Estimating Personal Care Home Bed Requirements

December 2002

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ISBN 1-896489-09-5

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We thank the University of Manitoba, Faculty of Medicine, Health Research Ethics Board for their review of this project. The Manitoba Centre for Health Policy complies with all legislative acts and regulations governing the protection and use of sensitive information. We implement strict policies and procedures to protect the privacy and security of anonymized data used to produce this report and we keep the provincial Health Information Privacy Committee informed of all work undertaken for Manitoba Health.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the contribution of the many individuals whose efforts and expertise made it possible to produce this report. We thank the following, and apologize in advance to anyone we might have overlooked:

- The Working Group for their suggestions and feedback as the project progressed: Lorraine Dent, Netha Dyck, Gail Keeley, Margaret Lamont, Marion Pringle and Andrea Zajac;
- Maria Mathews for her detailed review of the report;
- Colleagues who contributed to lively discussions concerning analytical methods: Dan Chateau, Oke Ekuma, Lisa Lix, Leonard MacWilliam and Robert Tate;
- Colleagues who provided comments and feedback: Patricia Martens, Verena Menec, Lori Mitchell, Noralou Roos, Evelyn Shapiro and Fred Toll;
- Paul Willetts, Eileen Pyke and Janine Harasymchuk for the preparation of figures and tables, and the formatting and production of the report.

The authors are indebted to Health Information Services, Manitoba Health for the provision of data and the Manitoba Bureau of Statistics for population projections.

We acknowledge the financial support of the Department of Health of the Province of Manitoba. The results and conclusions are those of the authors and no official endorsement by Manitoba Health was intended or should be inferred. This report was prepared at the request of Manitoba Health as part of the contract between the University of Manitoba and Manitoba Health.

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Executive Summary

This study describes how personal care homes have been used in the past, and uses these historical patterns to project expected use, or demand, into the future.[1] For a number of years, Manitoba Health has used a ratio of 120 beds per 1,000 population aged 75 or older as a means of planning the number of PCH beds for an area. We were asked to review the available information and propose a new approach to estimating future demand for PCH beds. The study is important as Manitoba plans for the effects of an aging population since the proportion of Manitobans aged 75 or older is expected to increase by 12% between 2000 and 2020.

We developed three methods to project demand for personal care home (PCH) beds in the Province through the year 2020. One uses regression techniques to identify trends and then to project those trends into the future. This method assumes that changes in use over the past ten years will continue in the same fashion for the next twenty years. The second model uses the most recent 3-year mean rates of PCH use and projects them forward. This Recent Use model assumes that utilization will continue at the rate current in the 1997/98 to 1999/2000 period, and utilization will only change as the distribution of the population does. The third method is simply the arithmetic average of the two previous projections, and we call it the Combined projection. Population projections were provided by the Manitoba Bureau of Statistics.

The variables used to estimate PCH use are age (six categories), sex and region in which the PCH was located. The literature suggests a variety of sociodemographic, health, functional and system characteristics that influence the use of nursing homes and these variables were also considered. However, few of them were in the data available for analysis. The advantage of using age, sex and region as predictors is that these are readily available, making the method easy to reproduce in subsequent years.

This is a population-based analysis, using data from the Population Health Research Data Repository. The study was conducted as one of the Manitoba Centre for Health Policy's six annual deliverables for Manitoba Health. A Working Group was established to provide insight as to the workings of the personal care home program in Manitoba, to review the methods, and to help interpret the results.

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[1] Throughout the report we will, for convenience and ease of reading, use the terms "demand" and "expected utilization (rates)" interchangeably. Our estimation methods are simply projections of utilization rates which take into account various trends and expected changes in population. They do not, strictly speaking, capture underlying "demand" or, even more critically, "need" which are controversial and notoriously difficult to define and measure.

Analysis of historical data revealed that several key indicators of PCH use have changed over the past ten to fifteen years: waiting times to enter PCHs have fallen and rates of PCH use are down as are lengths of stay. This may indicate that potential residents of PCHs are staying healthier longer, and/or are remaining in their homes longer. Moreover, all this has occurred over a period during which the nursing home bed supply has increased. Given these downward trends, it was not surprising that the regression models found a downward trend in nursing home use rates that was significant for most age-sex categories. Using a model based on trends in use over the recent ten years (Ten-Year Trend), we predicted that both Winnipeg and Non-Winnipeg would have a surplus of PCH beds in 2020 compared to capacity in 2000/01. Winnipeg was projected to have a surplus of 1,523 and Non-Winnipeg a surplus of 671 PCH beds. Comparison of results for five-, ten- and fifteen year trends showed the rate of decrease to be slowing down. Therefore, the assumption of a continuous and unchanging downward trend may not be valid.

Our second projection method (Recent Use) relies on the mean use rates of nursing homes by different age/sex groups during the three most recent years (1997/98-1999/2000). This method assumes that rates of use will neither increase nor decrease to the year 2020, but that an increase in the number of seniors will require more nursing home beds. Projections from this method indicate that more PCH beds will be required by 2020 over current capacity: 446 beds in Winnipeg and 733 in Non-Winnipeg.

The third method we used (Combined) is simply the arithmetic mean of the other two methods (Ten-Year Trend and Recent Use). We consider the Combined projection to be the most prudent because it captures the effects of the ten-year trend, but moderates it by the damping effect of current usage rates. The Combined projection estimates that Winnipeg will have a surplus of 538 PCH beds and Non-Winnipeg will have a deficit of 31 beds by the year 2020.

We provide Combined projections for each RHA; some are projected to have a deficit and some a surplus. The RHAs that are projected to be in a deficit position are North Eastman, South Eastman, Interlake and Burntwood/Churchill. (Burntwood and Churchill were combined for analysis because of their small populations.) In addition to Winnipeg, RHAs with a predicted surplus are Parkland, Marquette, South Westman and Central.

In order to make projections into the future, a number of simplifying assumptions had to be made. Our projections do not take into account the potential for changes in other health care services, like home care or hospitals, to affect the demand for PCHs. They also assume that migration into and out of RHAs for PCH care will not change. Furthermore, although

some RHAs appear to be over- or under-bedded with respect to the current planning formula of 120 beds per 1,000 persons age 75+, we assume that current relative rates of use among the different RHAs will continue. Moreover, the population estimates rely on a variety of assumptions and to the extent they over- or underestimate the number of seniors in the population in 2020, our projections will be incorrect.

Despite these limitations, our method has a number of strengths. It relies on utilization data for the entire population, and the variables used in the predictions—age, sex, region—are readily available. Thus it will be relatively easy to monitor usage continually, and modify the projection model as necessary. Furthermore our projections result in a bed to population ratio of roughly 110 per 1,000 persons age 75 or older by 2020, a ratio that four provinces—British Columbia, Alberta, Quebec and Prince Edward Island—have already. Therefore our results seem to be in conformity with some existing practice, although Alberta appears to be considering lowering its ratio.

1.0 INTRODUCTION

Canada's aging population is often perceived as a threat to our publicly-funded health care system. Governments are concerned about this and are currently planning to deal with the potential impact of an aging population on the health care system. Manitoba is no exception.

The aging of the population has two components. First, people are living longer. Second, the age distribution is changing.

The aging of the population has two components. First, people are living longer. According to Statistics Canada, in 1961, females could expect to live 74.3 years and males, 68.4 years. In 1997, those figures were 81.4 years and 75.8 years, respectively. In 1961, 80-year-old females could expect to live 7.0 years more, and in 1991, that had climbed to 9.4 years. Trends were similar for males (Canada at a Glance, Statistics Canada, www.statcan.ca). The second component of population aging is that the age distribution is changing: as the baby boom generation ages and as families have become smaller, the proportion of the population in the younger age categories is declining, while the proportion of older adults is growing.

Taken together, this means that the number of Canadians over the age of 65 will more than double, from 3.9 million in 2000 to 9.3 million in 2040. Comprising 12.5% of the total population in 2000, they are projected to form 18.3% in 2020 and 24.9% of the total in 2040. In Manitoba, the magnitude of the change is expected to be slightly less, an increase from 13.6% to 17.4% in 2020 and to 22.5% in 2040 (Robson, 2001).

Previous research at MCHP demonstrates that older persons tend to use more health care resources, including home care, hospitals, prescription drugs and nursing homes. The focus of this report is on the last of these: use of nursing homes, or as they are called in Manitoba, personal care homes (PCHs).

Specifically, this study analyzes personal care home data contained in the Population Health Research Data Repository to describe how personal care homes have been used in the past, and uses these historical patterns to help project expected use, or demand, in the future.[2] This study was undertaken as one of the Manitoba Centre for Health Policy's six annual deliverables conducted for Manitoba Health. A Working Group was established to provide insight as to the workings of the personal care home program in Manitoba, to review the methods, and to help interpret the results.

1.1 Context

It seems important to understand the current status of personal care home services in Manitoba and the issues surrounding utilization. The insured personal care home program in Manitoba started on July 1, 1973

[2] Throughout the report we will, for convenience and ease of reading, use the terms "demand" and "expected utilization (rates)" interchangeably. Our estimation methods are simply projections of utilization rates which take into account various trends and expected changes in population. They do not, strictly speaking, capture underlying "demand" or, even more critically, "need" which are controversial and notoriously difficult to define and measure.

The insured personal care home program in Manitoba started on July 1, 1973. Insured personal care services include basic nursing care and assistance with or supervision of activities of daily living. All pharmaceuticals are supplied.

(Management Committee of Cabinet, 1977). According to Manitoba Health's Annual Report for 1999/2000, insured personal care services include basic nursing care, and assistance with or supervision of activities of daily living. All pharmaceuticals are supplied. Residents are assessed a daily residential charge which is on an income-based sliding scale; effective August 1, 2000 the minimum rate was $26.30 per day and the maximum was $61.40.

In order to be admitted to a PCH, one must first be 'panelled.' That means that an application form must be completed and reviewed by a panel which determines whether the person requires admission or not. Many persons who apply to enter a PCH have been home care clients for a considerable period of time, but their care needs have become too great to manage in the community. They generally continue to receive home care until admitted.

Manitoba Health currently uses a planning ratio of 120 PCH beds per 1,000 persons aged 75 or older, although the actual ratio may vary from place to place for historical reasons. This planning ratio has evolved over time based on past practice and consensus among providers, but it was felt by Manitoba Health that this planning ratio might be refined. Furthermore, data from other provinces suggested that Manitoba might have more PCH beds than necessary.

In 2000, Manitoba had the highest ratio of personal care beds in Canada, 126 per 1,000 persons aged 75 or older; Ontario, at 88 beds, had the lowest.

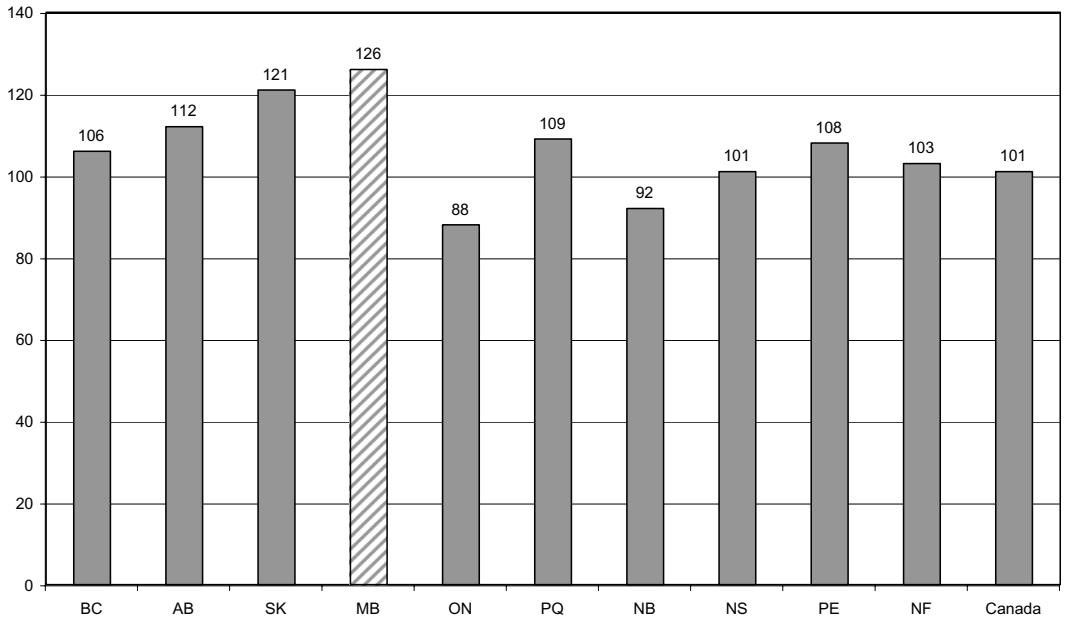
In 2000, Saskatchewan Health conducted a cross-Canada survey to assess the number of nursing home beds in each province per 1,000 persons aged 75 or older (Figure 1). The Canadian ratio was 101. Manitoba had the highest ratio at 126 (Winnipeg Regional Health Authority, 2001). The fewest beds were reported in Ontario, with 88 beds per 1,000 persons aged 75 or older, and New Brunswick was second-lowest with 92. Five provinces reported ratios in the 101 to 109 range: British Columbia, Quebec, Nova Scotia, Prince Edward Island and Newfoundland. Saskatchewan and Manitoba both reported having more than 120 beds per 1,000 aged 75 or older. Differences in how long term care and nursing home beds are categorized may account for some of this variation. Nevertheless, data like these suggest that Manitoba is at the high end of the continuum in Canada.

The data in Figure 1 suggest that Manitoba could safely consider a somewhat lower rate of PCH beds. However, Manitoba Health wished to proceed with caution. There is no benchmark or guideline on the appropriate number of nursing home beds. Therefore, it was important to consider how nursing homes have been used historically in Manitoba, and to assess what factors affect the use of nursing homes before making an estimate for the future. Therefore the objectives for this study were:

1. To describe patterns of care in Manitoba personal care homes in the past.

2. To identify characteristics associated with the need for nursing home use.
3. To use population-based characteristics in models to explain differences in PCH use in different regions of the province.
4. To use population projections from the Manitoba Bureau of Statistics and models of past use to project PCH bed requirements to 2020.

Figure 1: Number of Nursing Home Beds per 1,000 Persons Age 75+
Source: Cross Canada Survey by Saskatchewan Health 2000

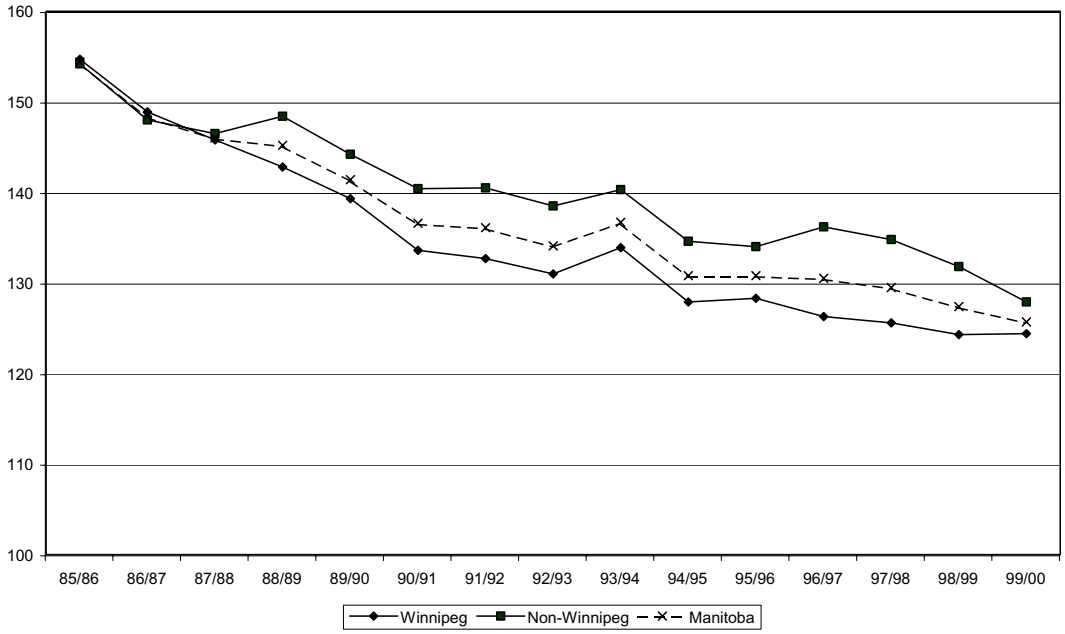


Even after accounting for aging, the number of residents per 1,000 population is trending slightly downwards. From 1989/90 to 1999/2000 the rate declined 11.1%. At the same time, admission rates, although they fluctuated more from year to year, remained quite stable. This decline in use cannot be explained by a reduction in PCH beds.

1.2 Trends in Personal Care Home Use in Manitoba

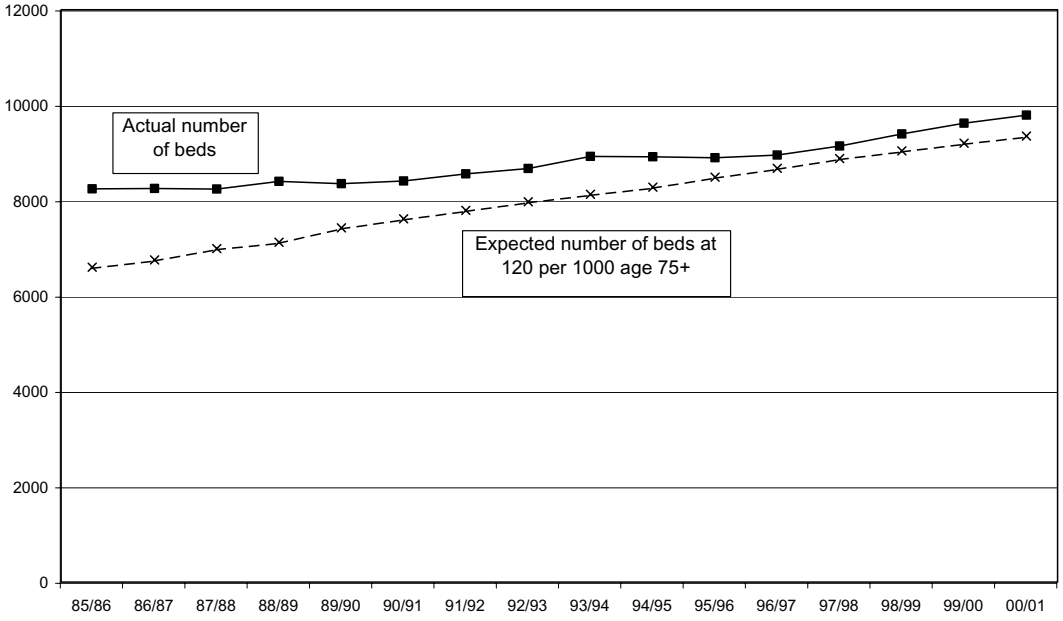
Understanding the way personal care homes have been used in the past is necessary to inform our attempts to develop projected demand for personal care homes in the future. Previous work at MCHP noted that the age-sex adjusted rates of nursing home use had declined between 1985/86 and 1998/99 (Roos et al., 2001a). Figure 2 charts the number of residents in PCH per year per 1,000 persons aged 75 or older. 'Residents' counts any person who stayed in a PCH in a given year; some residents were in PCH for the entire year, and some only part of that year. Rates have been age-sex adjusted to take into account changes in the age or sex distribution of the population. Even after accounting for aging, the rate is trending slightly downwards. Looking at a ten-year period, from 1989/90 to 1999/2000, the rate declined 11.1%. At the same time, admission rates, although they fluctuated more from year to year, remained quite stable (not shown).

Figure 2: PCH Residents Age 75+, Manitoba, 1985/86-1999/00
(Age-Sex Standardized Rates per 1,000 Population Age 75+)



This decline in use cannot be explained by a reduction in PCH beds. At the time that use was declining, the number of beds had actually increased. From 1985/86 to 2000/01, the number of PCH beds increased from 8,245 to 9,791 (Figure 3), an increase of 18.8%. This number slightly exceeds the expected number of beds if the planning ratio of 120 beds per 1,000 persons age 75 or older was used.

Figure 3: PCH Beds, Manitoba, 1985/86-2000/01: Capacity and Expected
(Expected Based on 120/1,000 Age 75+)



One possible explanation for the decrease in use rates while admission rates have remained stable is that individuals have been staying in their homes longer and entering nursing home at an older age. That is, persons with lower levels of disability may have been more likely to be cared for in the community, in part because of increased home care use, or perhaps, other community resources. Thus, those being admitted to PCH would have been frailer and therefore would have had shorter stays prior to death.

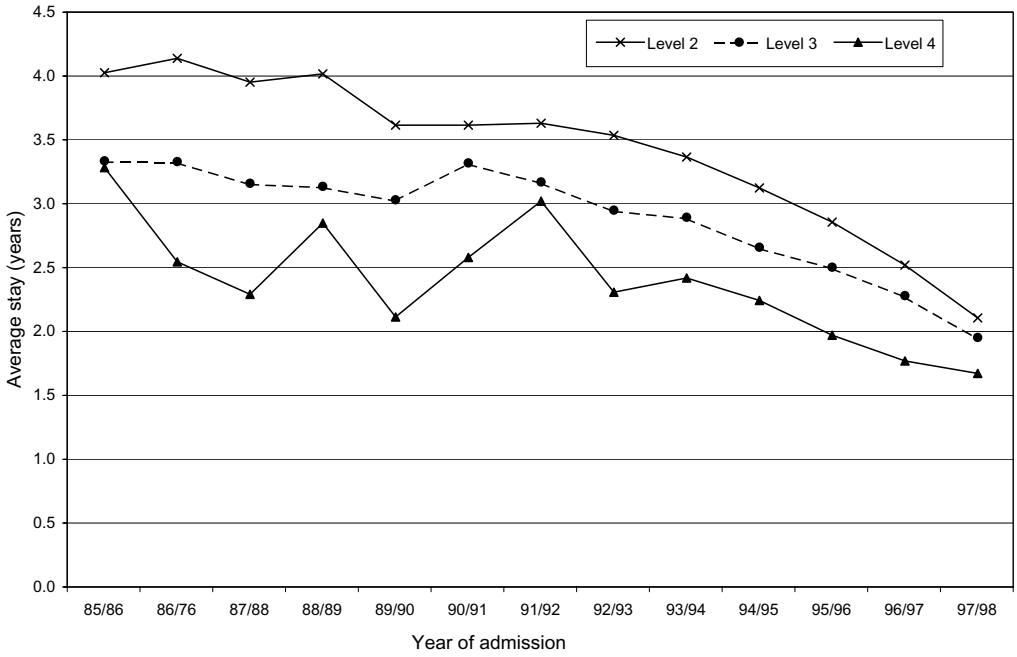
While only about 5% of 75 to 79 year-olds live in a nursing home, approximately 50% of those aged 90 or older reside in one. The proportion of PCH residents aged 85 or older has increased from 51% in 1990/91 to 55% in 1999/2000. The average age at admission increased from 82.0 for admissions into Winnipeg PCHs and 81.9 into Non-Winnipeg PCHs in 1990/91 to 82.7 and 83.0, for Winnipeg and Non-Winnipeg, in 1999/2000, respectively. The average age of residents increased from 83.1 in Winnipeg and 83.6 in Non-Winnipeg in 1990/91 to 83.7 and 84.3 in Winnipeg and Non-Winnipeg, respectively, in 1999/2000.

Some indication of the increasing frailty of persons who reside in a PCH can also be demonstrated by looking at level of care of PCH residents. Persons assessed at Level 2 require 2 hours of nursing care over a 24-hour period, and persons assessed as Level 3 or 4 require at least 3.5 hours of nursing care over a 24-hour period. Persons assessed as Level 1 require 0.5 hours of nursing care per day, but these individuals are generally cared for in the community. The proportion of residents requiring Level 2 care decreased between 1990/91 and 1999/2000 from 37% to 28%, while the proportion requiring Level 3 increased from 33% to 39%, and Level 4 from 26% to 33%.

The shorter lengths of stay, along with the shift in the PCH population to an older and frailer mix, therefore, could account for the apparent inconsistency of increased numbers of beds, constant admission rates, and lower utilization rates.

Figure 4 illustrates length of stay in PCH from 1985/86 to 1997/98, by level of care. The year in the chart refers to the year of admission. Since PCH lengths of stay are several years, the last year shown on this figure is 1997/98, and stays were tracked until March 31, 2001. This figure shows that for each level of care, lengths of stay have decreased over time. For example, a person who entered a nursing home at Level 2 in 1987/88 lived for 3.9 years versus 2.1 years in 1997/98. For levels 3 and 4, individuals lived for 3.2 and 2.3 years, respectively, in 1987/88 and 1.9 and 1.7 years in 1997/98. The shorter lengths of stay, along with the shift in the PCH population to an older and frailer mix, therefore, could account for the apparent inconsistency of increased numbers of beds, constant admission rates, and lower utilization rates.

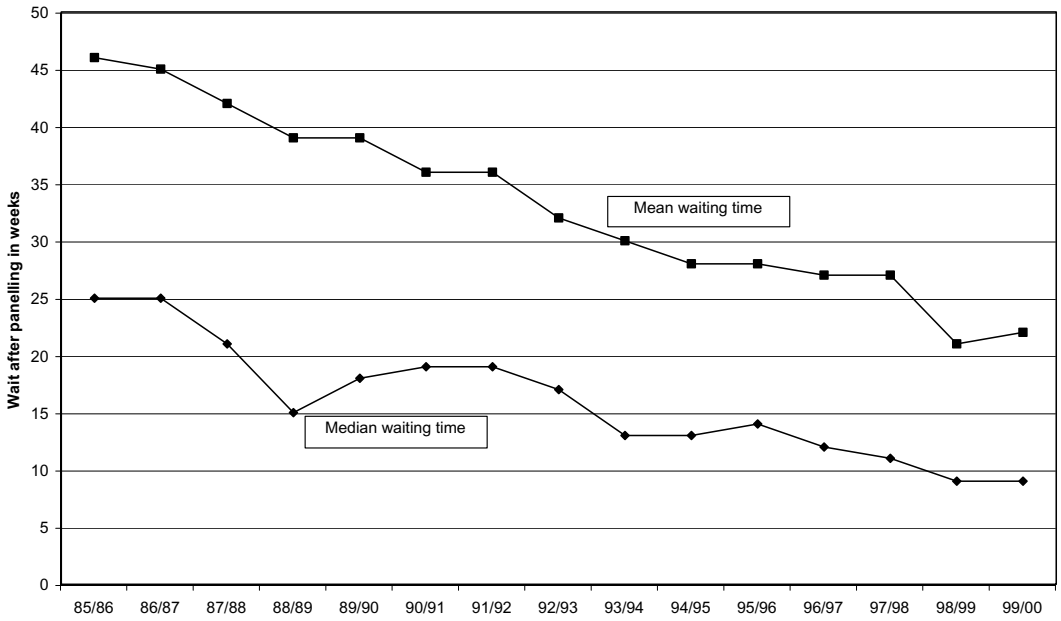
Figure 4: Average Length of Stay in PCH (Years), Manitoba, Age 75+



It should also be pointed out that although the definitions of levels of care have not changed, their interpretation may have. Members of the Working Group associated with this project stated that a person assessed as needing Level 3 care now is frailer than a comparable person ten years ago. Thus, decreasing survival time is not a reflection of poorer quality of care in PCH, but more likely a reflection of the greater availability, variety and quality of care in the community (through home care and other providers), which enables people to reside in their own homes longer.

One more figure will contribute to our understanding of patterns over time. The date of panelling is available in administrative data, and can be used to measure how long persons have to wait to be admitted. These waiting times have declined between 1989/90 and 1999/2000 (Figure 5). Mean waits between panel and admission decreased from 39 to 22 weeks from 1989/90 to 1999/2000, and median waits decreased from 18 to 9 weeks.

Figure 5: Waits to Enter PCH After Panelling, Manitoba, 1985/86-1999/00
(Year = Year of Admission)



Higher age and living in a town or city (versus rurally) have been associated with higher admission rates. Specific conditions such as diabetes, stroke, neurological disorders, cancer and heart disease are associated with a higher probability of institutionalization, according to the literature. As well, functional disability is also important as a predictor of the need for nursing home care.

The data indicate, therefore, that the nursing home bed supply has kept up with the aging of the population, that institutionalization rates have decreased over time, and that individuals in nursing homes are somewhat older and frailer than they were in the past. The fact that waiting times have decreased suggests that, even though people are entering PCHs at older ages, this is not because the waiting lists are so long they could not get in earlier. If anything, people are entering nursing homes with shorter waits than they did 10 years ago.

1.3 Characteristics Associated with Nursing Home Use: Findings of Literature Review

Characteristics that have been investigated for their impact on the need for nursing home use include: sociodemographic characteristics, health status, functional status, cognitive ability, formal and informal supports, and health system characteristics. There is a fairly extensive literature dealing with the impact of these various factors on the need for nursing home use. (Appendix A provides a more detailed review, which is summarized here.)

A variety of sociodemographic factors have been associated with increased likelihood of entering a nursing home. These include age, gender, rural versus urban residence, and socioeconomic status. Higher age and living in a town or city (versus rurally) have been associated with higher admission

rates. While women are more likely to be nursing home residents than men, this is likely due to other characteristics, such as age and marital status. Studies have also been conducted on the effects of health status on admission rates. Although the evidence is ambiguous, various conditions and indicators have been linked to higher admission rates. A higher probability of institutionalization has been associated with specific conditions such as diabetes, stroke, neurological disorders, cancer, heart disease, and having fallen. Higher admission rates have also been associated with more general measures of health, such as self-perceived health, number of visits to an internist, or a recent hospitalization.

Numerous studies emphasize the importance of functional disability as a predictor of the need for nursing home care. Often this is described as problems with one or more activities of daily living (ADLs) (eating, getting in or out of bed, mobility, dressing, bathing and using the toilet), but functional disability may also include problems with Instrumental Activities of Daily Living (IADLs) (using the telephone, grocery shopping, preparing meals, doing housework, doing laundry, taking medications, or managing money). Cognitive impairment has also been linked to increased probability of admission.

The availability of social supports, such as being married, not living alone, and participating in social activities, also seems to reduce the likelihood of institutionalization. At the aggregate level, the improving health of the older population has been seen to diminish the need for institutionalization.

The availability of social supports, such as being married, not living alone, and participating in social activities, also seems to reduce the likelihood of institutionalization. The availability of alternative resources such as home care and a larger physician supply have also been suggested as delaying the need for admission, while the availability of nursing home beds has been indicated as hastening admission. Finally, at the aggregate level, the improving health of the older population has been seen to diminish the need for institutionalization.

In summary, a variety of factors have been identified as influencing the need for nursing homes. We have also seen that there seems to be a trend to a decrease in the rate of PCH use in Manitoba. The next step was to attempt to combine the information from the literature review together with the information available to us regarding historical use of PCHs in Manitoba in order to develop methods of estimating the demands for PCH beds in the future.

2.0 METHODS

Three methods were used to project demand for the 2020 population: regression models to explore variables that explained past PCH bed use, mean use over the most recent three years, and a combination of the first two.

Population projections to the year 2025 were developed by the Manitoba Bureau of Statistics. Projections were available by five-year age groups, sex and region of residence. In order to project demand for the 2020 population, we used three methods:

1. regression models to explore the variables that explained PCH bed use in the past
2. projections of mean use over the most recent three years
3. a combination of method 1 and 2

The measure of PCH bed use in all models was in terms of PCH days, converted to estimated beds, simply by dividing by 365. This assumed that PCH beds are virtually 100% occupied, an assumption supported by Manitoba Health annual statistics and by members of the Working Group.

2.1 Data Source and Variables

The Population Health Research Data Repository was the data source for the analysis, together with Manitoba Bureau of Statistics population predictions.

The Population Health Research Data Repository was the source of data for analysis in this research. The Repository is a comprehensive data base which records all patient contacts with physicians, hospitals and personal care homes. All records in the Repository have been processed by Manitoba Health to remove names and addresses. Files used in this study include the personal care home file, the population registry, physician claims and the hospital file.

Unfortunately, few of the characteristics that are associated with the need for nursing homes are available in the Repository. Data that are available include age, sex, region of residence prior to PCH admission, region where PCH is located and level of PCH care required. Some socioeconomic characteristics are available but at a group rather than individual level. Some diagnoses may be identified in the hospital or physician claims, e.g., hip fracture, diabetes or stroke, but others like cognitive impairment are poorly captured. There are no measures of functional limitations. Manitoba Health provided data with regard to community supports to MCHP for this project. The data on supportive housing, respite beds and adult day care were complete; however data on community support programs were not reported in the same way among RHAs, making this information difficult to use.

We considered five categories of potential determinants of PCH bed use as a basis for projecting future need: health status, socioeconomic characteristics, age, sex, and region of residence. We decided to use the previous ten years as the basis for testing the explanatory power of the various factors at our disposal. It was judged the ten-year period was long enough to allow for the detection of any significant trends, but not so long as to reflect outdated historical patterns. The period of analysis parallels the one used in the recent MCHP report on the use of hospital resources (Stewart et al., 2002).

Health Status: The health status of the population has often been represented by the Premature Mortality Rate (PMR), that is the death rate of individuals prior to age 75. Indeed, this indicator has become a relatively standard measure of the health of the population in general (Carstairs and Morris, 1991; Eyles et al., 1991; Eyles and Birch, 1993) and has been used in previous MCHP research as a measure of population health. However, it is clear from its construction that it is likely to be a much more dependable description of the health of the population below the age of 75, and a markedly less valid and reliable indicator of health after that age. Since the vast majority of PCH bed use is in the post 75-year age groups, it is not likely to be a particularly useful predictor of demand. We looked at how well PMR was able to explain the pattern of PCH use in Manitoba and found that, as anticipated, it was not particularly good at explaining prior use. As a result, it was dropped as a possible predictor of future use.

Diagnoses: Three measures of morbidity more closely associated with aging populations and with the need for nursing home beds were considered as candidates for estimating PCH bed demand: stroke, diabetes, and hip fractures. Again, they proved to be inadequate at explaining bed use over the past ten years, and so were also dropped as possible predictors of future use.

Health status, socioeconomic characteristics, age, sex, and region of residence were considered as potential determinants of PCH bed use for projecting future need.

Socioeconomic Characteristics: The Socioeconomic Factor Index (SEFI) was developed by MCHP as a measure of the socioeconomic factors which are indicative of poor population health and need for health care resources. (See MCHP Concept Dictionary at www.umanitoba.ca/centres/mchp/concept.) The SEFI is an index consisting of six variables derived from Census data: the age dependency ratio, per cent single parent households, per cent female single parent households, labour force participation rate by females, an unemployment rate factor, and a high school completion rate factor. The SEFI has been found to parallel closely the Premature Mortality Rate as a correlate both of poor health and of use of various health services. Unfortunately, although there is a slight relationship between SEFI and the utilization of PCH beds in the past, it is not a strong enough relationship to allow for reliable projections of future use. It was, therefore, dropped as a potential predictor of future demand.

Age, sex, region of residence: The elimination of socioeconomic and health status indicators as direct predictors of demand for PCH beds left us with three remaining variables as possible predictors: age, sex, and region. One of the attractions of using age, sex and region is that these variables are readily available for forecasting by policymakers and RHAs, whereas many other measures are not.

We assumed that differences in things like social supports and availability of resources would be reflected in differences in PCH bed use by region. To put it another way, other factors mentioned above, which might affect PCH bed use but which are not directly measured, may be operating in the background and may be reflected in different patterns in PCH use among RHAs.

If we could explain PCH bed use over the recent past using only the size, and age/sex distributions of the population, that opens the possibility of using those variables to project demand into the future. If these variables do have an effect and the strength of that effect is changing over time, we would expect the rate of use of PCH beds to change over time. Above, we noted trends towards later admission and shorter stays. Basing our explanation of bed use on a relatively fine breakdown of the population into age/sex and regional categories allowed us to see how these different implicit factors are affecting bed use over time. We then projected those trends into the future to estimate future demand.

2.2 Regression Models to Explore the Variables that Explained PCH Bed Use in the Past

We developed separate regression models for Winnipeg and Non-Winnipeg over a ten-year period for twelve age-sex categories.

We developed separate regression models for Winnipeg and Non-Winnipeg over a ten-year period for twelve age-sex categories. This was done because there are potentially significant differences in factors affecting demand between the Winnipeg population and that in the rest of Manitoba. Winnipeg arguably has higher levels of community supports - including home care services, adult day care, supportive housing, companion care and meal services - which might enable Winnipeg residents to remain in the community more easily than if they lived elsewhere. So, there were 24 regression models in total. The outcome variable was PCH days per 1,000 population. Detailed descriptions of the methods used to develop the regression models can be found in Appendix B.

We divided the populations into six age strata and each of those into the two genders. The age strata were: 0-64, 65-74, 75-79, 80-84, 85-89, and 90+. In keeping with the procedures followed in MCHP's recent study as well as others (Jacobzone, 2000), we used the most recently available ten years of PCH bed use (from 1990/91 to 1999/2000) as the basis for trying to identify trends.

Separate linear regressions were developed for each age/sex stratum as a function of time (year) to estimate the number of days of PCH bed use per 1,000 population in each stratum. In other words, we developed a separate estimate to get a sense of the trend in the use of beds by, for example, 90+ males in Winnipeg over that ten-year period, and did the same for each

age/sex stratum in Winnipeg. We did the same for the population outside Winnipeg.

The actual number of PCH days in each year were used to develop regression equations for each category. Actual and estimated (or predicted) use were compared to see how well the model predicted what actually happened. (For further explanations and a detailed calculation, see Appendix B.) Figures 6 and 7 compare the used beds (PCH days/365) with the estimate from the regression models for Winnipeg and Non-Winnipeg. The actual number of PCH beds available is also provided. It is clear from Figures 6 and 7 that in both Winnipeg and Non-Winnipeg, the estimates over the years 1990/91 to 1999/2000 very closely approximate the actual usage.

Figure 6: Predicted PCH Beds per 1,000 Population
Winnipeg, 1990-1999 Trend

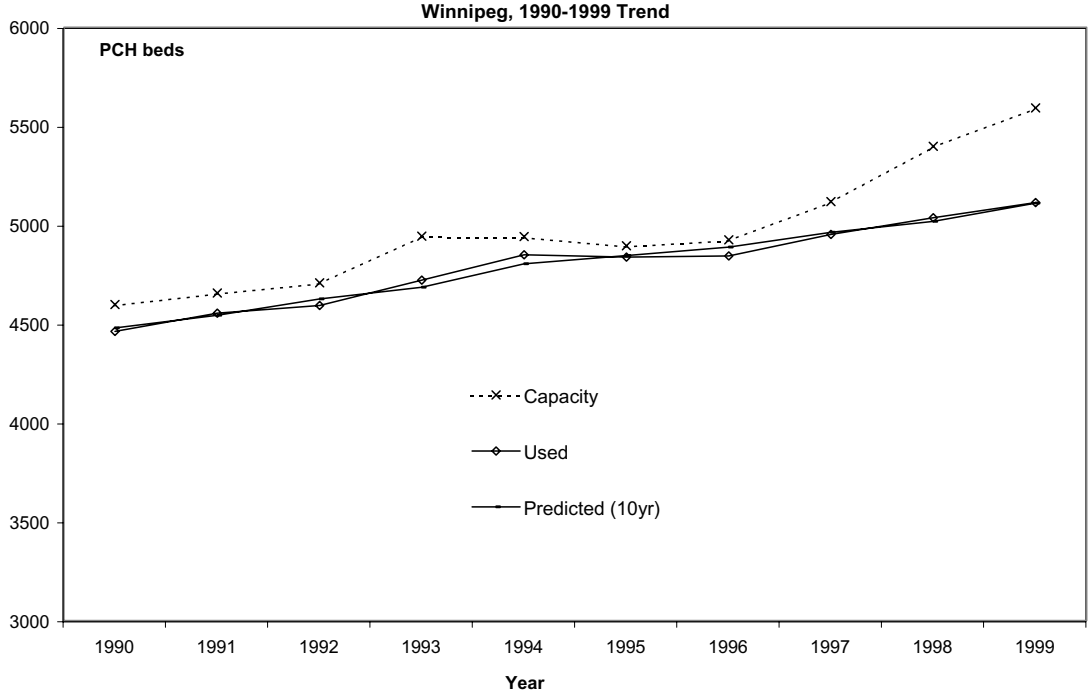


Figure 7: Predicted PCH Beds per 1,000 Population
Non-Winnipeg, 1990-1999 Trend

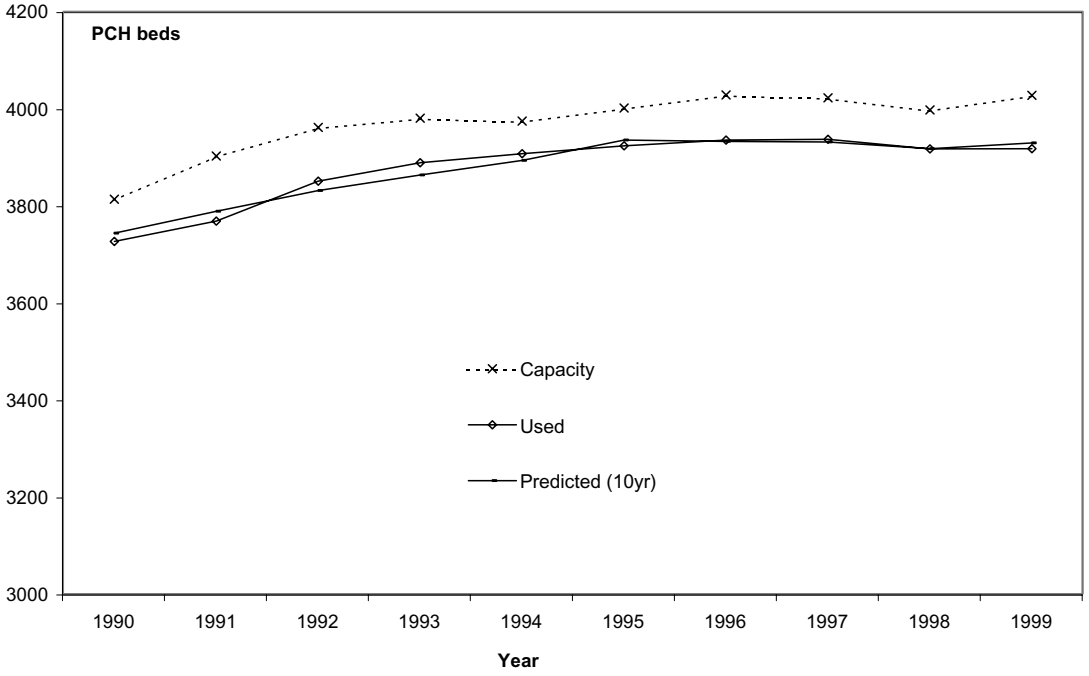


Table 1 provides the actual and estimated usage for Winnipeg and Non-Winnipeg, and from the difference between the two, one can see that there is a very good fit between the estimated and actual use. The closeness of the fit provides a rationale for using the age/sex strata estimates as a basis for projecting future demand for PCH beds. The next step is to use the model, but with the population projections provided by the Manitoba Bureau of Statistics, to estimate need for the year 2020.

Table 1: Predicted, Used and Available Beds in Winnipeg and Non-Winnipeg, 1990-1999

Beds/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Winnipeg										
Predicted (10yr)	4480	4544	4626	4685	4804	4846	4888	4963	5018	5111
Used	4462	4555	4593	4722	4850	4838	4844	4953	5037	5114
Difference	18	-11	33	-37	-46	8	44	10	-19	-3
Capacity	4598	4656	4708	4944	4942	4895	4925	5118	5398	5592
Non-Winnipeg										
Predicted (10yr)	3743	3788	3831	3863	3893	3935	3932	3931	3917	3929
Used	3726	3768	3850	3888	3907	3923	3935	3937	3917	3917
Difference	17	20	-19	-25	-14	12	-3	-6	0	12
Capacity	3813	3902	3961	3980	3974	4001	4028	4022	3997	4027

Figures 8 and 9 show the predicted demand for PCH beds through the year 2020 for both Winnipeg and the Non-Winnipeg segments of the Province. The estimates were derived using the method described above which we are calling the Trend Analysis method. As a basis for comparison, we have also projected bed demand using the current formula of 120 beds per 1,000 population ages 75 and over (which we have subsequently shortened to '75+ formula').

Figure 8: PCH Bed Projections for Winnipeg Based on 10-Year Trends

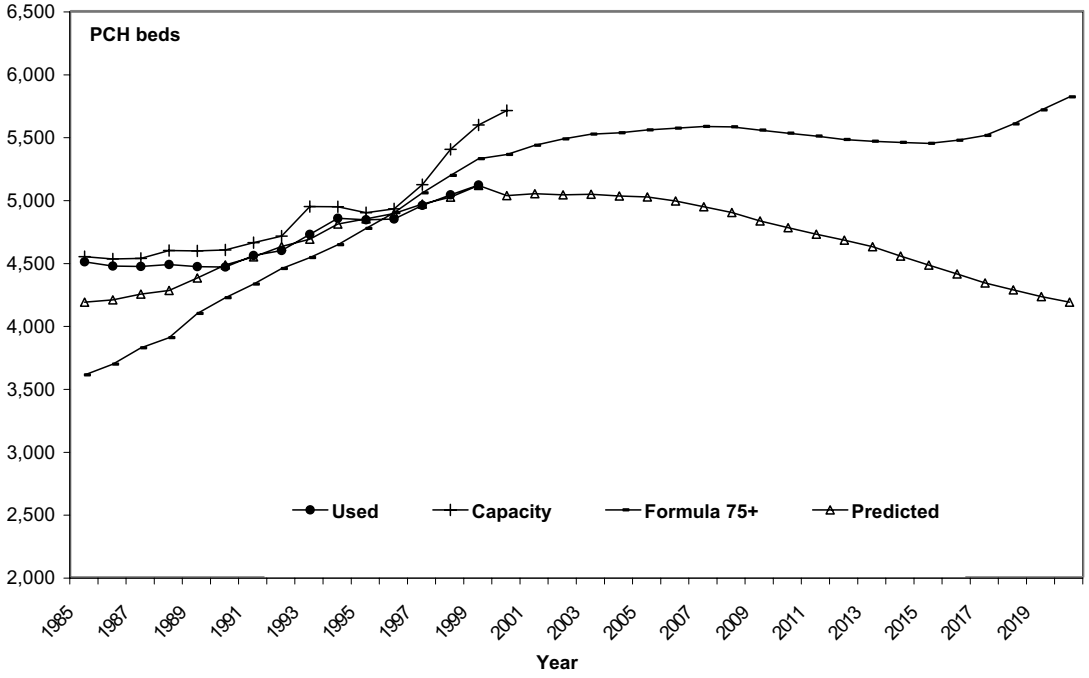
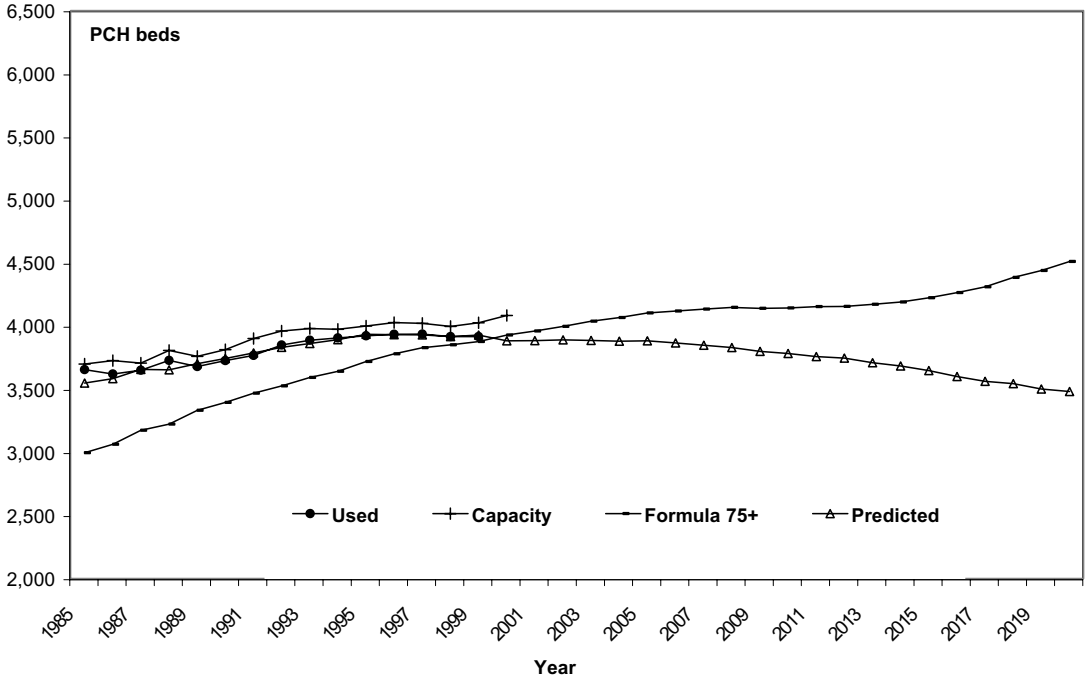


Figure 9: PCH Bed Projections for Non-Winnipeg Based on 10-Year Trends



In both Winnipeg and Non-Winnipeg, there is a very considerable difference in the projections using those two methods. The projection based on the 10-year Trend Analysis is for decreasing demand, while the 75+ formula projection is for increasing demand. For Winnipeg, the 75+ formula projects a need for 5,815 beds in the year 2020 and the Trend Analysis projects a need for 4,184 beds, a difference of 1,631 beds. In Non-Winnipeg, the 75+ formula projects a need for 4,511 beds in 2020 and the ten-year trend projects 3,413 beds, a difference of 1,098 beds. The Trend Analysis projections for both Winnipeg and Non-Winnipeg are well below the 2000/01 capacity of 5,707 and 4,084 beds, respectively. (See also Table B5 in appendix.)

The ten-year trend projections for both Winnipeg and Non-Winnipeg of 4,184 and 3,413 beds are well below the 2000/01 capacity of 5,707 and 4,084 beds respectively. In contrast, the Recent Use method projects demand would far outstrip current capacity, by 446 beds in Winnipeg and by 733 beds in Non-Winnipeg.

These are dramatic figures, but it is important to note that these differences, twenty years into the future are contingent on our assumption that the trend identified over the past 10 years will continue over that time span. But our assumption is just that: an assumption. We make no allowance for a slowing down or plateauing of demand due to changes in underlying factors. In order to test whether these trends are changing, we also examined the trend over the past five years and fifteen years. We found that the trend towards a decreasing rate of PCH use was evident for all three time spans, but it was most pronounced for 15 years, and least for five years. This suggests that the rate at which demand is decreasing may be slowing. Hence, it may be too optimistic to project the 10-year trend 20 years into the future. Therefore we developed a second projection method.

2.3 Recent Use Model

A much more conservative way of estimating future demand is to look at the utilization rates in the three most recent years for which data are available (1997/98-1999/2000), and to project the expected demand based on the average use rate in each age/sex category on that basis. This method assumes that any trends towards decreased demand have stopped, and that the current demand in each age-sex category will remain constant into the indefinite future, with no increases or decreases.

Using this method we find the mean rate of PCH days used per 1,000 population in each of the 12 age-sex categories, multiply that rate by the population in each year up to 2020, sum the number of days to find the total number of PCH days in each year, and divide the total by 365.

Figures 10 and 11 show the Recent Use projections to 2020. They are very different from those based on the ten-year trends. Rather than declining, demand appears to rise. Moreover, the Recent Use model projects a larger demand for PCH beds than the projection using the current 75+ formula. With the Recent Use projections, by 2020 demand in Winnipeg would be 6,153 beds which would exceed the 2000/01 capacity of 5,707 by 446 beds.

In the Non-Winnipeg areas demand is projected at 4817 beds, which would exceed the current Non-Winnipeg capacity of 4,084 by 733 beds. The Recent Use projections also exceed the 75+ formula projections by 338 and 306 beds for Winnipeg and Non-Winnipeg, respectively.

Figure 10: PCH Bed Projections for Winnipeg Based on 3-Year Mean Values

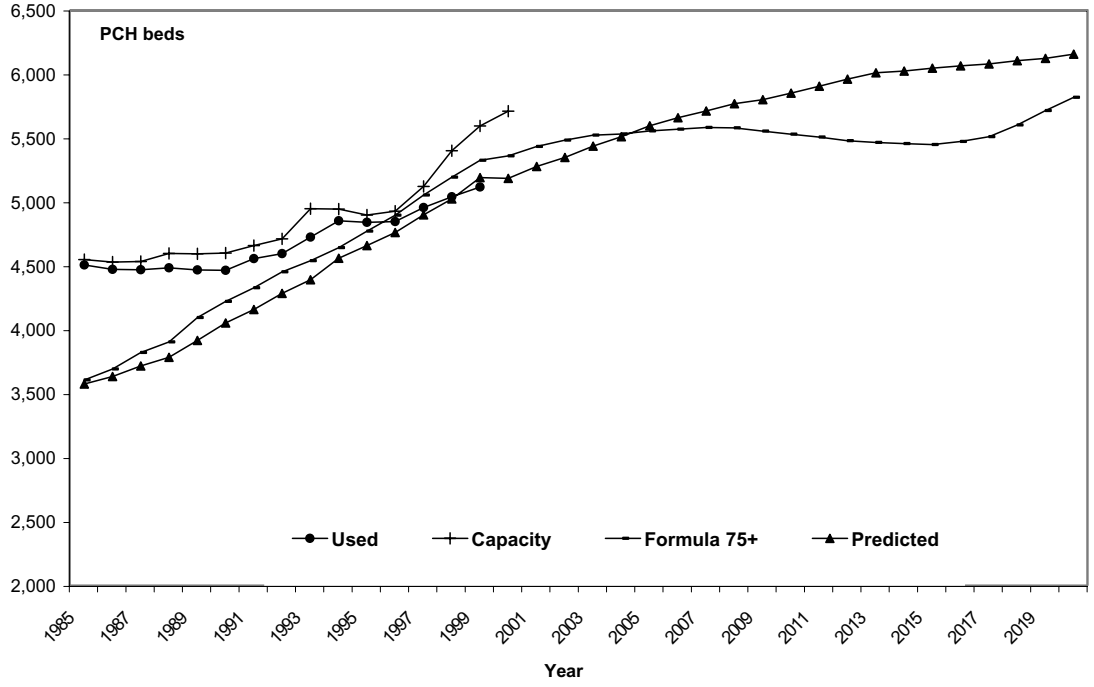
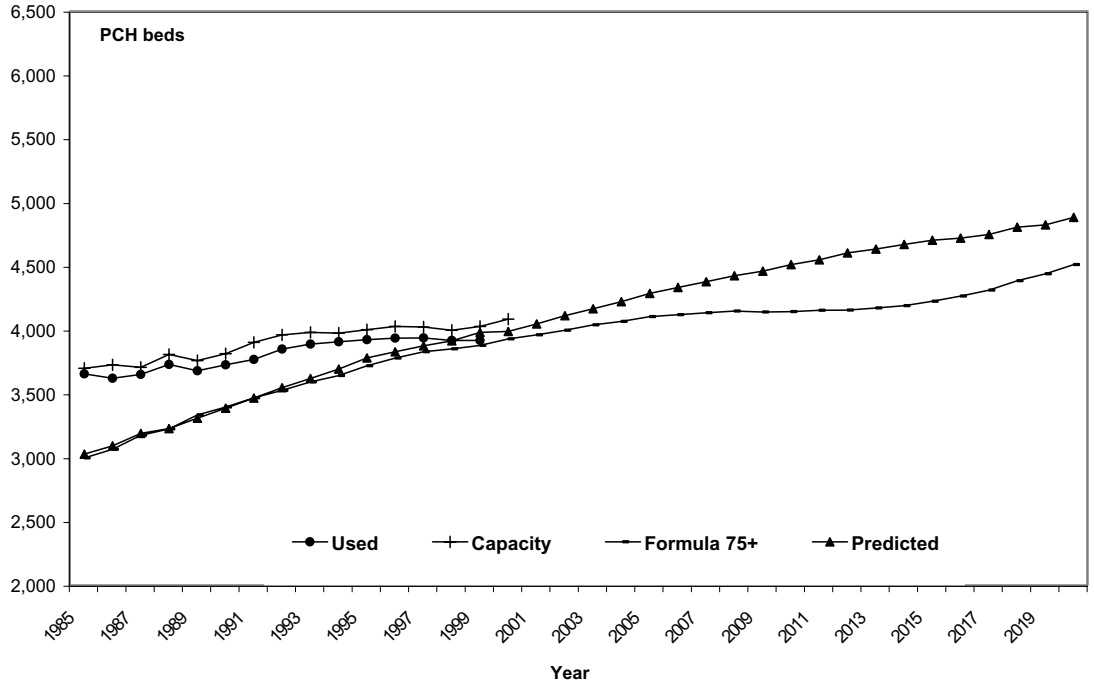


Figure 11: PCH Bed Projections for Non-Winnipeg Based On 3-Year Mean Values



But, just as the projection based on the 10-year trend may have been too optimistic, the Recent Use projection may be too pessimistic. A 3-year average does not allow for any change in trends. It simply projects recent usage, without regard to the evidence of a decline in demand. Recent usage could be higher because of changes in resources. For example, the PCH bed supply in Winnipeg increased by 9% (474) beds. Also closer adherence to a home care guideline that restricts its provision once costs exceed the costs of PCH care may have affected PCH use. We therefore developed a third projection method.

2.4 Combined Projection Model

As noted, there is a growing body of evidence that people are living not only longer but also healthier lives. Furthermore, there is a move to provide community supports to help people to stay in their homes as long as possible. These factors suggest that the downward trend in PCH use will continue; our own comparisons of fifteen-, ten- and five-year trends suggest that the rate of decrease might be slowing.

Given these considerations, perhaps the most prudent way of producing projections is to combine the possibly overly-optimistic 10-year trend projections and the potentially overly-pessimistic 3-year mean projections into a Combined projection. This Combined projection captures the effects of the ten-year trend, but moderates it by the damping effect of current usage rates. The result is a middle-level estimate.

Figures 12 and 13 show what the Combined projection looks like in comparison with the 10-year trend, the 3-year Recent Use, and the 75+ formula projections. The Combined method provides the middle level estimate. In Winnipeg this estimate is uniformly below the 75+ formula projection and is considerably below that projection as one approaches the end of the 20-year period. In the Non-Winnipeg part of the province, the Combined projection closely parallels the 75+ formula until 2015, at which time the two begin to diverge, with the 75+ formula yielding ever higher projections.

Figure 12: PCH Bed Projections for Winnipeg Based on Combining 10-Year Trends and 3-Year Mean Values

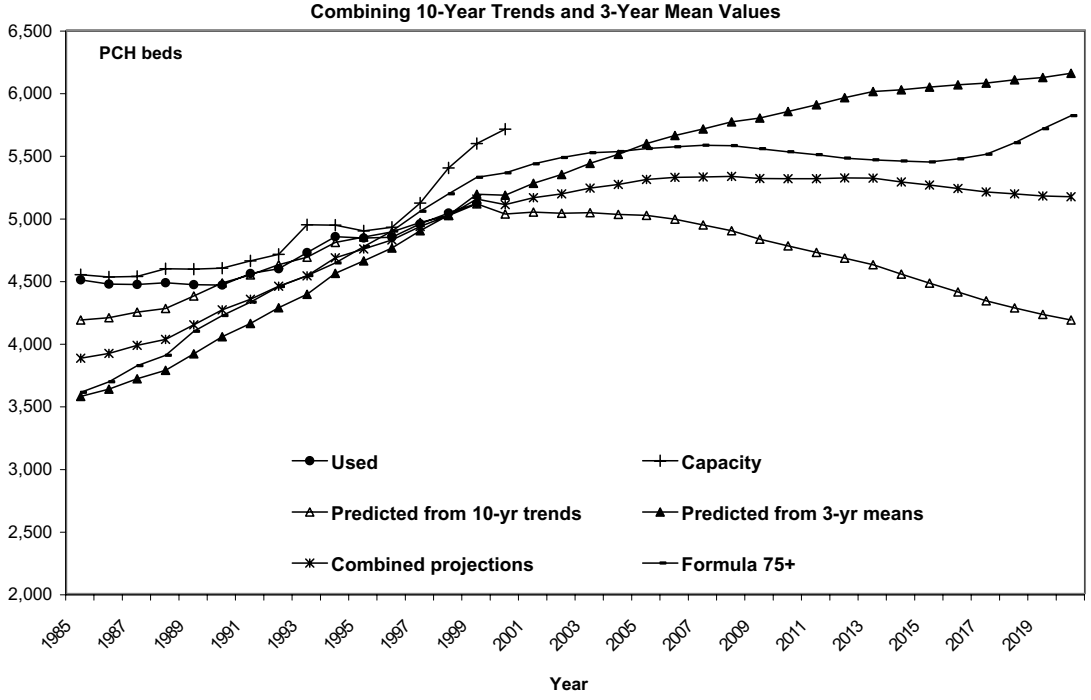


Figure 13: PCH Bed Projections for Non-Winnipeg Based on Combining 10-Year Trends and 3-Year Mean Values

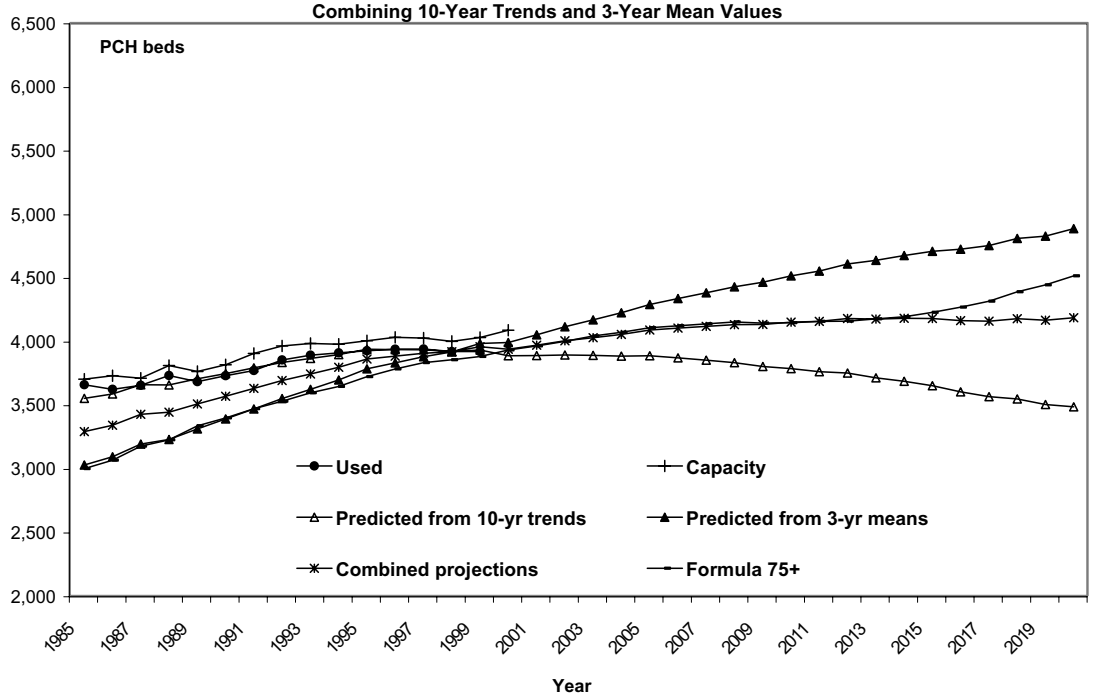


Table 2 provides the numerical estimates for the four projection methods along with current bed capacity. (The yearly data for both Winnipeg and Non-Winnipeg can be found in Appendix B, Table B6.) In Winnipeg, the

The Combined projection predicts a surplus of 538 beds in 2020 over the current supply for Winnipeg. For Non-Winnipeg the projection predicts a shortfall of 31 beds in 2020.

Combined projection remains below current capacity over the entire period ending with a projected demand in 2020 of 5,169 beds, a surplus of 538 over current capacity of 5,707. In Non-Winnipeg, the Combined method projects that demand will exceed the 2000/01 capacity of 4,084 beds starting in 2006. The peak demand of 4,145 is reached in 2012 (a shortfall of 61 beds), but then declines slightly, ending with 4,115 beds in 2020, which would yield a shortfall of 31 beds in 2020.

Table 2: Summary Table of Different Projection Methods for PCH Beds to Year 2020 in Manitoba

	PCH Beds Available in 2000/01	Ten-Year Trend Projection	Three-Year Recent Use Projection	Combined Projection	Current Formula 120 Beds/1000 Age 75+
Winnipeg	5707	4184	6153	5169	5815
surplus (deficit) over current		1523	(-446)	538	(-108)
Non-Winnipeg	4084	3413	4817	4115	4511
surplus (deficit) over current		671	(-733)	(-31)	(-427)

2.5 Projecting Demand in the Regional Health Authorities

Responsibility for administering PCH beds in Winnipeg falls under the single jurisdiction of the Winnipeg Regional Health Authority. In the rest of Manitoba, 11 Regional Health Authorities have those responsibilities. Accordingly, it is important to provide projections for the demand for PCH beds on a regional basis. However, populations of the Churchill and Burntwood Regions are so small that for purposes of analysis we have had to collapse them into a single entity, here called the Churchill/Burntwood Region.

We did not develop regression models for each RHA for a number of reasons. First, the population numbers in each age-sex category for some RHAs were too small. Moreover, within any given RHA, the number of beds used is capped by the number of beds available in that RHA. So, within any RHA, underlying demand is not necessarily reflected in prior use. That is, areas which have more beds per capita will very likely have higher use rates and those with fewer beds have lower use rates. This has in fact been demonstrated in previous MCHP deliverables (Roos et al., 2001b). Table 3 shows the number of beds in each Non-Winnipeg RHA in 1999, the number that were used (based on PCH days/365), and the number that would be expected based on the planning ratio of 120 beds per 1,000 population

age 75+. It is clear that the number of beds used is very close to capacity. Areas that appear to be underbedded are North Eastman and Churchill/Burntwood. Areas that appear to be over-bedded are Brandon and, to a small extent, South Westman.

Table 3: Capacity, Beds Used and Expected Use by 75+ Formula in Non-Winnipeg RHAs for 1999

RHA	Capacity	Used PCH Beds	Expected by 120/1000 Age 75+ Formula
Central	815	805	811
North Eastman	150	147	235
South Eastman	332	322	316
Interlake	552	538	545
Nor-Man	120	107	104
Parkland	545	524	517
Churchill/Burntwood	26	21	60
Brandon	595	591	396
Marquette	425	420	425
South Westman	468	443	433

Given that the provision of PCH care is the responsibility of each Regional Health Authority, it is not surprising that use in each RHA has been somewhat different from the overall Non-Winnipeg use. We estimated demand in each of the RHAs using the three methods described above, modified to take into account historical regional differences.

To estimate future demand, using the Ten-Year model, the Non-Winnipeg model was adjusted for each RHA according to the RHA's current use in relation to Non-Winnipeg.

To estimate future demand, using the Ten-Year model, each RHA was not simply assigned expected utilization rates according to the Non-Winnipeg model rate. Rather, the Non-Winnipeg model was adjusted for each RHA according to the RHA's current use in relation to Non-Winnipeg. So, for example, Brandon in 1999/2000 used the equivalent of 591 beds. Based on the Non-Winnipeg model rate and the population of Brandon in 1999/2000, it would have used only 400 beds. Therefore, Brandon's actual use was 48% higher than expected according to the Non-Winnipeg ten-year trend. (This can only partially be explained by the presence of a 100-bed PCH primarily for former residents of Brandon Mental Health Centre.) This utilization rate was projected forward into the future. Based on a comparison between actual and predicted use from 1997/98 to 1999/2000, the Non-Winnipeg ten-year model was adjusted up or down for each RHA. (See Appendix Table B3 for the actual adjustment coefficients for each RHA.)

In the Recent Use model, we built up the Non-Winnipeg projection from the projections for each RHA. We calculated the average PCH use over 1997/98-1999/2000 for each RHA, then summed them to reach the Non-Winnipeg values. Finally, the Combined projection is simply the average of

the projections of the two other models.

Figures 14 to 24 show the results of using the different projection methods in each RHA. Tables B6 to B15 in Appendix B have the data from which the figures were derived. The figures show the four ways in which we have projected demand: 75+ formula, 10-Year Trend projections, Recent Use projections and Combined projections. The first three are provided as brackets (best and worst-case scenarios) for the Combined projections. In our discussion below we will focus on the Combined projection as the most likely scenario.

2.5.1 Migration to other RHAs

Before discussing each RHA individually, one more issue should be addressed, and that is the degree of migration between RHAs for PCH care. As stated previously, the data available to us do not provide a measure of independent factors that can be used as indicators of need. However, one clue to the relationship between underlying demand and bed capacity is the extent to which residents of a given RHA are admitted to PCHs outside their region.

There are a variety of reasons why individuals may seek out a bed in a PCH in an RHA other than that in which they have lived: for example, proximity to children, relatives, or friends, or preference for an urban (or rural) location. On average, however, one might expect such factors to cancel one another across RHAs, and if underlying demand is equally addressed in all RHAs one would not expect significant net outflows from some RHAs and net inflows into others.

Analysis of PCH residents in RHAs according to residence prior to admission indicates that the vast majority (9,562 of 10,697, or 89.4%) move to a PCH in their region of prior residence.

Tables 4 and 5 show the migration of PCH residents among the RHAs for the 1999/2000 year, as compared to their prior RHA of residence. Table 4 shows the location of PCH residents according to where they lived prior to moving to a PCH. For instance, between April 1, 1999, and March 31, 2000, there were 903 Central RHA residents who were living in a PCH; 783 (86.7%) lived in a PCH in their own RHA (Central), 75 had moved to a PCH in Winnipeg and 45 to another RHA. Table 5 looks at migration according to PCH location. Using Central again as an example, there were 935 persons residing in a PCH in Central RHA over that time period and 783 (83.7%) had lived in Central prior to moving to a PCH, but 73 people from Winnipeg and 79 from other RHAs had moved to a PCH located in Central RHA. From these tables, it is clear that the vast majority (9,562 of 10,697, or 89.4%) live in PCHs in their region of prior residence.

Table 4: Where RHA Residents from a Given RHA Went to a PCH as of April 1, 2000

Region of residence (pre-PCH)	Region of PCH: To PCH in RHA	To PCH Out of RHA (Non-Winnipeg)	To PCH Out of RHA (Winnipeg)	Total
Central	783 (87%)	45 (5%)	75 (8%)	903
North Eastman	124 (61%)	21 (10%)	59 (29%)	204
South Eastman	281 (81%)	15 (4%)	49 (14%)	345
Interlake	513 (79%)	18 (3%)	120 (18%)	651
Nor-Man*	87 (88%)			99
Parkland	531 (93%)	16 (3%)	22 (4%)	569
Churchill/Burntwood*	23 (43%)			53
Brandon	526 (86%)	63 (10%)	20 (3%)	609
Marquette	432 (84%)	72 (14%)	11 (2%)	515
South Westman	458 (85%)	71 (13%)	10 (2%)	539
Winnipeg	5804 (93%)	406 (7%)	na	6210
Total	9562 (89%)	744 (7%)	391 (4%)	10697

* Data suppressed for Nor-Man and Churchill/Burntwood because of small numbers.

Table 5: Where Residents of a PCH in a Given RHA Came From as of April 1, 2000

Region of PCH	Region of residence (pre-PCH): From RHA	From other RHA (Non-Winnipeg)	From Winnipeg	Total
Central	783 (84%)	79 (8%)	73 (8%)	935
North Eastman	124 (75%)	8 (5%)	34 (20%)	166
South Eastman	281 (76%)	24 (6%)	66 (18%)	371
Interlake	513 (82%)	21 (3%)	89 (14%)	623
Nor-Man*	87 (84%)			103
Parkland	531 (85%)	39 (6%)	52 (8%)	622
Churchill/Burntwood*	23 (92%)			25
Brandon	526 (82%)	80 (12%)	36 (6%)	642
Marquette	432 (89%)	32 (7%)	22 (4%)	486
South Westman	458 (87%)	44 (8%)	27 (5%)	529
Winnipeg	5804 (94%)	391 (6%)		6195
Total	9562 (89%)	729 (7%)	406 (4%)	10697

* Data suppressed for Nor-Man and Churchill/Burntwood because of small numbers.

Only two RHAs had a net percentage outflow of more than 10%: North Eastman (22.9%) and Churchill/Burntwood (112.0%). However, the Churchill/Burntwood RHA also has 34 Federal nursing home beds not captured in our data, and so interpretation of results for that RHA must be tempered by that fact. Furthermore, Churchill has designated seven of its hospital beds as PCH. Also, although 112% of residents lived in a PCH outside the RHA, that represented only 28 persons. By contrast, no RHAs

had net inflows of more than 10%, although Parkland, Brandon, Central and South Eastman all had inflows ranging from 26 to 53 persons. In the discussion about each individual RHA below, the degree of migration into and out of the region will be noted. Table 6 summarizes net in- and out-flow of residents for each of the RHAs.

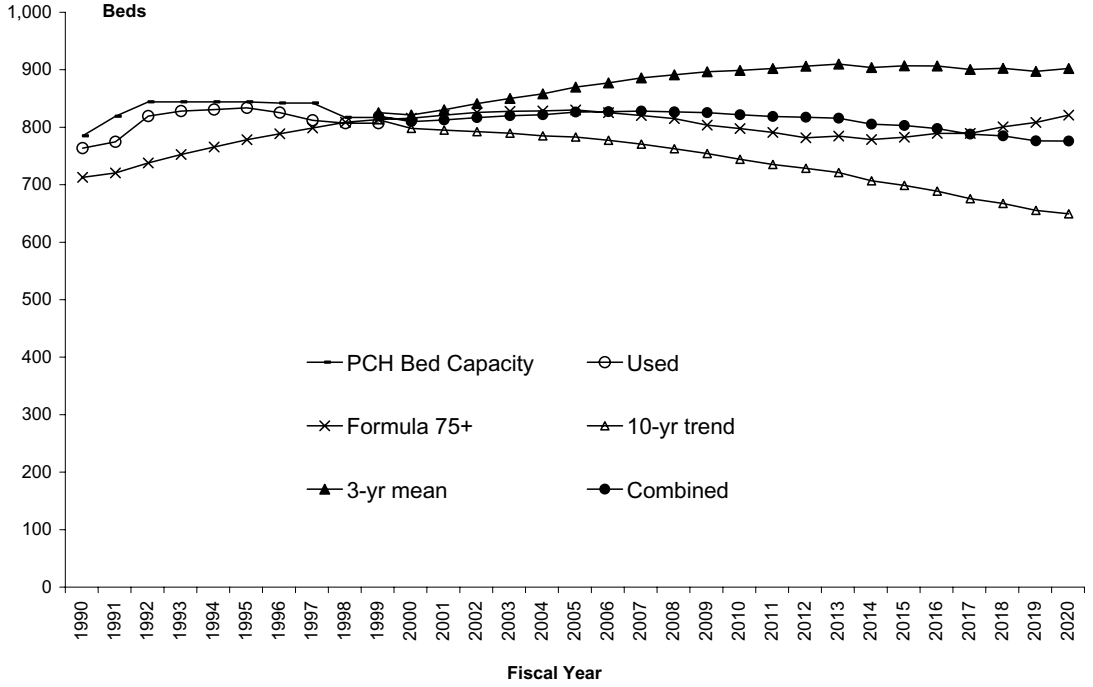
Table 6: Net In- and Out-Flow of Residents of PCHs as of April 1, 2000

Region	Number of residents in a PCH in RHA	Total RHA residents in a PCH in Manitoba	Surplus (deficit)*	Per cent inflow (outflow)
Central	935	903	32	3.4%
N Eastman	166	204	(-38)	(-22.9%)
S Eastman	371	345	26	7.0%
Interlake	623	651	(-28)	(-4.5%)
Nor-Man	103	99	4	3.9%
Parkland	622	569	53	8.5%
Chur/Bur	25	53	(-28)	(-112%)
Brandon	642	609	33	5.1%
Marquette	486	515	(-29)	(-6%)
S Westman	529	539	(-10)	(-1.9%)
Winnipeg	6195	6210	(-15)	(-0.2%)

* 'surplus' means more residents moved into RHA than out; 'deficit' means more residents moved out of RHA than in.

2.6 Central

Figure 14: Central RHA, PCH Bed Projections Using Four Different Methods



Population (%) age 75+ in 1998: 6,721 (6.3%)
Population (%) age 75+ in 2020: 6,825 (6.3%)
Change in population age 75+: +1.5%
Net Inmigration (outmigration) as of April 1, 2000: +32 persons
PCH beds 2000/01: 811
Combined model projection for 2020: 774
Surplus (deficit) between current and projected: +37 beds

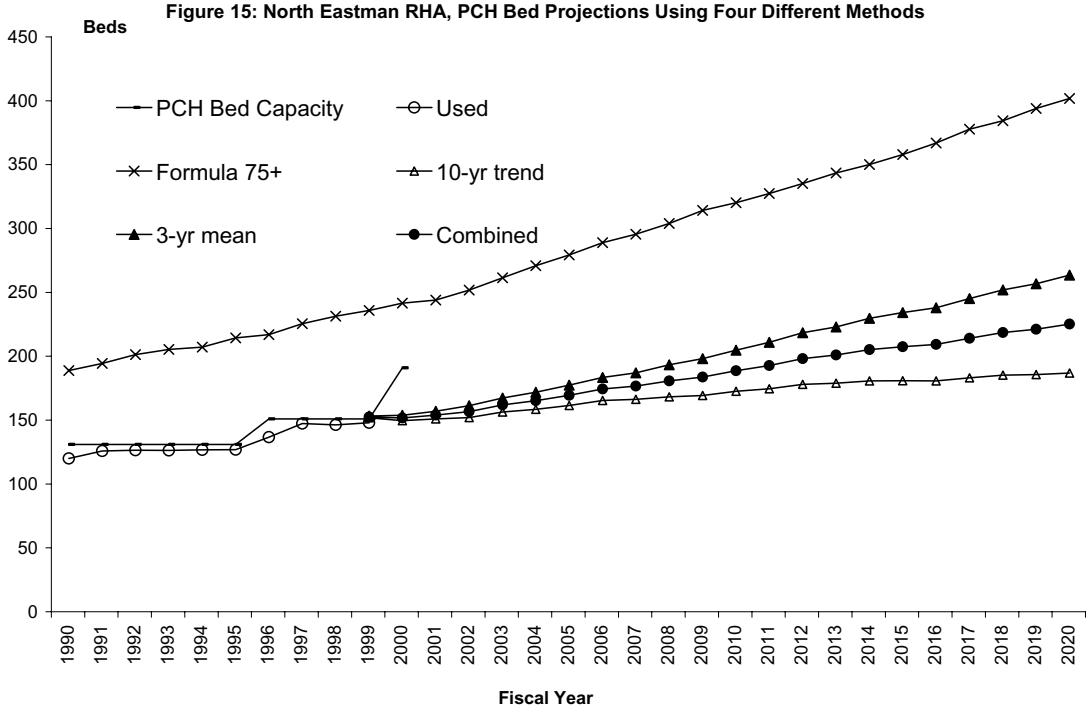
In Central RHA, the population age 75+ is projected to increase only slightly, from 6,721 to 6,825 (1.5%) from 1998 to 2020. Current PCH bed capacity in Central is 811 beds. In fiscal 1999/2000, there were 903 Central residents who lived in a PCH somewhere in the province, 783 (86.7%) of them were in a PCH in their own RHA. There were 935 persons residing in a PCH in Central region; 783 (84%) came from Central RHA.[3] Therefore Central experienced a net immigration of 32 persons.

The Combined projection predicts that demand will exceed supply from 2002 to 2013, by a maximum of 15 beds, which would occur in 2007. After 2013, demand will drop below current capacity and in 2020, the Combined model predicts the current capacity will exceed demand by 37 beds. These data suggest that Central has sufficient PCH beds to the year 2020.

[3] The number of persons who had resided in beds in Central exceeds the number of beds because of turnover due to various reasons, including death. This is, of course, true for most RHAs discussed below.

2.7 North Eastman

Figure 15: North Eastman RHA, PCH Bed Projections Using Four Different Methods



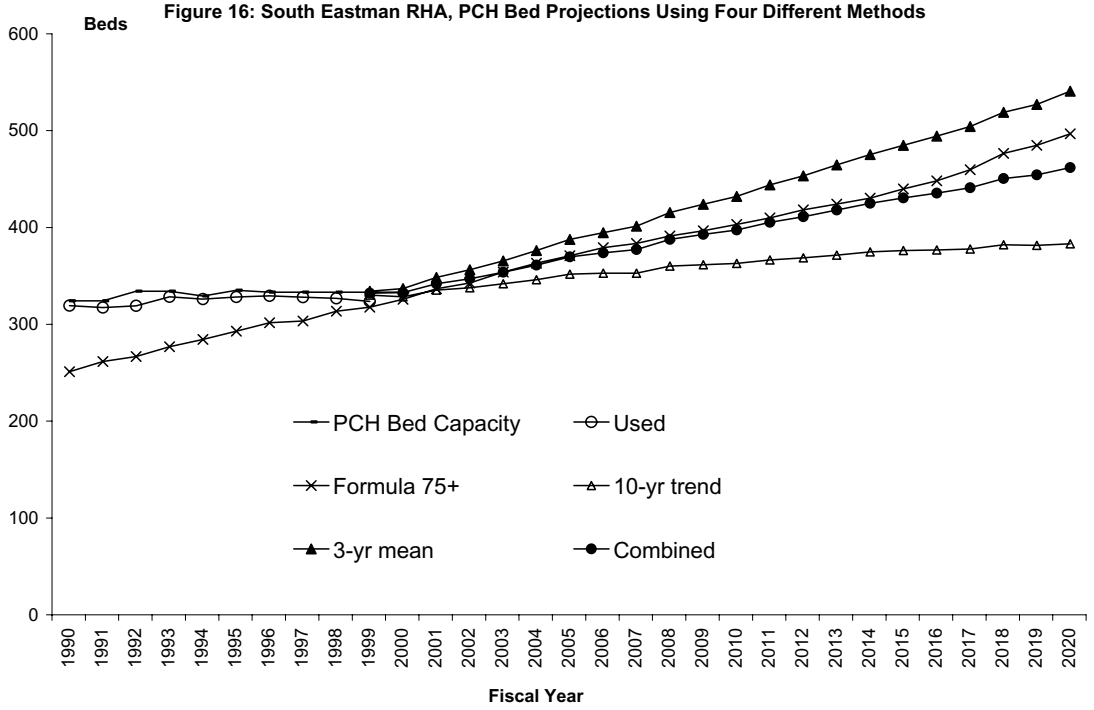
Population (%) age 75+ in 1998: 1,920 (5.0%)
Population (%) age 75+ in 2020: 3,340 (7.1%)
Change in population age 75+: +74.0%
Net Inmigration (outmigration) as of April 1, 2000: (-38) persons
PCH beds 2000/01: 190
Combined model projection for 2020: 224
Surplus (deficit) between current and projected: (-34) beds

In North Eastman the population age 75+ is projected to almost double between 1998 and 2020, from 1,920 to 3,340 (74.0%). Between April 1, 1999 and March 31, 2000 204 North Eastman residents resided in a PCH somewhere in Manitoba, 124 (60.8%) were in a PCH in North Eastman. There were 166 persons in a PCH in North Eastman, 124 (75%) from North Eastman for a net deficit of 38 persons.

The Combined projection indicates that demand will outstrip current capacity in 2011, and by 2020, demand is projected to be 224 beds, which is 34 more than current capacity. The projected growth in the older population, and the current outflow of North Eastman residents to other RHAs, mainly Winnipeg, suggest that North Eastman will need more PCH beds by 2020.

2.8 South Eastman

Figure 16: South Eastman RHA, PCH Bed Projections Using Four Different Methods

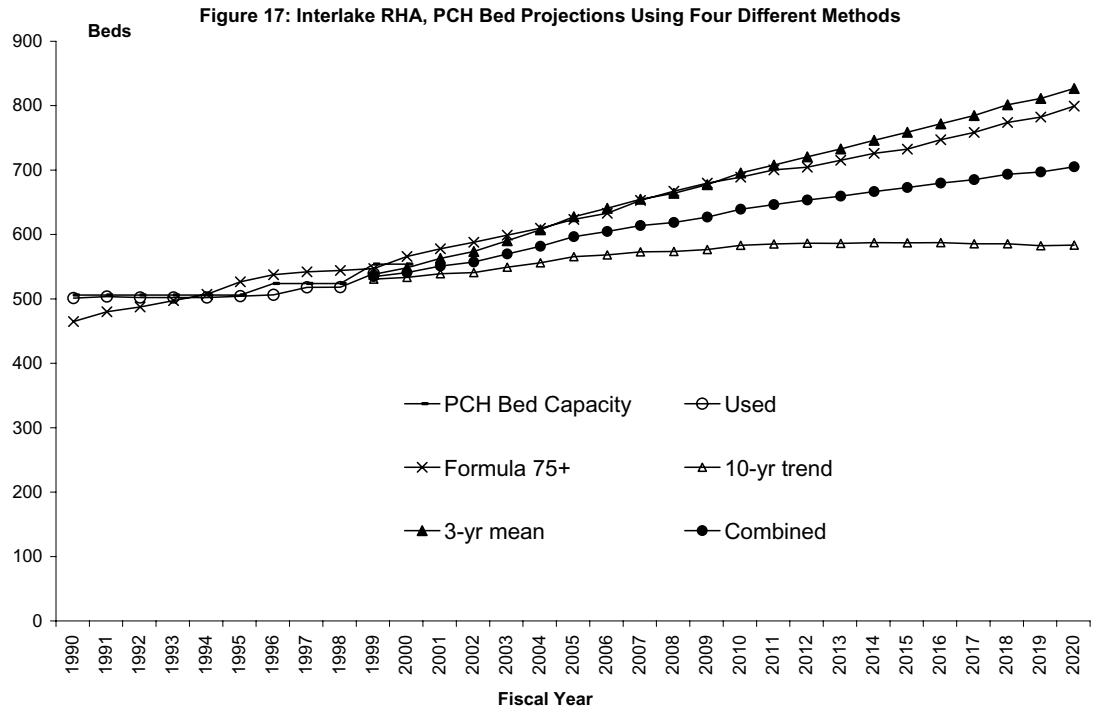


Population (%) age 75+ in 1998: 2,602 (4.9%)
Population (%) age 75+ in 2020: 4,130 (6.0%)
Change in population age 75+: +58.7%
Net Inmigration (outmigration) as of April 1, 2000: +26 persons
PCH beds 2000/01: 332
Combined model projection for 2020: 461
Surplus (deficit) between current and projected: (-129) beds

The population of seniors age 75+ is expected to increase in South Eastman by almost 60%, from 2,602 in 1998 to 4,130 in 2020. Between April 1, 1999 and March 31, 2000 there were 345 South Eastman residents who lived in a PCH, either in South Eastman (281) or elsewhere in Manitoba, and 371 persons resided in a PCH located in South Eastman, so there was a net in-migration in South Eastman of 26 persons. As with North Eastman, the majority of South Eastman residents who were not in a PCH in their own region were in a Winnipeg PCH; 49 (14.2%) of the 345.

The current capacity of 332 PCH beds is projected to be exceeded immediately, and by the year 2020, the Combined method calls for 461 beds, 129 more than current capacity. The data suggest that South Eastman will need more PCH beds in future.

2.9 Interlake

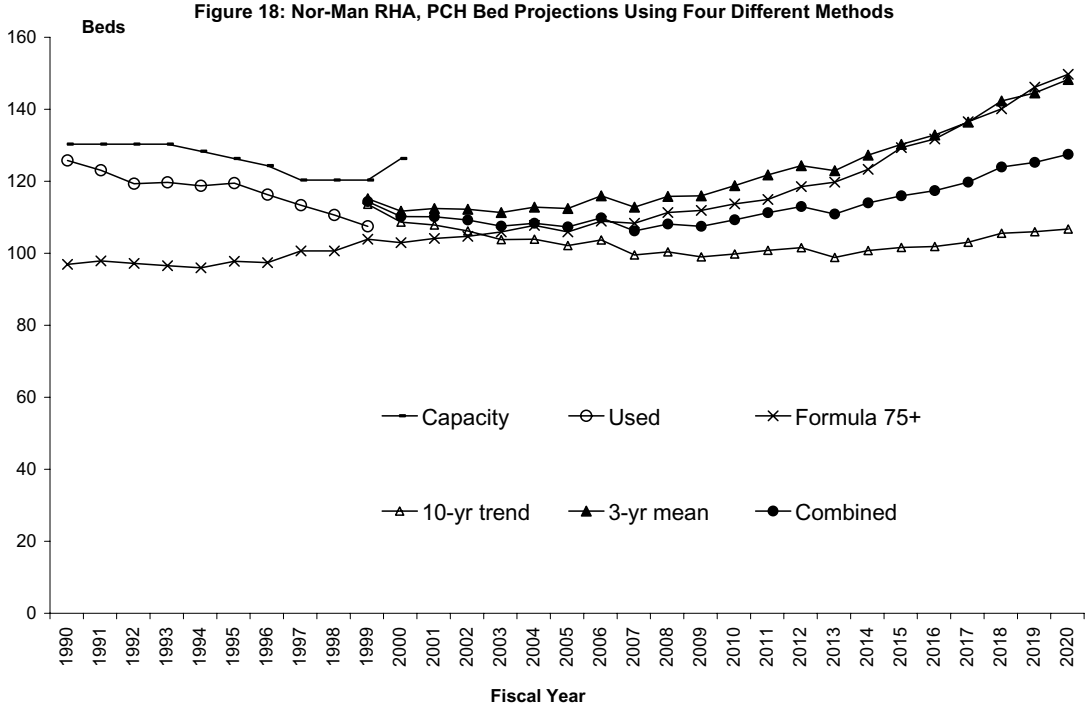


Population (%) age 75+ in 1998: 4,520 (6.1%)
Population (%) age 75+ in 2020: 6,645 (7.7%)
Change in population age 75+: +47.0%
Net Inmigration (outmigration) as of April 1, 2000: (-28) persons
PCH beds 2000/01: 552
Combined model projection for 2020: 703
Surplus (deficit) between current and projected: (151)

As for North and South Eastman, the Interlake population of 75+ year-olds is expected to be quite high, from 4,520 to 6,645 between 1998 and 2020 (47.0%). There were 651 Interlake residents in a PCH somewhere in the province between April 1, 1999 and March 31, 2000. Most of them (513 or 78.8%) were in their own Region, but 120 (18.4%) were in Winnipeg. Also, there were 623 persons residing in a PCH in Interlake, and 89 (14.3%) had moved from Winnipeg to a PCH in the Interlake. Thus, there was a net movement of 28 PCH residents out of Interlake. Similar to South Eastman, the PCH bed capacity of 552 is projected to be exceeded by demand immediately, and by 2020, the excess of demand over supply is projected to be 151 beds.

2.10 Nor-Man

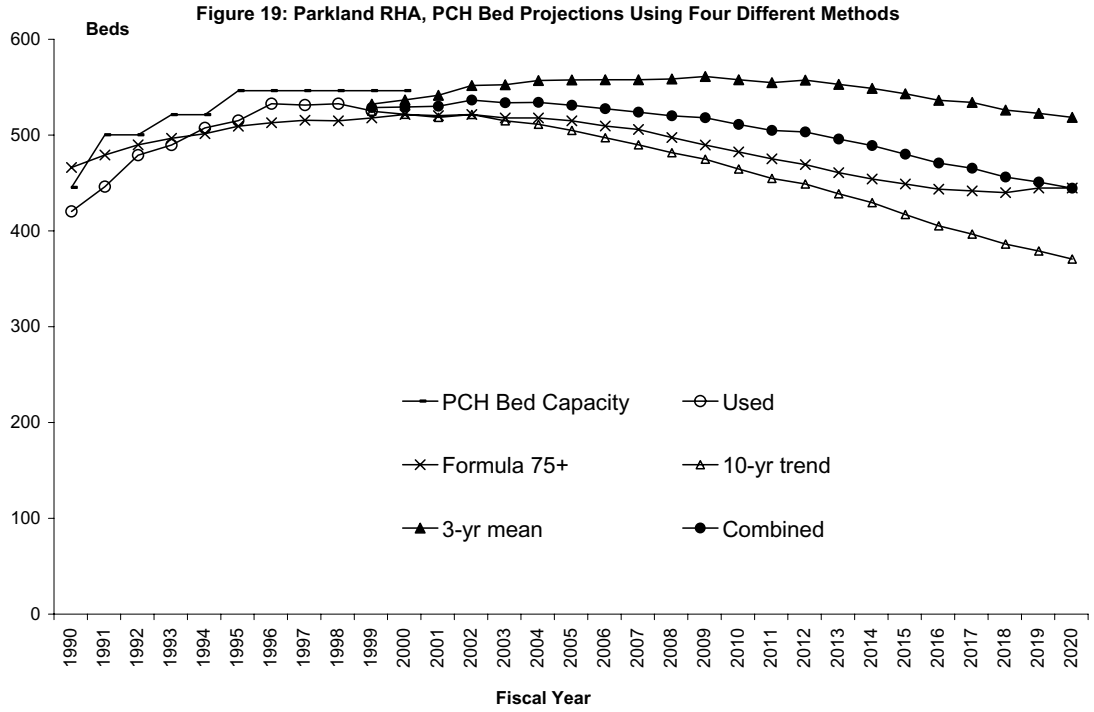
Figure 18: Nor-Man RHA, PCH Bed Projections Using Four Different Methods



Population (%) age 75+ in 1998: 836 (3.3%)
Population (%) age 75+ in 2020: 1,245 (4.4%)
Change in population age 75+: +48.9%
Net Inmigration (outmigration) as of April 1, 2000: +4 persons
PCH beds 2000/01: 126
Combined model projection for 2020: 133
Surplus (deficit) between current and projected: (-7) beds

The population aged 75 or older in Nor-Man is expected to increase by 409 persons (48.9%), from 836 in 1998 to 1,245 in 2020. In- and out-migration in Nor-Man was almost balanced. There were 99 Nor-Man residents who lived in a PCH between April 1, 1999 and March 31, 2000, 12 of them in another RHA. There were 103 persons residing in a PCH in Nor-Man, 16 of them from other RHAs. Current capacity of PCH beds is 126, and this is projected to be sufficient until 2018. Our projections suggest that Nor-Man should have sufficient PCH capacity.

2.11 Parkland



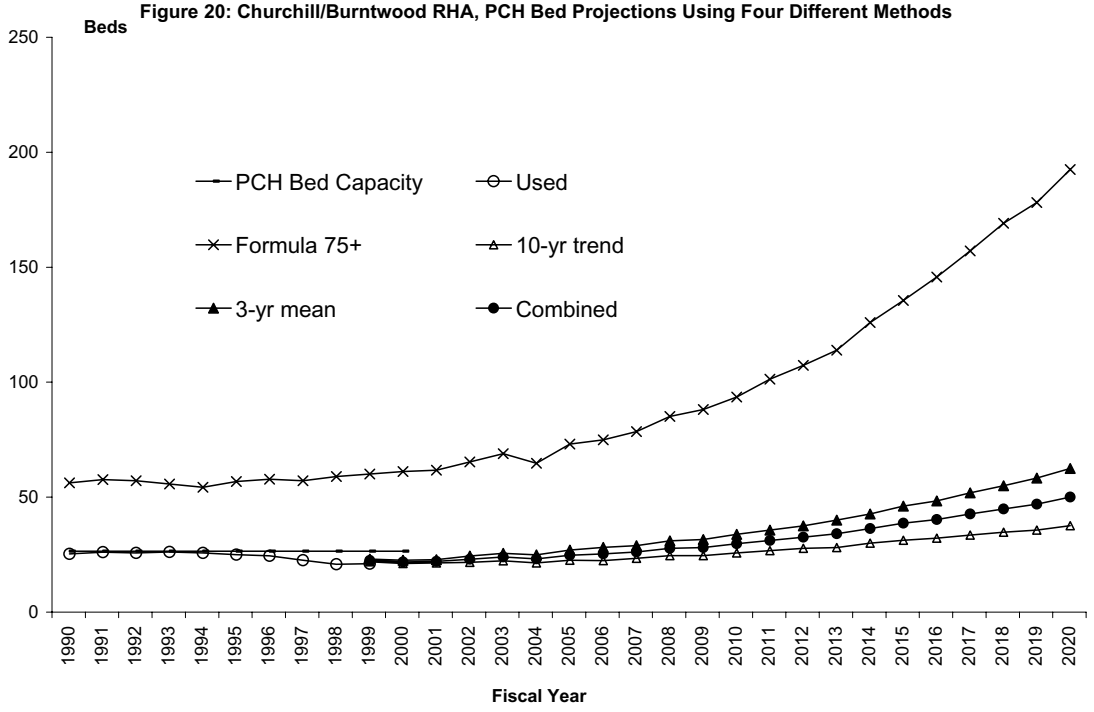
Population (%) age 75+ in 1998: 4,284 (9.9%)
Population (%) age 75+ in 2020: 3,695 (8.3%)
Change in population age 75+: -13.7%
Net Inmigration (outmigration) as of April 1, 2000: +53 persons
PCH beds 2000/01: 545
Combined model projection for 2020: 443
Surplus (deficit) between current and projected: +102 beds

The senior population (age 75+) is anticipated to decrease by 13.7% in Parkland, from 4,284 in 1998 to 3,695 in 2020. In Parkland between April 1, 1999 and March 31, 2000, there were 622 PCH residents, and most of them (85.4%) were from Parkland RHA. There were 569 persons from Parkland residing in a PCH, either in Parkland (531) or elsewhere in Manitoba. Therefore there was a net gain to Parkland of 53 PCH residents.

The current PCH bed capacity of 545 will be about 100 more beds than needed, according to the Combined method. The projection shows that starting in 2007, demand will be below what it was in 1999, and it will continue to decrease to 443 PCH beds in 2020. No new nursing homes are required for Parkland based on these estimates, and Parkland may experience a significant surplus in the future.

2.12 Churchill/Burntwood

Figure 20: Churchill/Burntwood RHA, PCH Bed Projections Using Four Different Methods



Population (%) age 75+ in 1998: 487 (1.1%)
Population (%) age 75+ in 2020: 1,600 (2.6%)
Change in population age 75+: +228.5%
Net Inmigration (outmigration) as of April 1, 2000: (-28) persons
PCH beds 2000/01: 26
Combined model projection for 2020: 50
Surplus (deficit) between current and projected: (-24) beds

The 75-and-older population in Churchill/Burntwood will more than triple, from 487 persons in 1998 to 1,600 in 2020. The current capacity of 26 PCH beds will be exceeded in the year 2008, according to the Combined method, and by 2020, the demand will be for 50 PCH beds, 24 more than the current capacity.

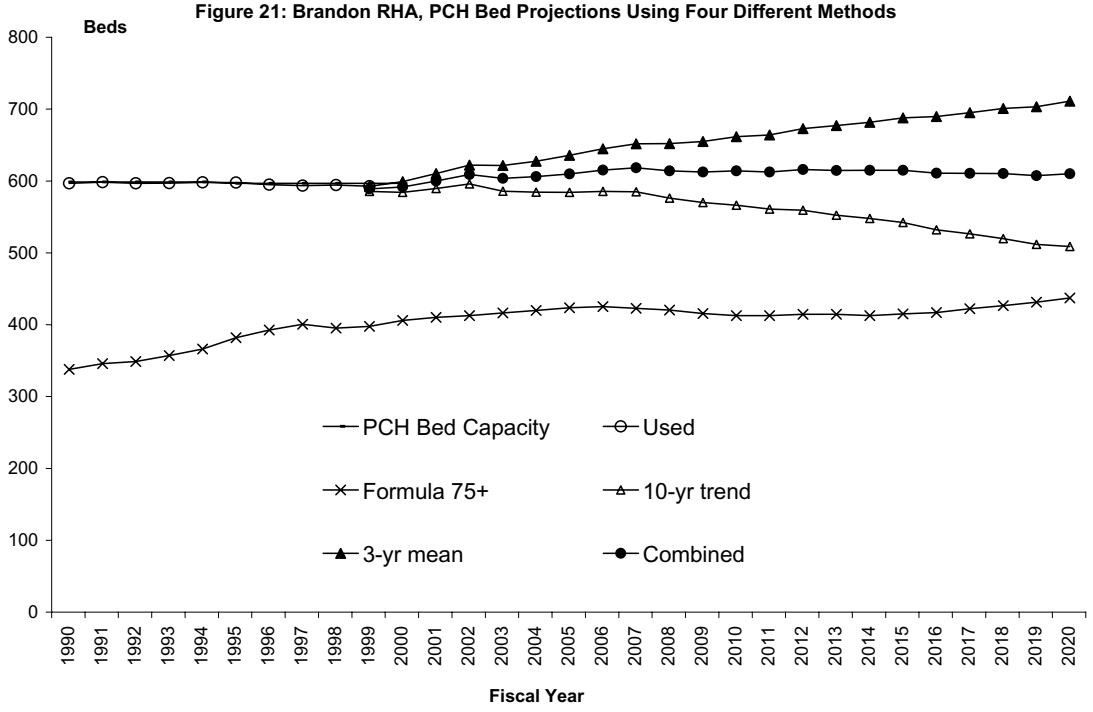
The projection for Churchill/Burntwood is further complicated by other factors: first, there are 34 federal nursing home beds for which we do not have data to use in our projection methods, as well as seven hospital beds in Churchill that have been designated for personal care that we have not included in our data. Second, the remoteness and isolation of communities in the Far North make it difficult to provide home care that can delay the

need for nursing home beds. Therefore, the need in this region may in fact be greater than we have projected.

Another reason to support the need for more nursing home beds in Churchill/Burntwood is the fact that 53 residents of this area were in a PCH in between April 1, 1999 and March 31, 2000, and only 23 of them were in their own RHA, while 14 were in a Winnipeg PCH and 16 were in another RHA, the majority in Nor-Man or Parkland.

2.13 Brandon

Figure 21: Brandon RHA, PCH Bed Projections Using Four Different Methods



Population (%) age 75+ in 1998: 3,280 (5.0%)
Population (%) age 75+ in 2020: 3,630 (7.1%)
Change in population age 75+: +10.7%
Net Inmigration (outmigration) as of April 1, 2000: +33 persons
PCH beds 2000/01: 595
Combined model projection for 2020: 608
Surplus (deficit) between current and projected: (-13) beds

In Brandon, the number of persons 75 years and older is projected to increase 10.7% from 3,280 in 1998 to 3,630 in 2020. Between April 1, 1999 and March 31, 2000, there were 609 Brandon residents who resided in a PCH, 526 (86.3%) in Brandon. There were 642 persons in a PCH located in Brandon, for a net inmigration of 33 persons.

The current capacity of 595 beds is only 13 less than the projection of 608 for 2020; however, demand is expected to rise to a high of 617 in 2007, after which it will decline slightly. It must be remembered though that Brandon is currently 'over-bedded' and has a use rate that is 48% higher than the Non-Winnipeg average. This is only partly explained by the 100-bed PCH for former Brandon Mental Health Centre residents. These data suggest that Brandon will have sufficient bed capacity until 2020.

2.14 Marquette

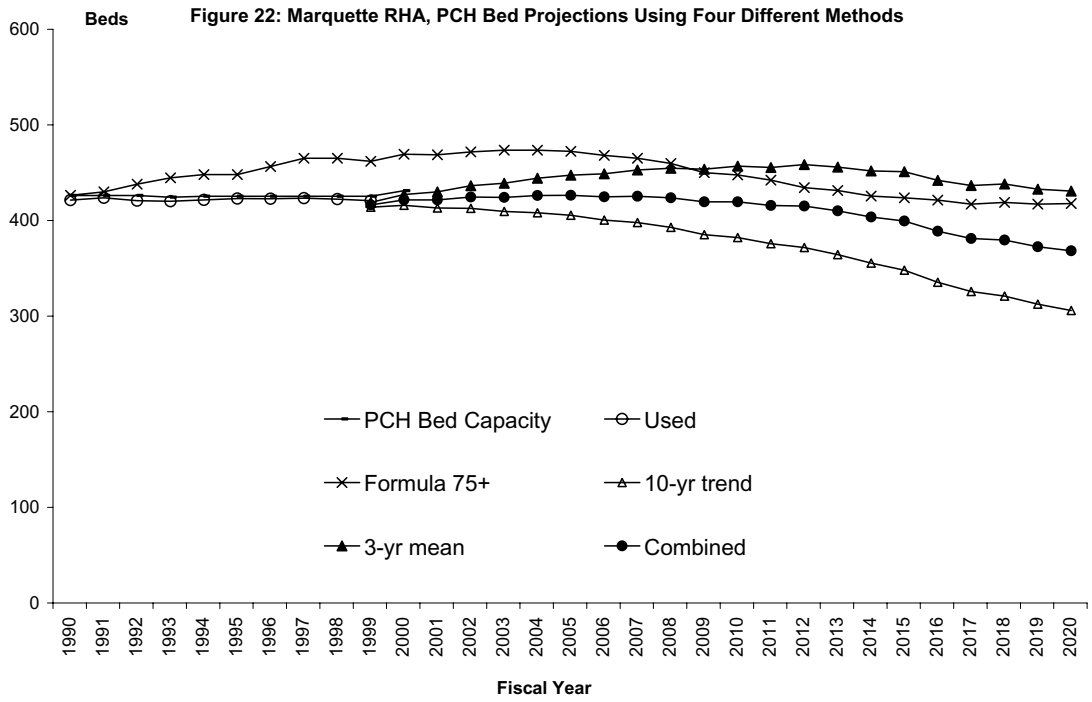


Figure 22: Marquette RHA, PCH Bed Projections Using Four Different Methods

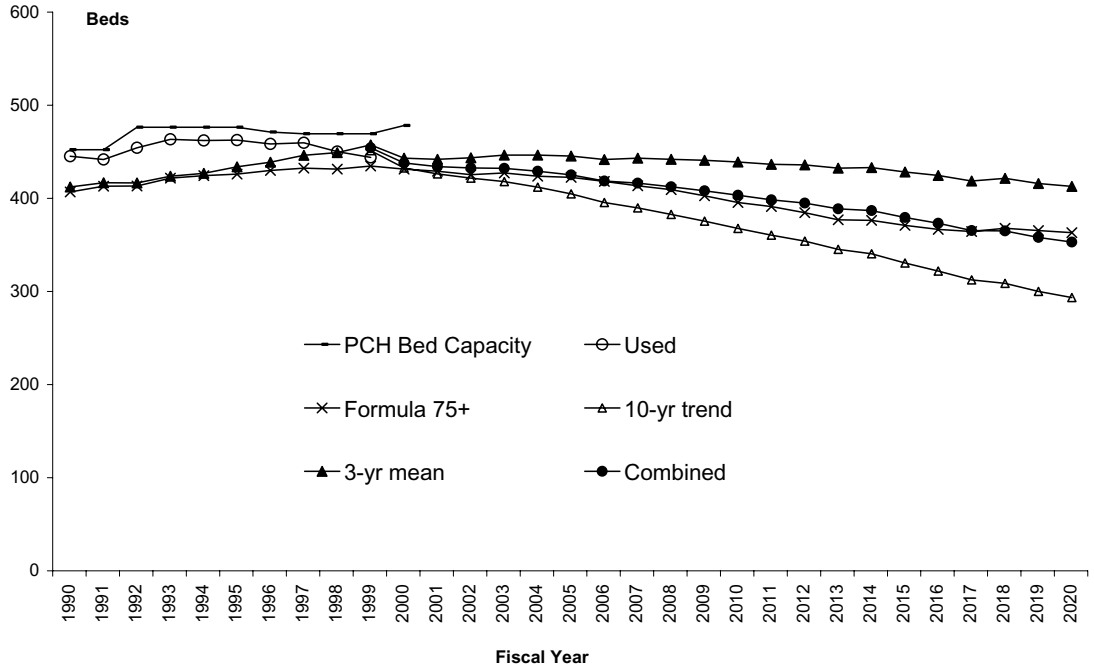
Population (%) age 75+ in 1998: 3,866 (10.3%)
Population (%) age 75+ in 2020: 3,470 (8.9%)
Change in population age 75+: -10.2%
Net Inmigration (outmigration) as of April 1, 2000: (-29) persons
PCH beds 2000/01: 430
Combined model projection for 2020: 367
Surplus (deficit) between current and projected: +63 beds

The population of seniors aged 75 or older is expected to decrease in Marquette by 10.2% from 3,866 to 3,470. Between April 1, 1999 and March 31, 2000, there was a net deficit of 29 persons from Marquette to other RHAs. There were 515 Marquette residents in a PCH somewhere in the Province: 432 in their own RHA (83.9%), and 72 in other RHAs, the largest proportion in Brandon (38 or 7.4%). There were 486 persons residing in a PCH in Marquette, 54 (11.1%) of them from another RHA.

Marquette's current bed capacity of 430 will not be exceeded at any time between now and 2020; in fact by 2020, the projection shows that Marquette will have a surplus of 63 beds. The data suggest that Marquette will have sufficient PCH bed capacity until 2020.

2.15 South Westman

Figure 23: South Westman RHA, PCH Bed Projections Using Four Different Methods

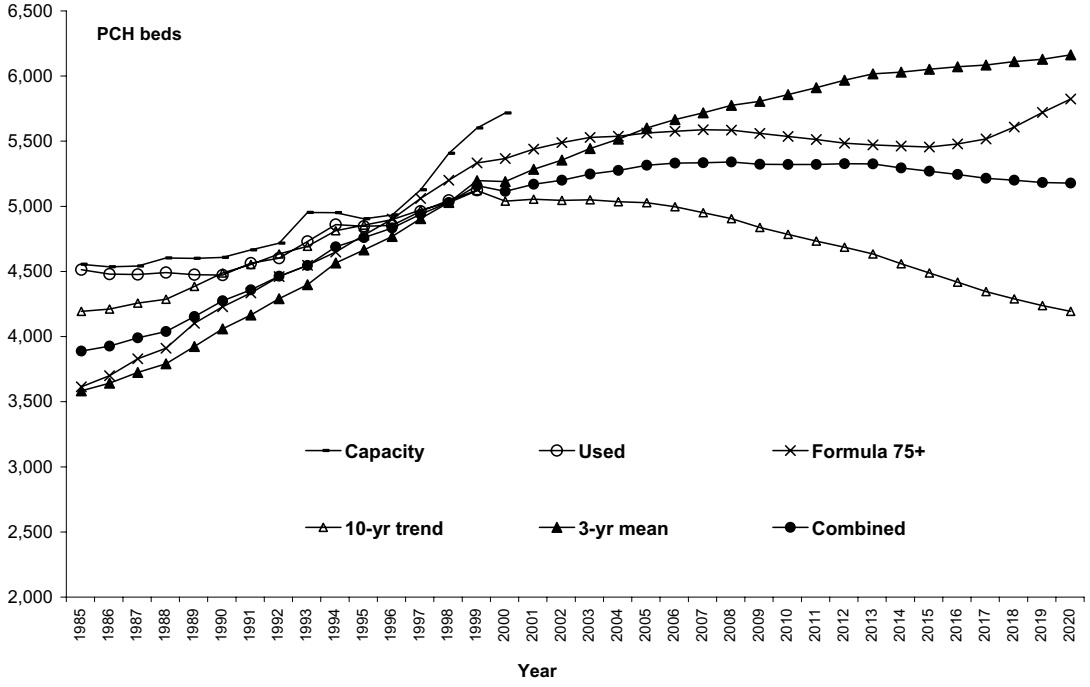


Population (%) age 75+ in 1998: 3,589 (10.4%)
Population (%) age 75+ in 2020: 3,015 (8.3%)
Change in population age 75+: -16.0%
Net Inmigration (outmigration) as of April 1, 2000: (-10) persons
PCH beds 2000/01: 477
Combined model projection for 2020: 352
Surplus (deficit) between current and projected: +125 beds

The 75+ population of South Westman, like the RHAs of Marquette and Parkland, is expected to decline; it will be 3,015 by the year 2020 from 3,589 in 1998. Between April 1, 1999 and March 31, 2000 there were 539 South Westman residents living in a PCH somewhere in the Province, 458 (85.0%) in South Westman and 81 in other RHAs, mostly Central and Brandon. There were 529 PCH residents in South Westman, 71 (13.4%) from other RHAs, so there was a net outflow of 10 persons from South Westman to other RHAs. The Combined model projects a demand for 352 beds in South Westman in 2020, which is 125 fewer than the 2000/01 capacity of 477. Our projections indicate that South Westman has sufficient PCH bed capacity until 2020.

2.16 Winnipeg

Figure 24: Winnipeg RHA, PCH Bed Projections Using Four Different Methods



Population (%) age 75+ in 1998: 43,260 (5.2%)
Population (%) age 75+ in 2020: 48,460 (7.8%)
Change in population age 75+: +12.0%
Net Inmigration (outmigration) as of April 1, 2000: (-15) persons
PCH beds 2000/01: 5,707
Combined model projection for 2020: 5,169
Surplus (deficit) between current and projected: +538 beds

Winnipeg's population aged 75 or older is expected to increase by just over 5,000 persons between 1998 and 2020, from 43,260 to 48,460 (12.0%). Despite this increase, the current PCH bed capacity of 5,707 should be adequate; the Combined model projects demand of 5,169 beds in 2020, 538 less than 2000/01 capacity. Between April 1, 1999 and March 31, 2000, there were 6,210 Winnipeg residents living in a PCH somewhere in the Province, 5,804 (93.5%) within Winnipeg. The 406 Winnipeg residents who were in a PCH outside Winnipeg were mostly located in Interlake (89), Central (73), South Eastman (66) and Parkland (52). There were a total of 6,195 persons residing in a PCH located in Winnipeg, 391 from other RHAs. The RHA which contributed the most to the Winnipeg PCH population was Interlake (120), followed by Central (75), North Eastman (49) and South Eastman (49). There was a net outmigration of 15 Winnipeg residents to Non-Winnipeg PCHs.

3.0 DISCUSSION

We have developed methods for projecting the demand for personal care home beds up to the year 2020. Using the Combined projection method, we estimate that the province as a whole will have sufficient PCH beds in 2020. It appears that Winnipeg will have a significant surplus, of over 500 beds. The Non-Winnipeg area will have sufficient bed capacity until 2009, but by the year 2020, there will be a deficit of 31 beds. This general pattern however does not hold for each RHA. Table 7 shows the projected surplus or deficit for each RHA. South Eastman and Interlake are projected to require more than 100 new PCH beds each, whereas Parkland, South Westman and Marquette are projected to have substantial surpluses. In interpreting these projections it is important to remember some of the assumptions that went into their construction.

The Combined method projects sufficient beds in Manitoba in 2020. It appears that Winnipeg will have a significant surplus of over 500 beds; the Non-Winnipeg areas, however, are projected to have a deficit of 31. Individually, the South Eastman and Interlake RHAs are projected to have deficits of more than 100 beds each, whereas Parkland, South Westman, and Marquette should have substantial surpluses.

Table 7: Projected Surpluses and Deficits Using the Combined Projections

RHA	Capacity 2000/01	Projection for 2020	Surplus (Deficit) from 2000
Central	811	774	37
North Eastman	190	224	(-34)
South Eastman	332	461	(-129)
Interlake	552	703	(-151)
Nor-Man	126	133	(-7)
Parkland	545	443	102
Churchill/Burntwood	26	50	(-24)
Brandon	595	608	(-13)
Marquette	430	367	63
South Westman	477	352	125
Non-Winnipeg	4,084	4,115	(-31)
Winnipeg	5,707	5,169	538
TOTAL	9,791	9,284	507

Recall that we assumed that current use rates in the regions form a baseline for future projections. The current baseline is highly dependent on current bed capacity. That capacity may have been the result of various historical events that do not necessarily represent true underlying need or demand. For historical reasons, some RHAs may be "under-bedded" relative to their true demand, while others may be "over-bedded". Without a conclusive measure of need it is impossible to identify whether any given region is in one category, or another, or is "just right". But the current 75+ formula (i.e., 120 beds per 1,000 persons aged 75 or older) does provide a rough guide, and it indicates that considerable variation from true entitlement may be present in a few RHAs. In North Eastman and Churchill/Burntwood, the 75+ formula gives an entitlement well above current capacity; by contrast, in Brandon, the 75+ formula is well below the current capacity. (Note that we have not addressed the extent to which aging nursing homes may need to be rebuilt.)

Our projection method, however, carries forward the historical usage patterns and only adjusts for anticipated changes in population and anticipated changes in utilization rates as per Winnipeg and Non-Winnipeg patterns. What this implies is that, since North Eastman and Churchill/Burntwood are starting out in what may be a deficit position, their needs in 2020 may be even greater than we have projected. Conversely, because Brandon may already be 'over-bedded,' the deficit we have projected may not occur.

In 2000, there were 184 federal nursing home beds in six RHAs; these additional beds increase the capacity in some RHAs, particularly Churchill/ Burntwood (by 131%), and are not accounted for in our projections.

The second point to remember is the snapshot we took concerning migration. We looked at the extent to which PCH residents between April 1, 1999 and March 31, 2000 were in a PCH in their own or another RHA. The RHAs with the highest net outflows of residents to other RHA PCHs were North Eastman (38), Interlake (28), Churchill/Burntwood (28), and Marquette (29). We do not know if residents moved out of their own RHA to live in a personal care home because they wanted to, or because they were obliged to because there were no beds for them in their own RHA. However, since North Eastman and Churchill/Burntwood appeared to be 'under-bedded,' it may be that for those two RHAs at least, the outflow symbolizes a need for more PCH beds in those regions.

One other point that has been touched upon briefly before is the presence of federal nursing home beds for First Nations persons. In 2000, there were 184 federal nursing home beds in six RHAs. These additional beds increase the total capacity of the RHAs in which they are located by as little as 4% (in Interlake) to as much as 131% (in Churchill/Burntwood). We have not accounted for these beds in any of our projections. If there are changes to this bed supply, it would have an impact on our projections, especially for North Eastman, Nor-Man and Churchill/Burntwood.

Certain services that enable persons to stay in the community longer, if increased, e.g., home care, will dampen our projections. This has been the experience in Denmark where the reliance on nursing homes has been reduced by experimenting with 24-hour home care, supportive housing for elders, and other initiatives.

This raises another point to remember when interpreting our projections. We have assumed that all other services will not change. It may be that certain services that enable persons to stay in the community longer could increase, with the effect of damping our projections. Home care services can help to reduce the need for nursing homes, as the example of Denmark illustrates. Since the 1980s Denmark has reduced its reliance on nursing homes; instead it has experimented with 24-hour home care services, supportive housing for elders, minimizing perverse financial incentives for institutionalization, and integrating care between home care and nursing home staff. Since 1988, there has been a ban on the construction of new nursing homes in Denmark, and remaining nursing homes are being converted into single occupancy rooms (Stuart and Weinrich, 2001). Between 1985 and 1997, nursing home beds per 1,000 population age 80+ decreased 45% from 301 to 166, (in Manitoba the figures are 282 and 220 PCH beds per 1,000 persons age 80+ in 1985 and 1997, respectively) and constant-curren-

cy expenditures per person decreased 12%. Outcomes have been generally positive with lower death rates, lower incidence of circulatory disorders and fewer days in hospital (Altman, 2002).

In Manitoba in 1997/98, the equivalent of 314 acute hospital beds were used by patients after panelling, 175 beds in Winnipeg and 139 in Non-Winnipeg. Given the low occupancy in many Non-Winnipeg hospitals, this may not be a problem; however, if pressure on the acute care hospitals increases, there will be more pressure to transfer panelled patients sooner.

The example of Denmark has been described as an illustration; their results may not be possible here. The point is that if the demand for and provision of other types of services changes, the projections are less likely to be accurate. This refers not only to home care and other forms of support in the community, but also to hospital care. Hospital care sometimes substitutes for PCH care, depending on both the capacity and the occupancy rates of both hospitals and PCHs. To get an idea of the extent of the substitution of hospitals for PCHs, we looked at the number of hospital days in each RHA accumulated by patients after they have been panelled, converting days to bed-equivalents by dividing by 365. In Manitoba in 1997/98, the equivalent of 314 acute hospital beds were used by patients after panelling, 175 beds in Winnipeg and 139 in Non-Winnipeg. Although this number is lower in Winnipeg than in the past (it was 317 beds in 1990/91), it has stayed relatively stable for Non-Winnipeg. Given the low occupancy in many Non-Winnipeg hospitals (Stewart et al., 2000), the presence of patients in acute care hospitals waiting for transfer to a PCH may not be a problem; however, if pressure on the acute care hospitals increases, there will be more pressure to transfer panelled patients sooner.

The projections also rely on the accuracy of the population projections. These projections take into account the effects of migration, fertility and death rates in each RHA. Manitoba Bureau of Statistics had to make assumptions based on past patterns, but their forecasts may prove to be incorrect. To the extent that there are errors in the forecasts for the seniors' population, again our projections will be inaccurate. This is especially important for the oldest old, who are high users of PCH beds.

The Combined projections captured both the downward trend in use as well as the most recent experience. It yields a bed-to-population ratio of 109 per 1,000 persons 75 or older, very close to that of British Columbia (106), Alberta (112), Quebec (109) and P.E.I. (108).

There are therefore a number of limitations to our projection techniques. However, the strengths of our analyses are that we have complete PCH data for the entire population of Manitoba for a number of years. Furthermore, our technique relies on readily available data-age, sex and region-making it relatively easy to reproduce and modify through time. In fact, we recommend that this be done at least every five years. The Combined projection, which captures both the downward trend in use as well as the most recent experience, yields a bed-to-population ratio of 109 per 1,000 persons age 75 or older in the year 2020. Recall Figure 1, in which we saw that four provinces currently have ratios very close to that: British Columbia (106), Alberta (112), Quebec (109), and Prince Edward Island (108), and some provinces, notably Alberta, appear to be planning to reduce their ratios further. Therefore, our results seem quite realistic.

4.0 CONCLUSIONS

This study indicates that demands for PCH beds within the next 20 years are not likely to rise enormously or to outstrip the current system's ability to cope.

Much has been made of the potentially catastrophic impact of an aging population on the demand for health care resources. Personal care home beds are among the most relevant services demanded by an aging population and might be expected to become a considerable burden on the health care system. This study indicates that demands within the next 20 years are not likely to rise enormously or to outstrip the current system's ability to cope.

Whereas Winnipeg appears to have more than enough beds to cover the projected demand, outside of Winnipeg, the situation is more variable, and some regions may experience deficits over the period.

There appears to be a trend towards a decrease in use of PCH beds, and this trend is projected to counterbalance the increasing proportion of the older population projected into the next 20 years. However, different trends inside and outside Winnipeg may lead to a distribution of demand that is not in line with the current availabilities. Winnipeg appears to have more than enough beds to cover the projected demand. Outside Winnipeg, however, the situation is more variable, and some regions may experience deficits over the period. The areas of South Eastman, North Eastman, Interlake, and Churchill/Burntwood appear most likely to experience a deficit in the coming years. Three of these areas border on Winnipeg, which is projected to have a surplus. The possibility of residents of these RHAs making more use of Winnipeg PCHs is worth considering.

It should be emphasized, again, that these projections are based on a mixed set of assumptions. Using some of the alternative projections we have discussed above would change the projections substantially. The 10-Year Trend model would reduce the estimates and the 3-Year Recent Use model would increase them. The considerable variance in these different projections argues for both caution and vigilance. While we believe that the Combined projections are most likely to reflect future demand, and that major increases in demand are not anticipated, there can be no guarantees on that account.

Predicted and actual use should be monitored closely, to strengthen and refine Manitoba Health's capacity to forecast trends. In 2020 the oldest baby-boom generation will be reaching 75 and the years between 2030 and 2055 will be especially critical for this group. Better planning models could help to avoid over-building for this short-term bulge .

Predicted and actual use should be monitored closely, to strengthen and refine Manitoba Health's capacity to forecast trends. This is especially important as we move beyond 2020, because in the year 2020, the oldest of the baby-boom generation will be reaching 75. The years 2030 to 2055 will be especially critical for that group. It will be necessary to avoid over-building for this short-term bulge, and having better planning models might help to avoid that from happening.

If trends towards a decreasing use continue, there is unlikely to be a significant demand for a large number of additional beds in the future, and the supply in Winnipeg may exceed the demand. But, if there is a plateauing of the current trends, or even a reversal, demand could begin to outstrip the existing supply. Capacities would likely be exceeded first in the RHAs of North Eastman, South Eastman, Interlake, and Churchill/Burntwood.

Given all the inherent uncertainties in predicting the future, however, trends in their utilization rates should be watched closely, and revised projections computed as the basis for ongoing policy decisions. Part of the monitoring could include analysis of PCH residents' preferred locations. As noted above, it is impossible to tell from administrative data whether residents reside in PCHs outside of their prior RHA of residence by choice or of necessity. Information of this sort could be obtained and could cast light on whether certain RHAs are truly underbedded relative to the underlying demand, and others overbedded, or whether the current distribution reflects residents' true preferences.

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APPENDIX A: FACTORS AFFECTING THE USE OF NURSING HOME BEDS

Sociodemographic characteristics

The likelihood of entering a nursing home has been associated with a variety of sociodemographic characteristics: including age, gender, rural versus urban residence, and socioeconomic status. The data on gender is conflicting. Generally female gender is associated with a higher probability of entering a nursing home. Lavery et al. (1997) explored discharge destination after diabetes-related lower leg amputation and found that women were more likely to be discharged to a nursing home, even after adjusting for age and single marital status. Rockwood et al. (1996) analyzed data from the Canadian Study of Health and Aging, comparing institutionalized and community-dwelling older adults. They found that female gender was associated with a higher risk of being institutionalized. Two studies of Manitoba data reported conflicting results, with Roos et al. (1988) finding that being female was associated with the need for nursing home, and Mustard et al. (1999) reporting the opposite. Several other studies support the latter finding (Jette et al., 1995; Smith, 2000; Freedman, 1996). It appears that even though the majority of nursing home residents are female, this in itself may not be a predictor, but is likely a reflection of women's greater longevity and increased likelihood of being widowed or lacking social supports.

Living in a rural area was associated with a lower likelihood of being admitted to a nursing home compared to living in a small town or a city (Dwyer et al., 1994; Mustard et al., 1999). One of these studies used American data and one used data from Manitoba.

A few studies found that lower socioeconomic status was associated with a higher probability of entering a nursing home. A prospective study of patients admitted to a geriatric ward in Madrid, Spain, Alarcon et al. (1999) found that one of the predictors of institutionalization six months after discharge was a low pension. Data from Manitoba showed that low income and low education were independently associated with a higher likelihood of nursing home admission (Mustard et al., 1999; Tomiak et al., 2000). Similarly, data from England and Wales demonstrated that home ownership, an indicator of wealth, was associated with a lower likelihood of institutionalization (Grundy and Glaser, 1997).

In summary, the literature suggests that, in addition to increasing age, sociodemographic predictors of the need for nursing home are urban residence and lower socioeconomic status.

Health status

A number of studies have explored health status as a predictor of the need for nursing home placement. In none of these studies was health status the only variable under consideration; that is, health characteristics were included as only one of a variety of factors that were thought to be associated with nursing home admission.

Two health conditions were independently associated with a higher risk of institutionalization in several studies: diabetes (Rockwood et al., 1996; Tsuji et al., 1995), and stroke or neurological disorders (Lavery et al., 1997; Rockwood et al., 1996; Roos et al., 1988; Tomiak et al., 2000; Nygaard and Albrektsen, 1992). A more general measure of health, such as self-perceived health, number of visits to an internist, or a recent hospitalization, predicted a higher probability of institutionalization in several studies (Roos et al., 1988; Shapiro and Tate, 1988; Steinbach, 1992). Of interest is the study by Steinbach (1992) which followed 5,151 noninstitutionalized seniors in Massachusetts for two years. A number of health conditions (diabetes, cancer, heart disease, stroke, and having fallen), were included in the models developed to predict nursing home placement. Although these health conditions were significant in univariate analysis, they dropped out of the multivariate model; self-perceived health though remained as a significant predictor.

There are also studies which found that physical disability or illness was not a significant predictor of nursing home use. Alarcon et al. were interested in discharge outcomes of people admitted to an acute geriatric unit in Madrid, Spain (Alarcon et al., 1999). The purpose of this study was to identify factors associated with a variety of outcomes, including death, long hospital stay, institutionalization, readmission to hospital, and attendance at emergency room following discharge. They found that neither the main diagnosis nor the number of diagnoses on admission predicted the need for an extended hospitalization, death or institutionalization. A study of 1,625 Massachusetts elderly who were followed for ten years beginning in 1974/75 modelled many independent variables as predictors of institutionalization (Jette et al., 1992). Health characteristics that were available in this study included visual acuity, hearing acuity, perceived health, diabetes, cardiovascular, musculoskeletal, digestive, neurologic, respiratory, or emotional conditions, cancer, and number of chronic conditions. The only one that was significant was presence of a neurologic condition but only as an interaction term with geographic distance from relatives, i.e., having a neurological condition was significant if relatives were distant, but not if relatives lived nearby. A six-year prospective study of 2,812 hip fracture patients in Italy explored the likelihood of death or institutionalization within six months of fracture (Marottoli et al., 1994). It found that poor physical health predicted

death, but poor baseline mental status predicted institutionalization.

Thus, the findings with respect to health status are inconclusive. Although there is some indication that diabetes and stroke are associated with a higher need for nursing home care, there are also studies in which these characteristics were not significant. Diabetes and stroke are likely to be associated with difficulties in mobility, problems with other activities of daily living, or with neurological deficit. It is possible that it is these outcomes of diabetes or stroke that are associated with the need for nursing home placement, rather than the presence of the condition itself; however, most of these studies did include a measure of cognitive and functional disability as well in their models.

Functional disability

Numerous studies emphasize the importance of functional disability as a predictor of the need for nursing home care. Often this is described as problems with one or more activities of daily living (ADLs) (eating, getting in or out of bed, mobility, dressing, bathing and using the toilet), but functional disability may also include problems with Instrumental Activities of Daily Living (IADLs) (using the telephone, grocery shopping, preparing meals, doing housework, doing laundry, taking medications, or managing money).

In their study of outcomes for patients admitted to an acute geriatric unit, Alarcon et al. (1999) noted only one characteristic, functional disability on admission, predicted institutionalization at discharge. Jette et al.'s study of Massachusetts seniors (1992) found that basic ADL disability was a strong predictor, whereas problems with instrumental disabilities and health problems were not. This study also found that 'getting out' less than daily predicted institutionalization compared to 'getting out' at least daily. Possibly this finding indicates lack of social contact, another predictor which will be discussed further below. Having a problem with ADLs was found to be a strong predictor of the need for nursing home care in several other studies (Osterweil, 1995; Shapiro and Tate, 1988; Steinbach, 1992).

Rockwood noted that functional impairment, cognitive impairment, illness factors, and the absence of a caregiver were all independently associated with institutionalization. Roos et al. (1988) came to a similar conclusion, that is, that the combination of diagnostic data with information on activity limitation yielded a stronger model.

Analyses of Manitoba Health use data and Statistics Canada data found that self-reported disability predicted the likelihood of nursing home admission. In one study, diagnostic data were not included in the model (Mustard et al., 1999). In another paper which analyzed the same datasets, diagnostic

data were included (Tomiak et al., 2000). Certain medical conditions, for example, Alzheimer's disease or dementia, musculoskeletal disorders and stroke, were at least as important predictors as functional disability.

One measure of functional impairment is falling. A study that prospectively followed 1,103 community-dwelling elders for three years noted that, even after adjustment for demographic, medical, cognitive, functional and social functioning, having a fall was significantly associated with the risk of institutionalization (Tinetti and Williams, 1997). Furthermore, there was a dose-response affect with the relative risk of admission to a nursing home increasing from 3.1 for one noninjurious fall, 5.5 for two or more noninjurious falls, and 10.2 for at least one fall causing serious injury. All of these were statistically significant.

Functional impairment is not universally found to be predictive of the need for nursing home care. A study of older adults who lived in Baltimore and received home care found that functional impairment was not a significant predictor (Tsuji et al., 1995). A study by Statistics Canada that modelled the likelihood of institutionalization between 1994/95 and 1998/99 also found that functional status was not significant (Shields and Chen, 1999). In this study, significant predictors were household income, self-perceived health, and both cognitive and visual impairment.

In summary there is ample evidence that functional disability is an important predictor of the need for nursing home admission; however, there is some suggestion that predictive ability can be improved by the addition of information on medical conditions. In other words, functional data alone while important should be supplemented with information on physical, social and cognitive problems if available.

Cognitive Impairment

The impact of cognitive impairment has been alluded to previously. This has been found to be an independent predictor of nursing home admission even after adjusting for other characteristics, such as functional limitations (Osterweil, 1995; Shapiro and Tate, 1988; Tomiak et al., 2000), and health problems (Rockwood et al., 1996; Tomiak et al., 2000).

Several studies focussed on home care clients. A study of 75 demented or depressed older patients receiving home care in Belgium found those at highest risk for institutionalization had severe cognitive impairment in addition to high dependency for ADLs, poor communication skills and behaviour problems (Steeman et al., 1997). This study did not separately test the impact of cognitive impairment versus ADL problems but, instead, focussed on clusters of characteristics that grouped into different risk profiles.

Nygaard et al. studied home care clients and found that increasing cognitive impairment, as well as the amount of home nursing received, were associated with a higher probability of nursing home admission (Nygaard and Albrektsen, 1992). In contrast, Juva et al. (1997) in a study of demented patients receiving home care found that whereas memory problems were often the initial reason that clients had home care services, it was clients' functional problems that predicted the transition to institutional care. This finding was supported by Jette et al. (1995).

Two studies of hospitalized patients found that cognitive impairment predicted nursing home placement. One of these found that hip fracture patients were more likely to be discharged to a nursing home if they were cognitively impaired prior to the fracture (Marottoli et al., 1994). The other found that cognitive impairment did not predict discharge to a nursing home, but was a significant predictor of admission to a nursing home within six months of discharge (Alarcon et al., 1999).

Social Support

Social support can be characterized in a number of different ways. Often the only variable that is available is the presence of a spouse. Some studies try to characterize family structure more fully to include children, siblings and other caregivers (Freedman, 1996; Grundy and Glaser, 1997). Still others focus on the concept of social networks, defined as 'the roles and ties that link individuals along definable paths of kinship, friendship, or acquaintances such as spouse, parent, close friend or neighbour' (Steinbach, 1992). Yet another factor to be considered is the role of caregiver, whoever that may be (Jette et al, 1995; Tsuji et al., 1995).

Several studies found that marital status was an independent predictor of the need for nursing home care, with married people being less likely to be institutionalized than widowed or single persons (Mustard et al., 1999; Roos et al., 1988; Shapiro and Tate, 1988). One Canadian study found that neither living alone or having low emotional support predicted the likelihood of being institutionalized (Shields and Chen, 1999). Freedman et al. (1996) found that being married reduced the risk of institutionalization by about one-half, and having at least one daughter or one sibling reduced the risk by one-quarter. Grundy and Glaser (1997) also looked at family structure including living with a spouse, with children, or with other relatives or unrelated people. Those living alone were at higher risk of institutionalization, although the differences were not statistically significant between married and widowed/single. This study compared two time periods, 1971-1981 and 1981-1991 in England and Wales; it noted that the rate of moving to live with relatives was much lower in the second time period, whereas the rate of institutionalization increased. These trends accompanied a marked increase

in the number of institutional beds available in the 1980s, but they may also reflect changes in family and social structures, i.e., more women participating in the work force and therefore being less able to care for aging parents.

An Australian study followed older patients who presented to the Emergency Room (Richardson, 1992). Ninety-day outcomes included death or increased dependence as defined by permanent institutionalization, moving in with family, or more than 90 days inpatient care. The strongest predictor of increased dependence was the presence of a social or placement problem.

Caregiver characteristics had an important impact on the likelihood of being admitted to a nursing home. Jette et al. (1995) found that elders with male caregivers were at twice the risk of admission compared to elders with a female caregiver. This study also found that living with the primary caregiver reduced the risk of admission to a nursing home. Similarly, Rockwood et al. (1996) found that not only being unmarried, but also the absence of a caregiver were significant predictors of nursing home admission. Tsuji (1999) noted that three caregiver characteristics predicted the need for nursing home placement in frail older patients receiving home care services: living separately from the patient, having time conflicts because of a job, and being stressed by caregiving.

Steinbach (1992) defined several activities as a measure of the presence of a social network: talking on the telephone with friends, neighbours or relatives, getting together with friends, neighbours or relatives, and social activities: using a senior centre, attending church or temple, attending a movie, concert or sports event, and participating as a volunteer. In multivariate analysis, social activities were found to reduce significantly the likelihood of institutionalization, and living alone significantly increased the likelihood of institutionalization.

Availability of Alternatives

Do alternatives help to keep individuals in the community longer and delay admission to nursing home? Examples of alternative health care services are hospital beds, formal home care, supportive housing, respite care or day hospital programs. Formal home care seems to be the most commonly perceived substitute for nursing home care, but its role in preventing or delaying the need for nursing home care is unclear.

An analysis of home care use in Manitoba by MCHP noted that 93% of persons admitted to a nursing home were home care clients prior to admission, and in the three years prior to admission, the average number of days of home care received was 537 days (Roos et al., 2001b). This suggested that

home care helped to delay nursing home admission. A study of Massachusetts community-dwelling seniors found that the use of formal home care was related to an increased risk of admission to nursing home (Jette et al., 1995). The authors suggested that formal home care may in fact be a precursor of institutionalization. This is supported by a study of Belgian seniors receiving home care, in which higher use of nursing services was associated with a higher probability of admission to a nursing home (Nygaard and Albrektsen, 1992).

Similar findings come from a study of Saskatchewan seniors, that explored the impact of preventive home care and seniors housing. Preventive home care is defined as a light level of home care services, such as homemaking, personal care and meal provision, that is designed to help seniors to stay in the community. This study found that persons receiving preventive home care were 50% more likely to die and 50% more likely to be admitted to a nursing home (Health Services Utilization and Research Commission, 2000). In contrast, persons who lived in seniors housing were 40% less likely to die and 60% less likely to be admitted to a nursing home.

The supply of nursing home beds, hospital beds and physicians were explored by Tomiak et al. (2000). The supply of nursing home beds was positively associated with nursing home admission, following the old saw "a bed built is a bed filled", whereas the supply of physicians was negatively associated with nursing home admission.

A recent study from British Columbia compared the costs of formal home care versus institutional care, and found that at all levels of care, home care was less expensive than nursing home care (Hollander, 2001). Home care costs were about 40%, 67% and 75% of nursing home costs at the lowest, intermediate, and highest care levels, respectively. The costs for home care clients who died were higher than the costs of nursing home residents who died. Most of these extra costs were related to the use of acute care hospitals by community-dwelling elders, whereas hospital use was less in nursing home residents. A study from the United States also found that home care was more cost-effective than either rehabilitation care or nursing home care in the post-acute phase (Kane et al., 2000). This study, however, focussed on shorter-term nursing home use in a skilled nursing facility, which is a different level of care than that provided in a personal care home in Manitoba.

Improving Health

As life expectancy has been increasing, the question has arisen as to whether people are living longer but in poorer health, that is, extending the period of disability before death, or the opposite. Recently, evidence has been accumulating that while people are living longer, they are also living healthier

(Crimmins et al., 1999; Freedman and Martin, 1998; Manton et al., 1997; Singer and Manton, 1998). In other words, there has been a trend to declining levels of disability in seniors. An American study found that the age-adjusted prevalence of disability for the population aged 65 or older was 21.3% in 1994, compared to 24.9% in 1982, a highly significant decline (Manton et al., 1997). Furthermore the rate of decline in the most recent five years of the study was faster than the rate in the earlier seven years. This was estimated to have a significant cost impact: if disability rates had not changed, there would have been 2.1 million people in long term care in 1994 rather than the actual 1.7 million, for a savings of $17.3 billion in 1994 alone (National Institute on Aging, 1999). These cost savings however did not account for additional costs that may have been accrued for informal and formal home care or other community support services.

Canadian data point to the same trends. Statistics Canada data revealed that between 1981 and 1996, a smaller proportion of persons aged 75 or older resided in long-term care facilities (Shields and Chen, 1999). The prevalence of activity limitation decreased for the 65-to-74 age group; however it remained stable for persons aged 75 or older. This latter finding may be due to the fact that people are living longer, so that the average age of the 75+ age group has increased. Using 1991 and 1996 Canadian Census data, Jacobzone (2000) found an increase in life expectancy without severe disability. Manitoba data also suggest the compression of disability (Menec et al., 2000). Between 1986 and 1998, the proportion of people aged 75 or older who resided in a personal care home decreased by 7% (Roos et al., 2001a). The evidence of a healthier aging population may soften the impact of the aging population on the need for nursing home care.

In summary, there appears to be strong and consistent evidence that age, lack of a spouse or other social supports, functional disability, and cognitive impairment predict the need for nursing home care. Poor health is also associated, especially self-perceived health, diabetes and stroke, although the evidence is not as consistent for these factors. Probably there are interactions between these various characteristics that taken together increase the likelihood of institutionalization. Formal home care appears to be a cost-effective way to delay the need for nursing home care, and the availability of nursing home beds is directly related to the number of people who are institutionalized.

APPENDIX B: METHODS

We used three methods to project demand for personal care home beds in the Province through the year 2020. One used regression techniques to identify possible trends and then to project those trends into the future. The other used the most recent 3-year mean rates of PCH use and projected them forward. The latter is built on the assumption that utilization will continue at the rate current in the 1997/98 to 1999/2000 period and will only change as the distribution of the population does. The Trend Analysis projects trends in PCH bed use over the past 10 years into the future. Those trends and projected changes in populations then determine future projections. The third method was simply the arithmetic average of the two previous projections, and we called it the Combined projection.

Geographical Regions:

For purposes of this study the Province was first divided into Winnipeg and Non-Winnipeg areas. In subsequent analyses the Non-Winnipeg areas were further subdivided into the 11 Regional Health Authorities (RHAs). However, the populations and bed numbers in Churchill and Burntwood were deemed to be too small to be analyzed as separate units and they were combined into a single area Churchill/Burntwood for purposes of analysis.

Time intervals:

Historical PCH use, bed capacity and Manitoba population data were used for the period from 1985-1999. Population projections from the Manitoba Bureau of Statistics were used for the years 2000-2020.

Regression Equations for 5, 10, and 15-year trend analysis in Winnipeg and Non-Winnipeg Areas:

The Winnipeg and Non-Winnipeg Populations were divided into 12 age and sex strata: 0-64, 65-74, 75-79, 80-84, 85-89, and 90+, male and female. The data were aggregated from the individual level.

Separate regression models were run for the 15 (1985/86 to 1999/2000), 10 (1990/91 to 1999/2000) and 5 (1995/96-1999/2000) year intervals, with PCH bed-days per 1,000 population in each stratum being regressed against year. SAS procedure PROC GENMOD was used for the Linear regression. The standard error in this procedure is estimated using a maximum likelihood method, which does not require a normal distribution of the outcome (days per population).

Individual Age/Sex Regressions

To get a sense of what these regressions look like for the individual strata, Figure B1 shows the results of the ten-year regression for Winnipeg Females

aged 85-89. The regression is significant and shows a negative trend in usage over the ten-year period: usage appears to be declining. Figure B2 shows a comparable plot of the ten-year trend in Non-Winnipeg Males aged 90+. In both cases the regression models are a very good fit to the data with roughly 85% of the variance in declining use explained by the model in each stratum.

Figure B1: Days in PCH per 1,000 Population
Winnipeg, Females Age 85-89, 1990-1999

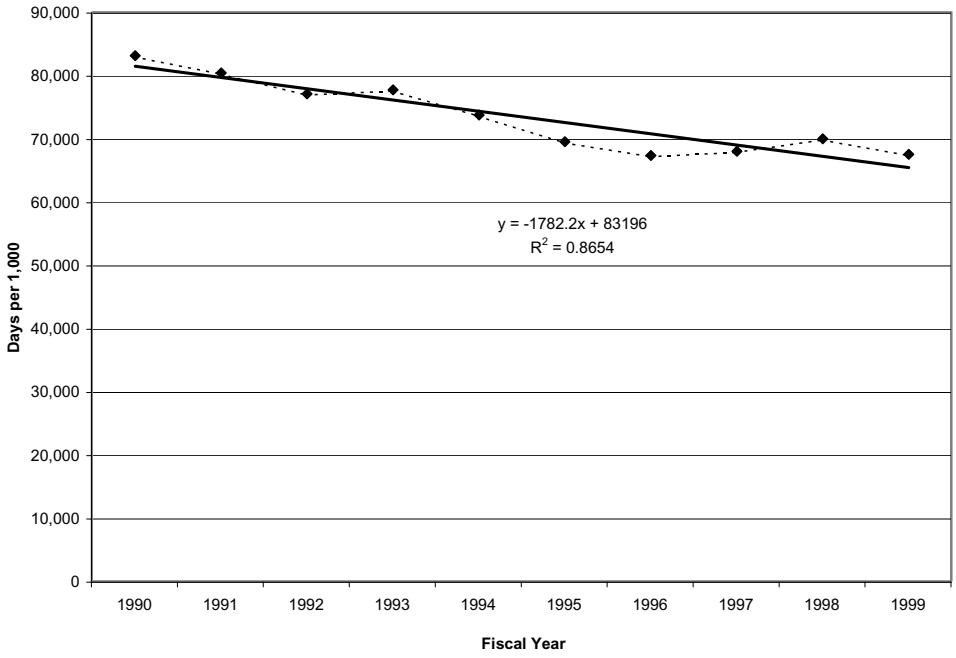
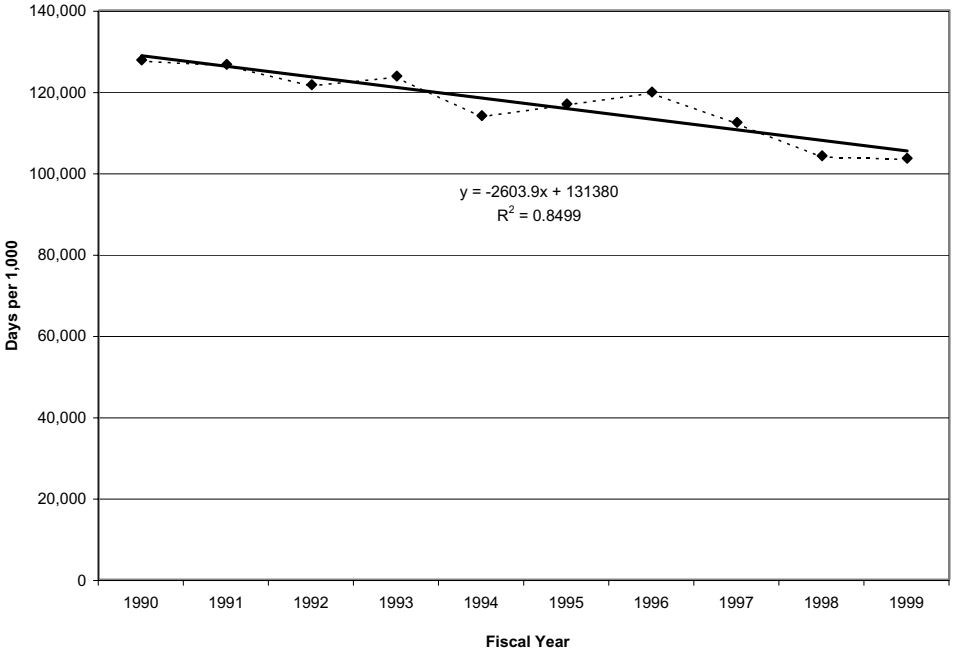


Figure B2: Days in PCH per 1,000 Population
Non-Winnipeg, Males Age 90+, 1990-1999



Examples

For both Winnipeg and the Non-Winnipeg areas, estimated bed-days per 1,000 population in each stratum per year were calculated using the coefficients of the estimating equations, and the population of the stratum. When the slope (beta-coefficients of estimating equation) was not significant, the average rate of use over the chosen time period multiplied by the population in the stratum was used to estimate bed-days for the stratum.

Tables B1 and B2 illustrate how the ten-year regressions are used to estimate bed-days for a given year, in this case 1998/99. In Table B1, the second column lists each of the six age categories, first for males and then for females. The third column lists the actual population in each category in 1998/99. The fourth column shows the equations that are used to yield the predicted PCH days per 1,000 population. The regression equations take the standard form of y = a + bx. In this case, 'y' stands for the number of PCH days per 1,000 population predicted from the regression, and 'x' is the year, where 1989/90 = '0', since this equation is for 1998/99, x = 9. The mean use over ten years was used for males age 75 to 79, males age 80 to 84 and females age 75 to 79 because the regression equations were not statistically significant. Column 5 shows the results of the calculations from column 4. Column 6 multiplies the rate (column 5) by the population to derive the total days predicted. These were summed and divided by 365 to yield the number of beds predicted. Similar calculations were performed for Winnipeg and Non-Winnipeg for each year.

Table B1: Stratum Specific Regression Coefficients for the Winnipeg 10-Year Trend Projections

Sex	Age Group	Population	Equation (mean)	Predicted Days per 1,000 Population	Total Days
Male	00-64	278,420	y = 149.3461 + 1.1218 * x	159	44,392
	65-74	20,562	y = 4037.88	4,038	83,027
	75-79	7,557	y = 11212.68	11,213	84,734
	80-84	4,494	y = 23281.55	23,282	104,627
	85-89	2,261	y = 52520.4844 - 773.61 * x	45,558	103,007
	90+	834	y = 116328.94 - 1683.51 * x	101,177	84,382
Female	00-64	278,888	y = 132.67	133	37,000
	65-74	25,764	y = 4305.27 - 65.66 * x	3,714	95,697
	75-79	11,771	y = 14191.268	14,191	167,045
	80-84	8,386	y = 34475.70 - 244.73 * x	32,273	270,643
	85-89	5,168	y = 83195.98 - 1782.25 * x	67,156	347,061
	90+	2,789	y = 178946.69 - 3544.88 * x	147,043	410,102
	Total	646,894			1,831,717
				Total Beds =	5,018

Table B2. Stratum Specific Regression Coefficients for the Non-Winnipeg 10-Year Trend Projections

Sex	Age group	Population	Equation (mean)	Predicted Days per 1,000 Population	Total Days
Male	00-64	219,353	y = 147.1 - 3.64 * x	114	25,088
	65-74	16,958	y = 3954.40 - 46.26 * x	3,538	59,999
	75-79	6,058	y = 10845.22	10,845	65,700
	80-84	4,023	y = 23023.89	23,024	92,625
	85-89	2,113	y = 59088.46 - 1069.45 * x	49,463	104,516
	90+	878	y = 131380.49 - 2603.88 * x	107,946	94,776
Female	00-64	210,913	y = 155.28 - 1.91 * x	138	29,119
	65-74	17,400	y = 4433.66 - 45.59 * x	4,023	70,006
	75-79	7,892	y = 14496.74	14,497	114,408
	80-84	5,689	y = 40947.42 - 751.55 * 9	34,183	194,470
	85-89	3,473	y = 87261.37 - 1540.86 * x	73,394	254,896
	90+	1,970	y = 174476.22 - 1108.60 * x	164,499	324,063
	Total	496,720			1,429,667
				Total Beds =	3,917

A similar process was followed using 15 years and five years of data to see if the rate of change was staying the same over time. Figures B3 and B4 compare the fifteen, ten, and five-year estimates. It can be seen that the steepest decline in use is projected with the 15-year trends, for both Winnipeg and Non-Winnipeg. In Non-Winnipeg, the five- and ten-year trends are very similar. In Winnipeg, the five-year trend shows a more gradual decline than the ten-year trend. These figures suggested that the trend towards decreasing use was real, but that the rate of decrease was itself decreasing. Therefore, we chose the ten-year trend on which to base our projections.

Figure B3: Winnipeg Comparison of 5-, 10-, and 15-Year Trends

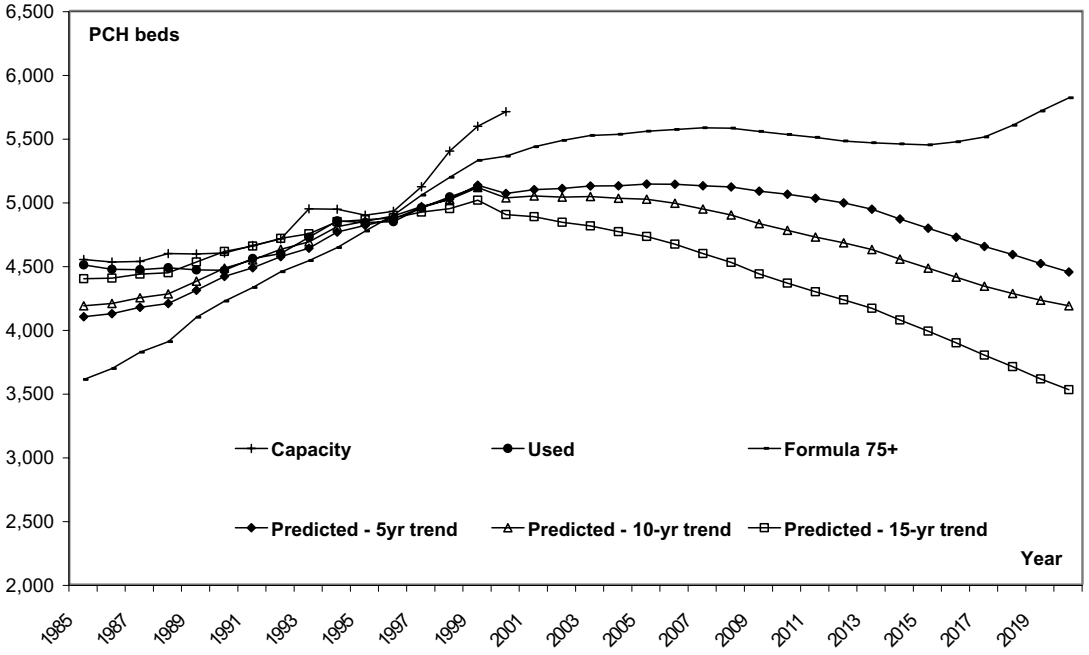
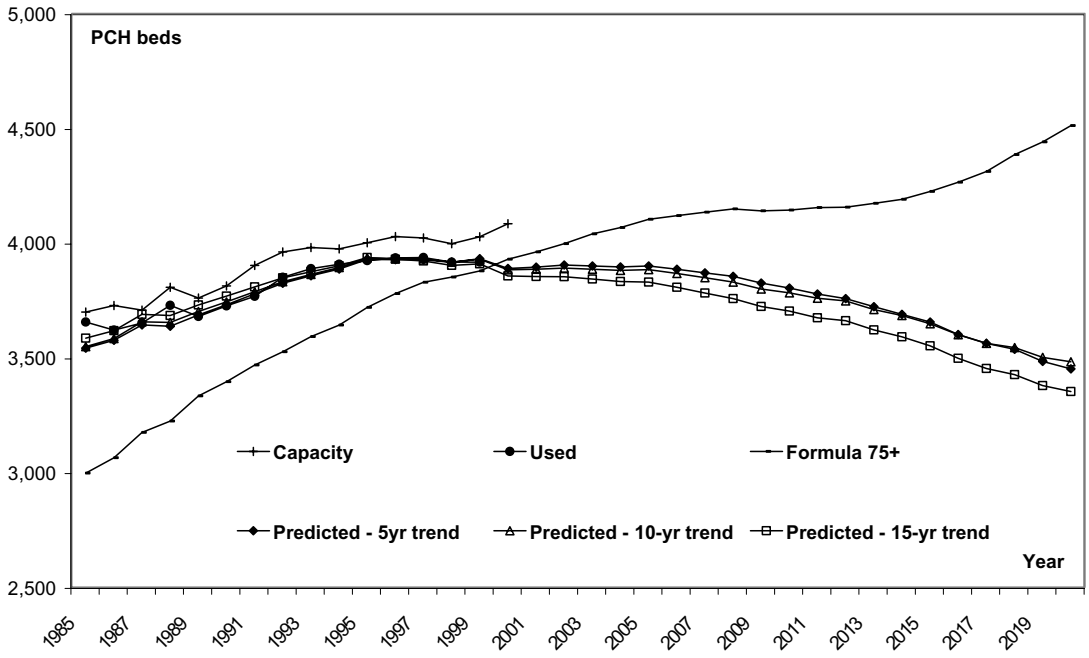


Figure B4: Non-Winnipeg Comparison of 5-, 10-, and 15-Year Trends



Regression Equations for 10-year trend analysis in the Separate RHAs

The numbers of individuals in several age/sex/strata in most of the RHAs were not sufficient to allow us to use separate regression estimates at the RHA level. Accordingly, we used the coefficients derived form the Non-Winnipeg 10-year trend regressions described above, and applied them at the RHA level. But historically, there have been significant differences in relative PCH bed use in various regions. We assumed that, except for changes in populations, these relative rates of use would continue. Therefore, in assigning projected 10-year trend demand to the various RHAs it was necessary to adjust each RHA's projections by an adjustment factor which reflected historical use. We chose the most recently available years 1996/97-1998/99 as the basis for computing this factor. Equation B1 describes the computation of the adjustment factor and Table B3 gives the values for each RHA.

Equation B1: Calculation of Adjustment (Use) Coefficient for Each RHA in Any Given Year

$$\aleph = \frac{\sum_{i=1}^{12} rate_i^{(rha)} \times pop_i^{(rha)}}{\sum_{i=1}^{12} rate_i^{(Non-Wpg)} \times pop_i^{(rha)}}$$

Table B3: Adjustment Coefficients - Based on Average 1996/97-1998/99 Use of PCH Beds by RHA Compared to Overall Non-Winnipeg Use

RHA	Adjustment (Usage) Coefficient
Central	0.98
North Eastman	0.65
South Eastman	1.02
Interlake	0.98
Nor-Man	1.02
Parklands	1.02
Churchill/Burntwood	0.30
Brandon	1.46
Marquette	0.89
South Westman	0.98

So for example, to compute the 10-year trend projection for Brandon, we applied the coefficients of the equations for Non-Winnipeg trend projections to the populations in the strata in Brandon in each year, summed the results and multiplied the sum by the adjustment. In that case, Brandon, having a historically high use rate had an adjustment factor of 1.46. Multiplying by that factor brought the Brandon projection into line with current usage. It should be noted that using this adjustment factor is tantamount to assuming that the underlying relative usage across RHAs will remain constant over the time period in question, and that only differences in population will alter the balance of demand across the regions.

Estimating technique for Recent Use projections:

The Recent Use projections relied on 3-year mean estimates. These were computed using the same age/sex strata and the 1996/97-1998/99 values of PCH bed-day use. The 3-year average rates per 1,000 population in each stratum were calculated. Those rates were then applied to the populations in each strata in each of the years under consideration to yield estimated number of bed-days for each year. The estimate for the Non-Winnipeg area was calculated using the individual RHA projections and then aggregating them across all RHAs.

Table B4 illustrates how the mean estimates can be used to predict PCH bed requirements in Winnipeg. This table uses the actual population for 1998/99 in each age-sex stratum, multiplied by the mean use for 1996/97-1998/99 to yield an estimate of the total PCH bed-days for that year. To project forward, the population figures estimated by Manitoba Bureau of Statistics were substituted for each year.

Table B4: Projected PCH Bed Demand in Winnipeg for 1998/99 Based on Mean Use for 1996/97-1998/99 and Population Projections

Sex	Age group	Population	Mean Days per 1,000 Population	Total Days
Male	00-64	278,420	163	45,249
	65-74	20,562	3,795	78,024
	75-79	7,557	11,294	85,347
	80-84	4,494	23,687	106,450
	85-89	2,261	45,938	103,865
	90+	834	100,860	84,117
Female	00-64	278,888	137	38,156
	65-74	25,764	3,686	94,974
	75-79	11,771	13,712	161,405
	80-84	8,386	32,366	271,422
	85-89	5,168	68,450	353,751
	90+	2,789	146,947	409,834
	Total	646,894		1,832,594
			Total Beds =	5,021

Combined Projections

The combined projections for the RHAs consisted of the arithmetic means of the 10-year trend projection and the Recent Use projection.

Table B5 shows the results of the current planning formula of 120 beds per 1,000 persons age 75+, the Ten-Year Trend projection, the Three-Year Recent Use projection and the Combined Projection for Winnipeg and Non-Winnipeg. The Non-Winnipeg values were obtained by aggregating the values for individual RHAs for each projection method. This is true of both the projected rates of use and the projected population.

This method produces slightly different results than if the projection methods were applied to the total Non-Winnipeg population. (Results using the total Non-Winnipeg population are available on request.) This discrepancy exists because: (1) the projected age-sex distribution of the population is different for each RHA, and between each RHA and Non-Winnipeg, and (2) rounding error. The aggregated method was chosen because our intent was to develop a projected value for each RHA. Table B6 to B15 show the year by year estimates for each method for each of the Non-Winnipeg RHAs.

Table B5: Projected Demand for PCH Beds for 2000-2020 in Winnipeg and Non-Winnipeg Using Different Estimating Procedures

	Winnipeg					Non-Winnipeg**				
Year	PCH Bed Capacity	Manitoba Health Current*	10-Year Trend	3-Year Mean	Combined	PCH Bed Capacity	Manitoba Health Current*	10-Year Trend	3-Year Mean	Combined
2000	5,707	5,357	5,031	5,181	5,106	4,084	3,929	3,881	3,988	3,935
2001		5,431	5,046	5,275	5,160		3,961	3,884	4,046	3,965
2002		5,480	5,036	5,346	5,191		3,997	3,890	4,111	4,001
2003		5,519	5,041	5,435	5,238		4,039	3,879	4,159	4,019
2004		5,529	5,027	5,507	5,267		4,067	3,874	4,216	4,045
2005		5,553	5,019	5,592	5,306		4,103	3,873	4,278	4,076
2006		5,567	4,988	5,657	5,322		4,119	3,856	4,323	4,090
2007		5,579	4,943	5,709	5,326		4,134	3,835	4,366	4,101
2008		5,576	4,897	5,766	5,331		4,148	3,810	4,409	4,109
2009		5,551	4,829	5,797	5,313		4,140	3,778	4,446	4,112
2010		5,527	4,776	5,849	5,312		4,143	3,757	4,490	4,123
2011		5,504	4,723	5,902	5,313		4,154	3,729	4,525	4,127
2012		5,476	4,677	5,959	5,318		4,156	3,713	4,577	4,145
2013		5,462	4,625	6,008	5,316		4,172	3,673	4,605	4,139
2014		5,453	4,550	6,022	5,286		4,190	3,641	4,634	4,138
2015		5,446	4,478	6,044	5,261		4,224	3,601	4,666	4,134
2016		5,470	4,408	6,062	5,235		4,265	3,550	4,680	4,115
2017		5,507	4,337	6,076	5,206		4,312	3,508	4,704	4,106
2018		5,599	4,281	6,102	5,191		4,385	3,484	4,755	4,119
2019		5,711	4,228	6,120	5,174		4,440	3,437	4,768	4,103
2020		5,815	4,184	6,153	5,169		4,511	3,413	4,817	4,115

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.
** Non-Winnipeg estimates are the sum of RHA estimates.

Table B6: Estimated PCH Bed Demand in Central, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	783	761	711			
1991	817	772	719			
1992	842	817	736			
1993	842	826	751			
1994	842	829	764			
1995	842	832	776			
1996	840	823	787			
1997	840	810	797			
1998	815	805	807			
1999	815	805	811	811	823	817
2000	811		814	796	819	808
2001			819	793	828	811
2002			824	790	839	815
2003			826	788	848	818
2004			826	783	856	820
2005			828	781	868	824
2006			823	775	875	825
2007			818	768	884	826
2008			813	760	889	825
2009			802	752	895	823
2010			796	742	897	820
2011			789	733	900	817
2012			779	726	904	815
2013			782	719	908	814
2014			776	705	902	803
2015			781	697	905	801
2016			787	687	904	796
2017			787	674	899	786
2018			799	665	900	783
2019			806	653	895	774
2020			819	647	900	774

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B7: Estimated PCH Bed Demand in North Eastman, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	130	119	188			
1991	130	125	193			
1992	130	125	200			
1993	130	125	204			
1994	130	126	206			
1995	130	126	213			
1996	150	136	216			
1997	150	146	225			
1998	150	145	230			
1999	150	147	235	151	152	152
2000	190		241	149	153	151
2001			243	150	156	153
2002			251	151	160	156
2003			260	155	166	161
2004			270	158	171	164
2005			278	161	176	169
2006			288	164	182	173
2007			295	165	186	176
2008			303	167	192	180
2009			313	168	197	183
2010			319	172	204	188
2011			326	174	210	192
2012			334	177	218	197
2013			343	178	222	200
2014			349	180	229	204
2015			357	180	233	207
2016			366	180	237	208
2017			377	182	244	213
2018			383	184	251	218
2019			393	185	256	220
2020			401	186	263	224

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B8: Estimated PCH Bed Demand in South Eastman, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	323	318	250			
1991	323	316	260			
1992	333	318	266			
1993	333	327	276			
1994	328	325	283			
1995	334	327	292			
1996	332	328	300			
1997	332	327	302			
1998	332	326	312			
1999	332	322	316	329	333	331
2000	332		325	327	336	331
2001			335	334	347	341
2002			341	337	355	346
2003			353	341	364	352
2004			362	345	375	360
2005			370	351	386	369
2006			378	352	393	373
2007			382	352	400	376
2008			390	359	414	386
2009			395	360	423	392
2010			402	362	431	396
2011			409	365	443	404
2012			417	368	452	410
2013			423	370	463	417
2014			429	374	474	424
2015			439	375	484	429
2016			447	376	493	434
2017			458	377	503	440
2018			475	381	518	449
2019			484	380	526	453
2020			496	382	539	461

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B9: Estimated PCH Bed Demand in Interlake, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	504	499	463			
1991	504	502	478			
1992	504	500	486			
1993	504	500	495			
1994	504	500	505			
1995	504	502	525			
1996	522	504	536			
1997	522	516	540			
1998	522	516	542			
1999	552	538	545	529	536	533
2000	552		564	531	546	539
2001			576	537	561	549
2002			586	539	572	555
2003			597	547	589	568
2004			608	554	605	580
2005			622	564	626	595
2006			631	567	639	603
2007			651	571	653	612
2008			665	572	662	617
2009			678	575	676	625
2010			687	581	694	637
2011			698	583	706	645
2012			703	585	719	652
2013			713	584	731	658
2014			724	585	744	665
2015			731	585	757	671
2016			745	586	770	678
2017			757	584	783	683
2018			772	584	799	692
2019			781	581	809	695
2020			797	582	825	703

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B10: Estimated PCH Bed Demand in Nor-Man, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	130	125	97			
1991	130	123	98			
1992	130	119	97			
1993	130	119	96			
1994	128	118	96			
1995	126	119	97			
1996	124	116	97			
1997	120	113	100			
1998	120	110	100			
1999	120	107	104	113	114	114
2000	126		103	108	111	110
2001			104	108	113	110
2002			104	106	113	109
2003			106	103	113	108
2004			107	104	114	109
2005			106	102	114	108
2006			109	103	118	111
2007			108	99	115	107
2008			111	100	119	109
2009			112	99	119	109
2010			113	99	122	111
2011			115	100	125	113
2012			118	101	129	115
2013			119	99	128	113
2014			123	100	133	117
2015			129	101	137	119
2016			131	102	141	121
2017			136	103	145	124
2018			140	105	151	128
2019			146	106	155	130
2020			149	106	160	133

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B11: Estimated PCH Bed Demand in Parkland, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	444	419	465			
1991	499	445	478			
1992	499	478	489			
1993	520	488	495			
1994	520	506	500			
1995	545	514	508			
1996	545	532	512			
1997	545	530	514			
1998	545	531	514			
1999	545	524	517	524	531	527
2000	545		520	521	536	528
2001			519	517	540	529
2002			520	520	550	535
2003			517	514	551	533
2004			517	510	556	533
2005			514	504	556	530
2006			508	496	557	526
2007			505	489	557	523
2008			496	480	557	519
2009			488	474	560	517
2010			481	463	556	510
2011			474	454	554	504
2012			468	448	556	502
2013			460	438	552	495
2014			453	428	547	488
2015			448	416	542	479
2016			442	404	535	470
2017			440	395	533	464
2018			439	385	525	455
2019			443	378	521	450
2020			443	369	517	443

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B12: Estimated PCH Bed Demand in Churchill/Burntwood, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	26	25	56			
1991	26	26	57			
1992	26	25	57			
1993	26	26	55			
1994	26	25	54			
1995	26	24	56			
1996	26	24	57			
1997	26	22	57			
1998	26	20	58			
1999	26	21	60	21	23	22
2000	26		61	21	22	21
2001			61	21	22	22
2002			65	21	24	22
2003			68	22	25	23
2004			64	21	24	23
2005			73	22	26	24
2006			74	22	28	25
2007			78	23	28	26
2008			85	24	30	27
2009			88	24	31	28
2010			93	25	33	29
2011			101	26	35	31
2012			107	27	37	32
2013			113	28	40	34
2014			125	29	42	36
2015			135	31	46	38
2016			145	32	48	40
2017			157	33	51	42
2018			169	34	54	44
2019			178	35	58	46
2020			192	37	62	50

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B13: Estimated PCH Bed Demand in Brandon, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	597	595	336			
1991	597	597	344			
1992	597	595	347			
1993	597	595	355			
1994	597	596	364			
1995	595	596	380			
1996	595	593	391			
1997	595	592	399			
1998	595	593	394			
1999	595	591	396	584	591	587
2000	595		404	583	597	590
2001			409	588	609	598
2002			411	594	621	607
2003			415	584	620	602
2004			418	583	626	604
2005			422	582	634	608
2006			424	584	643	614
2007			421	583	650	617
2008			419	574	650	612
2009			414	568	653	611
2010			411	565	660	612
2011			411	559	662	611
2012			413	558	671	614
2013			413	551	676	613
2014			411	546	680	613
2015			413	541	686	613
2016			415	531	688	609
2017			421	525	693	609
2018			425	518	699	609
2019			430	510	702	606
2020			436	507	709	608

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B14: Estimated PCH Bed Demand in Marquette, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods: Adjusted 10-Year Trend	Projection Methods: 3-Year Mean	Projection Methods: Combined
1990	425	420	425			
1991	425	422	429			
1992	425	419	437			
1993	423	419	443			
1994	424	420	447			
1995	424	422	447			
1996	424	422	455			
1997	424	422	464			
1998	424	421	464			
1999	424	420	461	413	418	415
2000	430		468	415	426	420
2001			467	412	429	420
2002			470	411	435	423
2003			472	408	438	423
2004			472	407	443	425
2005			471	404	446	425
2006			467	399	448	423
2007			464	396	452	424
2008			458	392	453	422
2009			449	384	452	418
2010			446	381	456	418
2011			441	375	454	414
2012			433	371	457	414
2013			430	363	455	409
2014			424	354	451	402
2015			422	347	450	398
2016			420	334	441	387
2017			416	325	435	380
2018			418	320	437	378
2019			416	311	431	371
2020			416	305	430	367

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.

Table B15: Estimated PCH Bed Demand in South Westman, Using Three Different Estimating Procedures

Fiscal Year	PCH Bed Capacity	PCH Beds Used	Manitoba Health Current*	Projection Methods		
				Adjusted 10-Year Trend	3-Year Mean	Combined
1990	451	444	406		411	
1991	451	440	412		415	
1992	475	453	412		415	
1993	475	462	420		422	
1994	475	461	423		426	
1995	475	461	425		433	
1996	470	457	429		437	
1997	468	458	431		445	
1998	468	449	430		448	
1999	468	443	433	450	456	453
2000	477		430	431	442	437
2001			428	425	441	433
2002			424	421	442	431
2003			426	417	445	431
2004			422	411	445	428
2005			421	404	444	424
2006			417	394	440	417
2007			412	388	442	415
2008			408	381	441	411
2009			401	374	440	407
2010			394	366	438	402
2011			390	359	435	397
2012			383	353	435	394
2013			376	344	431	387
2014			375	339	432	385
2015			370	329	427	378
2016			365	321	423	372
2017			363	311	417	364
2018			367	307	420	364
2019			364	299	415	357
2020			362	292	412	352

* Manitoba Health's current planning ratio is 120 PCH beds per 1,000 population aged 75 or older.