address problems of nurse recruitment, retention and burnout.

Despite a modest increase in the number of beds in Ontario, productivity per bed increased. In other words, although increases in nurse productivity were not substantially evident over this time, the increased levels of nursing input were employed in ways that supported both an increased number of beds and an increase in throughput (severity-adjusted caseloads). In the case of New Brunswick, both adjusted episodes per nurse and adjusted episodes per bed

increased. The P.E.I. data were based on only two acute-care hospitals and indicate that the rate of reduction in adjusted episodes exceeded the rates of reduction in nursing hours and beds, implying a reduction in average productivity.

Table 2 in Appendix E presents the estimated coefficients on non-nursing inputs in the regression equation explaining variation in average severity-adjusted inpatient episodes per full-time-equivalent nurse. Two different models are presented, with model 2 including a "beds-squared" term to allow for non-linearity in the relationship between nurse productivity and beds. Both beds and diagnostic/therapeutic staff were significantly associated with differences in average productivity. However, although, a greater number of beds was associated with higher average nurse productivity, higher levels of allied health professional staff were associated with lower average nurse productivity. A possible explanation is that higher levels of allied health staff may be associated with more investigations and procedures, hence imposing more demands on nurses and extending inpatient lengths of stay. This finding may be associated with better patient outcomes, but in the absence of any direct measure of patient health status, investigating this further was beyond the capacity of this study.

Changes in average productivity over the period of study were not evident. However, average nurse productivity was less in both New Brunswick and P.E.I. than in Ontario, but this probably reflected the much larger average size of hospitals in Ontario. This result is supported by the introduction of the "beds-squared" term, which indicates that productivity increases at an increasing rate with the number of beds, at least within the range of hospital sizes considered in this study. A more meaningful analysis for smaller provinces would be to compare hospitals of similar small sizes across all provinces. The data on which this study was based were insufficient to pursue this issue further.

The estimated levels of overall efficiency for the production of inpatient care are presented in table 3 in Appendix E. As shown, although efficiency remained steady over the period, this finding reflected a steady increase in efficiency in Ontario but a reduction in efficiency in New Brunswick. The results, and in particular the findings for New Brunswick, should be interpreted with great caution, however, given the domination of Ontario hospitals and the disparities in average hospital size between the two provinces.

The analysis indicates that in the case of inpatient nursing care over a three-to-four-year period, the rate of service output, as measured by severity-adjusted inpatient episodes of care, has changed and that the direction and rate of change has differed between provinces. Moreover, the findings show that levels of employment of other staff are significantly associated with the average productivity of nurses. As such, the required number of nurses to deliver a planned level of service (or manage a particular patient mix) will depend on the configuration of other hospital inputs (it is context-specific).

It is important to recognize that the analysis is constrained by the nature and quality of data, and the contribution of this type of research to policy developments will depend on appropriate data being collected and made available to researchers. In this research we found that data on hours of staff time by different category of staff were only available for a small number of provinces. Moreover, even where these data were available, there were many challenges to using them. Data were not generally available for different staff levels within a particular category, allocations of staff time between categories appeared to shift over time, while levels of staff time are generally limited to directly employed staff and hence sensitive to the use of contracting out of some services (such as hotel services).

Similarly, the study was limited to focusing on inpatient episodes of care in acute-care hospitals. Although significant levels of hospital care are now provided in non-inpatient settings, and some hospital functions will cover both inpatient and outpatient settings, data on non-inpatient care (outpatients and emergency department) were largely limited to basic patient counts with little or no information on case severity. Clearly these activities represent important areas for planning both human and non-human healthcare resources in their own right. But these activities may also affect staff productivity in inpatient care.

Finally, our concept of productivity is based on the production of inpatient episodes of care after allowing for differences in patient severity. However, health outcomes of inpatient care are not considered. Outcomes may depend on factors beyond the inpatient stay, including services available, both formal and informal, to support the patient post-discharge as well as the particular characteristics of the patient and his or her social and economic environments. Tomblin-Murphy et al.(2004)[42] found that hospitals with significantly higher levels of nursing inputs were found to have significantly lower average lengths of stay, but no evidence was found that this was reflected in lower levels of patient outcomes. This indicates that improvements in productivity leading to increased throughputs and shorter average lengths of stay can be achieved in ways that avoid adverse effects on patient outcomes.

PROJECT 3

CONTEXT

Although research has examined nurse turnover and retention with respect to jobs and employers, less is known about inactive nurses and former nurses who have left the profession. In a U.S. survey of registered nurses (n=1,004) who were unemployed or employed outside of nursing, decisions to become inactive or active were more highly related to professional factors (such as preferred clinical area, flexible scheduling, safety, workload) than to personal factors (such as financial need, family support).[43] Unemployed nurses were more willing to return than those employed outside of nursing.[43] A qualitative study of former Australian nurses (n=29) suggested that the decision to leave the profession was related to an inability to meet career goals among younger nurses and incongruence between work values and workplace conditions among older nurses.[44] Another study[45] found that concerns about legalities and employers, professional practice, worklife/home life, and contract requirements and external values and beliefs about nursing explained 55.4 percent of the variance in former Australian nurses' decisions to leave (n=17).

Intention to leave or retire early from nursing may also have considerable impact on nurse supply for those working. American hospital nurses (n=787) reporting greater professional satisfaction and financial dependence were less likely to intend to leave nursing.[46] Nurses who were dissatisfied with their jobs were 65-percent more likely to leave the National Health Service than their satisfied counterparts.[47] A recent Canadian survey indicated higher intent to leave the profession among nurses who were younger, healthier, working part-time or who preferred fewer hours.[48] Higher intent to leave has been reported among nurses who were male, white-non-Hispanic or held less than a master's degree[49] or who scored lower on occupational commitment scales.[50] Nurses who were likely to remain in the profession desired more work hours, were more satisfied with their current position, did not expect job instability and had chosen nursing for altruistic reasons.[48] Although the literature is replete with recommendations to retain practicing nurses and enhance job satisfaction, these strategies are global in nature and have yet to be prioritized by nurses and targeted to the specific needs of different cohorts of nurses.

Thus, another focus of this study was to determine the preferred policy initiatives to retain the current workforce. Among those in nursing, factors influencing job satisfaction, intent to retire early and risk of leaving nursing were explored and retention policy initiatives preferred by these groups were identified. Among former nurses who had left nursing as a career, factors explaining the decision to leave, the scope of career paths outside of nursing and the nursing skills that helped achieve non-nursing positions were examined. Former nurses who remained registered were asked reasons for maintaining registration. Finally, former nurses identified preferred policy initiatives to attract them back to the profession.

IMPLICATIONS

1. Individual, job and employer characteristics lend insight into nurses' career intentions.
2. One size fits all retention strategies may not be preferred by nurses along different career paths, in different jurisdictions and of various ages. Policy initiatives need to be tailored to re-attract former nurses and to retain current nurses.

APPROACH

A cross-sectional survey design sampled three groups of nurses: a) former registered nurses who have left nursing and do not maintain registration (snowball sample); b) registered nurses who maintain registration but do not work in nursing or are unemployed; and c) registered nurses who remain in practice, with special attention to over-sampling in the under 35 age cohort. Participating jurisdictions were Saskatchewan, Ontario, New Brunswick, Newfoundland and Labrador, Nova Scotia and Prince Edward Island.

Mailing addresses of nurses were obtained from jurisdictional nursing registrars. The snowball sample was obtained using a purposive network sampling technique through newspaper ads and web sites of jurisdictional registrars. Business cards with study information were inserted into packages sent to nurses to distribute to any former nurses they knew. Of the 12,964 nurses sampled (including 300 from the snowball sample), a total of 5,422 surveys were received (overall response rate of 41.8 percent).

Analysis Techniques. Descriptive statistics were compiled. Subscale scores and alpha reliabilities were generated for instruments (see Appendix H). Regression models were fitted for the determinants of job satisfaction (ordered probit), risk of leaving nursing (binary probit), and intent to retire early from nursing (binary probit). With the exception of the sample descriptives, responses were weighted to reflect population estimates based on the nurse population totals in the Canadian Institute for Health Information's Registered Nurses Database for the participating jurisdictions (see Appendix F).

RESULTS

Demographics

Descriptive results related to the objectives outlined above are presented. Detailed results are tabled in Appendix J. Of the 5,422 nurses, the mean age was 43.8 (SD = 11.6), 96.8 percent were female, 79.8 percent were married, common law or partnered, and 54.4 percent had children. Highest nursing education credential included diploma (55.9 percent), baccalaureate degree (40.8 percent) and graduate degree (3.3 percent). Tenure in the profession averaged 17.4 years (SD=11.4). Most respondents were registered as nurses in Ontario (25.3 percent), Saskatchewan (13 percent) or the Atlantic provinces (62.6 percent). Current or most recent nurse employment settings were hospitals (58.7 percent), long-term care (11.6 percent), community (11.7 percent) and other settings (17.9 percent, including educational institution, association, government). Nurses' most current or recent employment statuses were 64.2 percent full-time permanent, 22.7 percent part-time permanent, 6.7 percent casual and 6.3 percent temporary or contract. Household incomes before tax varied from less than $50,000 (48.9 percent), $50,000 to $79,999 (39.7 percent) and more than $80,000 (11.4 percent).

Research Question 1.

What are the individual, job and employer characteristics among nurses that influence a) job satisfaction; b) risk of leaving nursing; and c) the decision to take early retirement from nursing?

a. **Job satisfaction.** When nurses worked permanent part-time or were employed and met with their supervisor at least yearly about career and employment issues, they were more satisfied. Nurses were also more satisfied when they were more affectively or normatively committed to the profession. Nurses who felt they had invested substantial time and training into their nursing careers were less satisfied. Job satisfaction was also lower when nurses were concerned about practice legalities and the perceived image of the profession.

b. **At risk of leaving nursing.** Individuals who chose a nursing career for altruistic reasons were more at risk of leaving than those who entered for other reasons. Nurses who perceived many other alternative career options were also more at risk than those who perceived fewer options. However, nurses with household incomes of $50-79,000 and living in rural areas were less at risk of leaving than those with incomes less than $50,000 or living in urban areas. Nurses who were satisfied with their job were also less at risk of leaving the profession than their dissatisfied counterparts. Nurses who were more affectively and normatively committed to the profession were also less at risk of leaving.

c. **Early retirement among nurses aged over 50.** Intent to retire before age 65 was significantly predicted by nurses who took care of young children, who had children in college, who practiced in community nursing as opposed to hospitals, who did not have educational opportunities available in their workplace or who worked in a clinical position which did not report to a nurse. Intent to retire early was less likely if nurses

had initially entered nursing as a stepping stone to another career, were satisfied with their job, worked in other settings compared to hospitals or worked in a non-clinical position which did not report to a nurse. Those in management positions, whether they reported to a nurse or not, were less likely to retire before age 65.

Research Question 2.

Which policy retention initiatives are preferred by nurses who a) plan to remain in nursing; b) are at risk of leaving nursing; and c) are planning on early retirement?

Respondents ranked their top 5 preferred policies from a list of 21 policies derived from the literature and the research team. Weighted estimates of mean rankings ? 1.0 are presented in Table 1 of Appendix H, with higher values indicating greater importance of the policy initiative. Highly ranked policies by all nurses included appropriate workload, benefits package, better salary, support for continuing education and improved work environment. However, policies can be tailored to particular sub-groups. For instance, nurses over age 50 and those intending to retire early highly valued managerial support. Ontario nurses at risk of leaving would welcome greater availability of the types of nursing positions sought, with those under age 50 also highly ranking preferred shifts. The importance of a shorter work week with full pension contribution was most highly rated by Saskatchewan nurses aged over 50 who were at risk of leaving the profession and by Ontario nurses who intend to retire early. Nurses under age 35 in Saskatchewan and the Atlantic region valued full-time employment. Nurses in Atlantic Canada also fairly consistently preferred policies supporting safe work environments.

Research Question 3.

Among former nurses, what factors influenced the decision to leave nursing as a career?

At least 20 percent of former nurses indicated that the following items moderately or very greatly influenced their decision to leave nursing as a career: opportunities for preferred lifestyle or work-life balance in other fields (53.5 percent), concerns about the quality of care and patient safety (39.9 percent), difficulty managing shift work (38.6 percent), dissatisfaction with nursing (37 percent), difficulty managing weekend shifts (33.2 percent), opportunities for more financial rewards in other fields (31 percent), better opportunities for promotions in other fields (29.8 percent), difficulty managing workload or patient assignments (29.3 percent), leaving to be a caregiver (21.8 percent) and difficulty managing heavy physical labour (20.9 percent). Qualitative responses revealed that the main themes influencing the decision to leave related to work environments, personal and family reasons, as well opportunities outside of nursing.

Research Question 4.

Among former nurses who have left nursing as a career, a) what is the scope of career paths outside of nursing; b) what nursing skills help achieve non-nursing positions; and c) what factors explain the decision to maintain registration?

a. **Scope of career paths outside of nursing.** Former nurses most frequently worked in the following industries: healthcare and social assistance (31.8 percent; for example, allied health professional, unregulated healthcare worker); educational services (11.5 percent; for example, educational assistant, academic counselor); other services (10 percent; for example, childcare); scientific research and development (5.1 percent; for example, project manager, research assistant); retail trade (3.9 percent; for example, customer relations); and finance and insurance (three percent; for example, financial planner). Educational credentials required for positions held outside of nursing were on-the-job training (37.1 percent), university education (34.8 percent), college education (21.9 percent), secondary school (five percent) and apprenticeship (1.2 percent).

b. **Nursing skills that help achieve non-nursing positions.** At least 60 percent of respondents rated the following skills as very important: multi-task (70.6 percent), be accountable for

actions (69.8 percent), relate to people (69.8 percent), understand people (67.4 percent), communicate effectively (67.3 percent), work under pressure (66.8 percent), use time effectively (65.6 percent), adapt to change (64.2 percent), work with the public (63.9 percent), have a professional demeanor (63.7 percent), make assessment of needs/situation (63.4 percent), work autonomously (62.8 percent) and get things done (62.2 percent).

c. **Factors that explain decision to maintain registration.** Among former nurses, the decision to maintain registration was mainly related to keeping their status as a professional (46.3 percent), potentially returning to nursing (37.4 percent) or other reasons (12.8 percent).

Research Question 5.

Among former nurses, what are the preferred policy initiatives that will attract them back to nursing?

Respondents ranked their top 5 preferred policies from a list of 21 policies derived from the literature and the research team. Weighted estimates of mean rankings ? 1.0 are presented in table 2 in Appendix H, with higher values indicating greater importance of the policy initiative. Highly ranked policies by all former nurses included appropriate workload, better salary and improved work environment. Those under age 35 particularly valued full-time employment whereas those in mid-career prioritized workplace safety. Preferred shifts were highly ranked by those under age 50. Position availability was very important to those aged 35 and older.

FURTHER RESEARCH

The next step in this research is to expand this approach to include all provinces and territories in Canada. All statistical and simulation models should be updated every two years to ensure that changes in populations needs and characteristics are considered in planning for health human resources. The model needs to be tested on other provider groups so that the impact of substituting different providers can be evaluated.

Planning for health human resources cannot continue to be done in silos; strategies that support models for health human resources planning which are needs-based, outcome-directed, and responsive to changing service delivery must be implemented and evaluated on an ongoing basis. A significant investment in data infrastructure to inform health human resources planning and management in Canada must be realized. Ongoing investment in accessible, comparable and comprehensive data is critical. Health human resources policy and research questions should be developed based on the health needs of the population measured independently of utilization, supply and demand. Policy and research questions must reflect the context in which they are being asked, including education policies and the prevailing social, political, geographic and economic contexts. Policies aimed at increasing retention of the workforce (such as strategies aimed at enhancing working conditions, enhancing benefits and the provisions and incentives for early retirement) need to consider ways to tailor the options based on the age distribution of the provider.

ADDITIONAL RESOURCES

The reader is referred to the appendices for additional details on the analysis models run in this study. In addition, please refer to the below web sites for further information on health human resources planning and the resources used throughout this research program.

Health Human Resources Modelling: Challenging the Past, Creating the Future – www.hhrp.ca

National Chair in Nursing Health Human Resources – http://www.hhrchair.ca

Gail Tomblin Murphy – http://nursing.dal.ca/Faculty/gail.tomblin.murphy.php

Canadian Institute for Health Information – www.cihi.ca

Statistics Canada Research Data Centres – http://www.statcan.ca/english/rdc/index.htm

Nova Scotia Health Research Foundation – www.nshrf.ca

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