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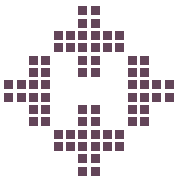
Using Administrative Data to Develop Indicators of Quality Care in Personal Care Homes

October 2006



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THE MANITOBA CENTRE FOR HEALTH POLICY

The Manitoba Centre for Health Policy (MCHP) is located within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. The mission of MCHP is to provide accurate and timely information to healthcare decision-makers, analysts and providers, so they can offer services which are effective and efficient in maintaining and improving the health of Manitobans. Our researchers rely upon the unique Population Health Research Data Repository (Repository) to describe and explain patterns of care and profiles of illness, and to explore other factors that influence health, including income, education, employment and social status. This Repository is unique in terms of its comprehensiveness, degree of integration, and orientation around an anonymized population registry.

Members of MCHP consult extensively with government officials, healthcare administrators, and clinicians to develop a research agenda that is topical and relevant. This strength along with its rigorous academic standards enable MCHP to contribute to the health policy process. MCHP undertakes several major research projects, such as this one, every year under contract to Manitoba Health. In addition, our researchers secure external funding by competing for research grants. We are widely published and internationally recognized. Further, our researchers collaborate with a number of highly respected scientists from Canada, the United States and Europe.

We thank the University of Manitoba, Faculty of Medicine, and Health Research Ethics Board for their review of this project. MCHP 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.

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Executive Summary

Introduction

Older adults (people 65 years or older) are the predominant users of personal care homes (PCHs) in Manitoba, and about 85% of people admitted to PCHs are 75 years and older. Also, PCH residents are typically now more frail than in the past, and these individuals have diverse and extensive healthcare needs. It is important to establish indicators of quality care in PCHs to help ensure that appropriate standards of care provision are maintained.

The Manitoba Centre for Health Policy (MCHP) was asked by Manitoba Health to develop indicators of quality care for PCHs using administrative data, and also to describe how this quality of care varies between Regional Health Authorities (RHAs) and individual PCHs in Manitoba. This report addresses two specific research questions:

1. Using administrative data, what indicators can be created to describe the quality of care provided in PCHs in Manitoba, and how do these outcomes vary between RHAs and individual PCHs in the province?
2. Can PCH facility and resident characteristics be used to define scenarios when quality indicators (QIs) are more likely to occur? Data in this report can be used to target more explicitly quality of care interventions in PCHs, focussing on residents most at risk of experiencing these adverse events.

Focus of the Report

QIs are markers to reflect the presence or absence of potential shortcomings in the provision of healthcare. Rather than identify definitive areas of good versus poor quality healthcare, QIs are intended as information triggers so that decision-makers know when to conduct follow-up activities. Used in this context, QIs help to target PCHs where successful quality care strategies may be emulated and also where problems may exist.

Comparing Rates of Quality Indicators (QIs) Between Regional Health Authorities (RHAs) and Personal Care Homes (PCHs)

Ten QIs were defined from administrative data to assess the quality of care provided in PCHs. Rates of these QIs have been compared between the RHAs and also between individual PCHs in Manitoba, using administrative data from April 1, 1999 to March 31, 2004.

Six of the QIs in this research are referred to as 'diagnostic QIs'. These QIs are based on how frequently PCH residents were admitted to a hospital or were visited by a physician for the following reasons:

- Hip fractures
- Non-hip fractures
- Accidental falls
- Skin ulcers
- Respiratory infections
- Fluid and electrolyte imbalances

Rates of these QIs were assessed during the entire time that residents resided in a PCH during the study period. These rates have been expressed using the concept of person-years, to account for any time that residents were not living in a PCH (e.g., if they were hospitalized for a period of time). This has helped to compare rates of diagnostic QIs more fairly between PCHs.

Four additional QIs in this research are based on drug dispensing patterns to PCH residents, focussing on those who received:

- Nine or more different categories of medications (polypharmacy).
- Short, intermediate and long-acting benzodiazepines.
- Typical as well as atypical antipsychotic medications.
- Select Beer's Criteria medications (these are medications considered to be particularly higher risk for use by older adults).

These drug-related QIs were only assessed for residents who were admitted to a PCH during the five-year study period. Drug dispensing patterns are reported for a period of 100 days before these residents were admitted to a PCH, and also for a period of 100 days shortly after this date. RHA-level data in this report emphasize changes in drug dispensing patterns between these periods, while comparisons between PCHs focus on the latter time period. Data on drugs dispensed from hospital pharmacies are not provided to Manitoba Health; PCHs that were supplied drugs from hospital pharmacies were therefore excluded from these analyses.

When making comparisons between RHAs and PCHs, rates of both the diagnostic and drug-related QIs were adjusted (standardized) for resident sex, age and level of care. For each QI, statistical testing was used to look for significant differences between RHAs ($p<.01$). Relative thresholds (i.e., the 10^{th} and 90^{th} percentile of ranked PCHs) were used to identify PCHs where each QI was reported less and more frequently. Trends in these results are provided for PCHs, separately for the diagnostic and drug-related QIs.

Determining When PCH Residents Were More Likely to Experience QIs

Multivariate analyses were also conducted to determine scenarios when PCH residents were more likely to experience QIs. These analyses have used both PCH-level data (e.g., type and size of facility, hours of staff provided per resident, etc.), and resident-level data (e.g., resident age, sex, level of care, presence of chronic diseases, etc.). Results from these analyses are presented for each QI and trends in results are also reported.

Findings

Comparing the Characteristics of PCH Facilities and Residents Between RHAs

Analysis of the characteristics of PCH facilities and residents provides some context for interpreting other results in this report. These facility- and person-level characteristics differ for some RHAs in Manitoba. Some highlights of these findings are as follows:

- In the 2003/04 fiscal year, PCHs in RHAs differed by size and by facility type. Facilities in the Winnipeg Regional Health Authority (WRHA) and Brandon RHA tended to be larger; all of these PCHs were free-standing facilities (i.e., were not juxtaposed to another healthcare facility) and close to 40% were proprietary (i.e., for profit). PCHs in most other RHAs were smaller and in many instances were non-proprietary. In some of these latter RHAs (e.g., Assiniboine, Parkland, Nor-Man), PCHs are often juxtaposed to another healthcare facility.
- Different volumes of PCH staffing hours (nurses and aides) were also reported for some RHAs during the study period. PCHs in the Interlake, North Eastman and South Eastman RHAs reported providing the largest volume of staffing care to residents, while PCHs in the Central and Brandon RHAs reported providing smaller volumes of this care. Also, non-proprietary PCHs in the WRHA tended to provide larger volumes of staffing care as compared to proprietary PCHs in this RHA. These results should be interpreted with some caution, as staffing data were not available for all PCHs during the study period.
- On average for each year of the study period, 69.7% of PCH residents in Manitoba were assigned a level of care of 3 or 4 and 55.2% of all residents were 85 years or older. Also, 65.3% of PCH residents had been diagnosed with dementia and 70% of residents had been diagnosed with two or more categories of chronic diseases. These PCH resident characteristics differed for some RHAs in Manitoba. For example, as compared to the Manitoba average, residents in the

Brandon RHA tended to be younger and were typically assigned a lower level of care. The 'turn-over' of residents in this RHA also was typically slower, characterized by lower annual admission rates and longer median lengths of stay. Conversely (for example), while residents residing in proprietary PCHs in the WRHA tended to be younger, these individuals were assigned typically a higher level of care. Compared to the Manitoba average, the 'turnover' of residents in proprietary PCHs in the WRHA was reported to be faster during the five-year study period.

Comparing Rates of Diagnostic QIs Between RHAs and Individual PCHs

Rates of diagnostic QIs were calculated for 122 PCHs in Manitoba during the study period. RHA-level data for these QIs are summarized as follows:

- The *number* of diagnostic QIs reported during the five-year study period varied considerably, ranging from 1,231 events of hip fractures to 7,958 events of respiratory infections. Between 2,000 and 4,000 events of each of accidental falls, skin ulcers, non-hip fractures, and fluid and electrolyte imbalances were counted during the five-year study period.
- Diagnostic QIs were reported at a similar *rate* for most RHAs. Some of these QIs were reported less frequently in each of the Parkland, Central and North Eastman RHAs, while all diagnostic QIs were reported more frequently in proprietary PCHs in the WRHA. Some of these QIs were also reported more frequently in the Brandon RHA.

QI rates varied considerably between PCHs in most RHAs. For each QI, individual PCHs were rank ordered according to how frequently events were reported; PCHs have been emphasized where QI rates were among the lowest (i.e., were ranked below the 10th percentile of all PCHs) and highest (i.e., were ranked above the 90th percentile of all PCHs) in the province. Results are summarized as follows:

- Forty-two PCHs ranked below the 10th percentile for at least one diagnostic QI (diagnostic QIs were reported less frequently in these PCHs). Of these 42 PCHs, 10 ranked below the 10th percentile threshold for two diagnostic QIs, two PCHs ranked below this threshold for three diagnostic QIs, and one PCH ranked below the 10th percentile threshold for four of the six diagnostic QIs included in this research. These facilities may be used to identify strategies to improve aspects of quality care provided in other PCHs. As noted in Chapter 6 of this report, the results for *some* of these

PCHs may be due to a lack of medical claims data (i.e., physicians in some of these PCHs may have been paid via salary and did not submit ICD-9-CM codes to reflect the care they provided), versus more exceptional quality of care provision.

- Forty of the 122 PCHs included in this research ranked above the 90th percentile for at least one diagnostic QI (QIs were reported most frequently in these facilities). Eight of these PCHs ranked above the 90th percentile threshold for two QIs, two PCHs ranked above this threshold for three QIs, and one PCH ranked above the 90th percentile threshold for four of the six diagnostic QIs included in this research. Decision-makers may decide to follow-up with these facilities to determine if select problems in quality care provision exist.

Comparing Rates of Drug-Related QIs Between RHAs and Individual PCHs

Prescribing practice for QI drugs are limited to PCHs that received drugs from a retail-based pharmacy during the five-year study period (n=89 PCHs).

RHA-level analyses of the drug-related QIs have focussed on changes in drug use before versus shortly after residents were admitted to a PCH. Highlights of these analyses are as follows:

- In general, PCH residents in Manitoba were more likely to have been dispensed QI drugs shortly after versus before they were admitted to a PCH. For example, 4.8% of residents met the criteria for polypharmacy before they were admitted to a PCH compared to 9.0% of residents shortly after this date (an increase of 88.8% of residents). Similar increases in drug dispensing were noted for antipsychotics (16.5% of residents were dispensed these medications before they were admitted to a PCH compared to 30.2% of residents shortly after this date). Increases in drug dispensing were less dramatic for benzodiazepines and Beer's Criteria medications; approximately 40% more residents were dispensed each of these types of drugs shortly after versus before they were admitted to a PCH (16.8% of residents were dispensed benzodiazepines before they were admitted to a PCH compared to 23.7% of residents shortly after this date; 7.6% of residents were dispensed Beer's Criteria medications before they were admitted to a PCH compared to 10.5% of residents shortly after this date).
- Increases in drug use with admission to a PCH were labelled as substantive when the number of residents dispensed QI-drugs increased by at least 20%. Substantive increases in QI-drug dispensing were

reported in most RHAs as residents were admitted to a PCH. While less substantive increases in QI-drug dispensing were reported in some RHAs, residents in these RHAs were often more likely to be already taking QI-drugs before being admitted to a PCH. These data demonstrate the complexity of assessing changing patterns of drug use with admission to a PCH. Recommendations have been made to conduct additional research with more complete drug data, to understand further how patterns of drug use change with admission to a PCH.

PCH-level analyses of the drug-related QIs focussed on the period of time 91 to 190 days after residents were admitted to a PCH. Results are summarized as follows:

- Of the 89 PCHs in Manitoba that were a part of these analyses, 24 facilities ranked below the 10th percentile for at least one of the four drug-related QIs. This means that QI-drugs were dispensed less frequently to residents in these PCHs; two of these PCHs ranked below the 10th percentile threshold for two of the drug-related QIs, while one PCH ranked below this threshold for three of the four drug-related QIs. Lessons may be learned from these PCHs with respect to minimizing drug utilization.
- Sixteen PCHs in Manitoba ranked above the 90th percentile for at least one of the drug-related QIs, meaning that QI-drugs were dis pensed most frequently to residents in these PCHs. Three of these PCHs ranked above the 90th percentile threshold for two QIs, while one PCH ranked above this threshold for three of the four drug-related QIs. Problems with excessive use of higher risk drugs may exist in these facilities.

Defining When QIs Were Most Likely to Occur to PCH Residents

Based on the results of multivariate data analyses, this research has demonstrated that diagnostic and drug-related QIs were more likely to occur in certain scenarios. These results may help decision-makers to develop strategies to optimize the quality of care provided in PCHs. The following information is important to consider:

- Factors such as resident age and sex, as well as the level of care assigned to residents and the presence of chronic comorbidities, are all important considerations when designing strategies to improve quality of care. The influence of some of these risk factors varied for different QIs. For example, while individuals who were assigned a

higher level of care were more likely to experience skin ulcers, individuals who were assigned a lower level of care were more likely to fall accidentally, or to experience a hip or a non-hip fracture.

- Residents were much more likely to have experienced diagnostic QIs immediately after they were admitted to a PCH or when they were closer to death, compared to all other time periods when they were living in a PCH. These data suggest that diagnostic QIs may be more likely to occur at certain times when an individual is residing in a PCH.
- Residents were much more likely to have been dispensed higher risk drugs if these and other medications were prescribed by two or more physicians. These results demonstrate the importance of ensuring continuity of care in PCHs.
- After controlling for a variety of resident-level risk factors, variables such as PCH facility size and staffing-to-resident ratios did not influence how often QIs occurred. However, most diagnostic QIs were more likely to have occurred in proprietary PCHs in the WRHA (versus non-proprietary free-standing facilities in Manitoba). Antipsychotic medications were also dispensed to more residents in proprietary PCHs in the WRHA versus residents who resided in most other types of PCHs. It is important to recognize that these are average results, and should not necessarily be attributed to all proprietary PCHs in the WRHA. Also, data that provide more facility-level information (e.g., more accurate data on the type and volume of staffing provided) and more resident-level information [e.g., direct measures of function and cognitive performance, indicators of informal supports and socioeconomic status (SES)], may help to explain these unique results for proprietary PCHs in the WRHA.
- In this research, it is important to keep in mind that diagnostic QIs were reported using ICD-9-CM codes. Inter-PCH variation in these QIs can therefore be attributed to actual differences in rates that QIs occurred, or to extraneous factors such as different physician remuneration strategies in PCHs (i.e., fee-for-service physicians are required to submit ICD-9-CM codes for payment, while salaried physicians may not necessarily do so). Variables were created in this research to account for this potential source of bias. Based on findings from multivariate analyses, these 'contact bias' risk factors influenced study results minimally, meaning that the results presented for the diagnostic QIs are less likely to be attributable to extraneous factors such as differences in physician reporting strategies.

Study Recommendations

Eight recommendations are provided to influence policy, to suggest follow-up research activities and to improve the quality of long-term care administrative data in Manitoba.

Policy Recommendations

1. While this research does not define acceptable rates of QIs for PCHs, it does define facilities where QIs were reported less and more frequently in the province. Decision-makers and healthcare providers can use this information to compare how frequently events were reported for PCHs in the province, and to target facilities where problems with quality care may be most evident (i.e., targeting PCHs that ranked above the 90th percentile for a given QI). Examples of how to improve this quality of care may be 'borrowed' from PCHs where QIs were reported least frequently. Problems with quality care are most likely to exist in PCHs that ranked above the 90th percentile for multiple QIs. Follow-up is recommended for these facilities.

2. This research does not suggest ways to optimize the quality of care provided in PCHs, however, results demonstrate scenarios where QIs may be more likely to occur. Decision-makers and healthcare providers can use these data to understand periods of time when residents are more at risk of experiencing a QI, and if certain groups of PCH residents are especially at risk. These data can be used to target more explicitly quality of care interventions in PCHs.

Data Recommendations

3. To understand better the results provided for some PCHs, direct measures of resident function and cognitive performance are required. Some of these data are gathered currently when individuals are panelled for admission to a PCH, however these data are available in hard copy only. These data are also available electronically in Minimum Data Sets (MDS) in the WRHA for home care clients when they are admitted to a PCH, and also for residents of non-proprietary PCHs in the WRHA. At present, MDS data are not collected in other RHAs in Manitoba. MDS data for the WRHA are presently not available to Manitoba Health for analyses.

   MDS data also contain additional QIs for PCHs. These data may be used to assess, for example, how often physical restraints are used, and the prevalence of frequent bladder or bowel incontinence without a toileting plan. These additional QIs will help to define further the quality of care provided in PCHs in Manitoba.

4. Data for the drug-related QIs are limited to some extent in this research, as the drugs supplied to PCHs from hospital-based pharmacies are not available to Manitoba Health for analyses. Inclusion of hospital-based pharmacy data would permit drug-related research to be conducted on more PCHs in Manitoba; 33 of the 122 eligible PCHs were excluded from the drug-based analyses in this research, as these facilities received drugs from hospital-based pharmacies.

   The present research provides data on the proportion of people who were dispensed QI-drugs before and shortly after they were admitted to a PCH. Often residents were hospitalized during these time periods. As the drugs dispensed during hospitalization are unavailable to Manitoba Health for analyses, these patterns of drug use may be biased in some instances. While steps were taken to minimize this potential source of error in the current research (i.e., by excluding from the analyses residents who resided in a hospital for more than 60 days, either before or shortly after they were admitted to a PCH), access to data from hospital-based pharmacies would help to understand more fully how drug dispensing patterns change as residents are admitted to a PCH.

5. This research has used nursing and aide staffing data to help explain inter-PCH variation in QI rates. These results should be interpreted with some caution, as nursing and aide data are not available for all PCHs during the study period. Further, data for additional types of PCH staff (e.g., recreational services, occupational therapy, pastoral care, etc.) are reported jointly in the administrative data (i.e., the hours of care provided for these staff are often combined into a category of 'other' in the administrative data). As workload issues are becoming more prominent in PCHs, it is imperative to understand how the amount of care provided by different types of staff influences QI rates. The majority of these data are already provided in the administrative data, but need to be reported using a more consistent and standardized format.

Recommendations for Future Research

6. MDS data are currently available for residents in non-proprietary PCHs in the WRHA, and these data provide valuable information about resident function and cognitive performance. These data should be linked to the administrative data in Manitoba to help understand variance in QI rates between different types of PCHs, and also to define further how resident characteristics influence these rates. QIs in the MDS and administrative data may be combined to assess more completely the quality of care that is provided in PCHs.

7. This research has provided an initial assessment of drug utilization patterns in Manitoba PCHs, documenting the dramatic increase in drug use as residents are admitted to a PCH. Follow-up research should be conducted to define scenarios where this increase in drug use is particularly dramatic. This may include assessing changes in drug use as residents are admitted to a PCH from a community-based versus a hospital-based environment, or if these changes in drug use are more dramatic for residents with certain characteristics.

8. This research has demonstrated that the risk of experiencing a diagnostic QI was greater for residents just after they were admitted to a PCH or when they were closer to death. These results may demonstrate the level of morbidity associated with experiencing some diagnostic QIs (e.g., PCH residents who experience a hip fracture may die shortly thereafter). For other QIs (e.g., accidental falls), these results may reflect the period of time required for residents to adapt to their new living environment. Future research should assess the differences in risk of experiencing QIs between these two times, to understand further when PCH residents are most likely to experience different adverse events.

CHAPTER 1: INTRODUCTION AND RESEARCH PURPOSES

1.1 Introduction

Quality healthcare is about "delivering the best possible care and achieving the best possible outcomes for people every time they deal with the health-care system or use its services" (Romanow, 2002). This research has utilized the administrative healthcare data in Manitoba to define select quality indicators (QIs) of care for personal care homes (PCHs). The results of this research highlight PCHs where areas of successful quality of care may be emulated and where problems may exist, pending follow-up activities by decision-makers. These results do not suggest ways to improve quality of care in PCHs.

Shapiro and Tate (1993, 1995) demonstrated that QIs can be developed for PCHs using the administrative healthcare data in Manitoba. These researchers assessed how frequently select QIs occurred in health regions in Manitoba, and determined how PCH facility and resident characteristics influenced these results. At the conclusion of their research, Shapiro and Tate (1993) cautioned that QIs developed from administrative data should be considered as experimental, and that additional and follow-up research in this area was needed. Since this time, several researchers have used administrative data to investigate the quality of care provided in PCHs (Bronskill et al., 2004; Dhalla et al., 2002; Wagner et al., 2004).

1.2 Research Purposes

Manitoba Health requested that the Manitoba Centre for Health Policy (MCHP) continue to assess how QIs can be developed for PCHs using administrative data, and also to describe how this quality of care varies between RHAs and individual facilities. This research has addressed two specific research questions:

1. Using administrative data, what indicators can be created to describe the quality of care provided in PCHs in Manitoba, and how do these outcomes vary between RHAs and individual PCHs in the province?
2. Can PCH facility and resident characteristics be used to define scenarios when QIs are more likely to occur? Examples of PCH characteristics include facility size (i.e., number of beds) and PCH type (e.g., proprietary, free-standing, and juxtaposed), as well as the volume and type of staffing that are provided. Examples of PCH resident characteristics include age, sex, level of care, as well as the diagnosis of mental health conditions and additional chronic diseases.

Responses to this research question can be used to target more explicitly quality of care interventions in PCHs, focussing on residents most at risk of experiencing these adverse events.

1.3 Focus and Organization of the Report

Trends in population aging in Manitoba are highlighted in Chapter 2 of this report. An introduction to PCHs is also provided in this chapter, and recent changes in PCH utilization patterns are described. Older adults are the predominant users of PCHs in Manitoba, and the information in this chapter provides a brief rationale for conducting the research.

Administrative healthcare data were used in this research to develop QIs for PCHs in Manitoba. A brief review of the literature is presented in *Chapter 3* of this report. This review focusses on methods that have been used by other researchers to assess the quality of care in PCHs, and introduces strategies to determine when QI rates may be considered acceptable and less acceptable in PCHs.

The methods used in this research are described in *Chapter 4* of this report. This chapter emphasizes concepts that are fundamental to the research, such as the criteria that were used to include PCHs and residents in the analyses, the methods that were used to count how frequently QIs were reported, and the strategies that were used to interpret study results. Collectively, this information defines the parameters of the research and provides some background information to help interpret data that are provided in later chapters.

Results are presented in Chapters 5 through 8 of this report. Findings in *Chapter 5* describe how PCH facility and resident characteristics differed for some RHAs during the defined study period. Examples of the PCH characteristics described in this chapter are facility type (e.g., PCHs that are for profit or proprietary versus non-proprietary PCHs that are free-standing or juxtaposed to another healthcare facility), facility size (number of beds) and staffing-to-resident ratios. The age and sex distributions of PCH residents and various indicators of resident frailty and illness are also described in this chapter. These data provide some context with which to interpret the results provided in Chapters 5 through 8 of this report.

Two categories of QIs were developed in this research. The first category uses ambulatory care physician visits and/or hospital contacts to report how frequently certain QIs occurred during the study period (i.e., diagnostic QIs). The second category of QIs is based on the proportion of PCH

residents who were dispensed select higher risk medications (i.e., drug-related QIs). The results for these QIs are presented in *Chapters 6* and *7* of this report, for the diagnostic and drug-related QIs respectively. These findings have been presented for the RHAs and for individual PCHs in Manitoba.

QIs were reported at various rates for PCHs in this research. Using multivariate statistical analyses, researchers sought to determine PCH facility and resident characteristics that placed participants more at risk of experiencing a QI. The results of these analyses are provided in *Chapter 8* of this report.

Chapter 9 provides a summary of the main findings of this report along with study recommendations.

CHAPTER 2: POPULATION AGING AND INTRODUCTION TO PERSONAL CARE HOMES (PCHS) IN MANITOBA

This chapter reviews the current population age structure for Manitoba and also describes projected population aging trends in the province. An introduction to PCHs is also provided in this chapter and recent changes in PCH utilization patterns are highlighted.

2.1 Current and Projected Trends in Population Aging in Manitoba

Older adults are defined typically as individuals who are 65 years or older, and this population can be defined further as people 65-74 years old (the 'young-old'), 75-84 years old ('middle-old'), and 85 years or older ('old-old'). As of June 2004, there were 158,676 older adults living in Manitoba, comprising 13.6% of the provincial population (Manitoba Health, 2004). At this time, 49.2% of older adults in Manitoba were considered to be 'young-old', while 36.8% of older adults were 75-84 years old and 14.0% of older adults were 85 years or older.

How is the age of the Manitoba population expected to change in the future? The Manitoba Bureau of Statistics (2004) has estimated population growth and aging trends for Manitoba from 2001 to 2036. These projected trends are influenced by past changes in total fertility rates (TFR), and are influenced also by projected trends in TFR as well as net migration rates and age-specific death rates.

How do past changes in TFR influence population aging? During the 'Baby Boom' period (1946 to 1964), an average of 3.0 to 4.0 children were born per female during the child-bearing years. Since this time TFR has decreased in Manitoba, and less than 2.0 children are now born per female during the child-bearing years. As a result, the population of Baby Boomers is much larger than subsequent population cohorts. Baby Boomers will start to reach 65 years old by 2011, 75 years old by 2021, and 85 years old by 2031.

The projected aging trend of the Manitoba population is provided in Figure 2.1, based on a medium population projection scenario.[1] In 2001, 13.7% of the Manitoba population was 65 years or older representing 157,100 individuals. In comparison, 20.1% of the Manitoba population is expected to be 65 years or older by the year 2036 comprising 292,100 individuals. This

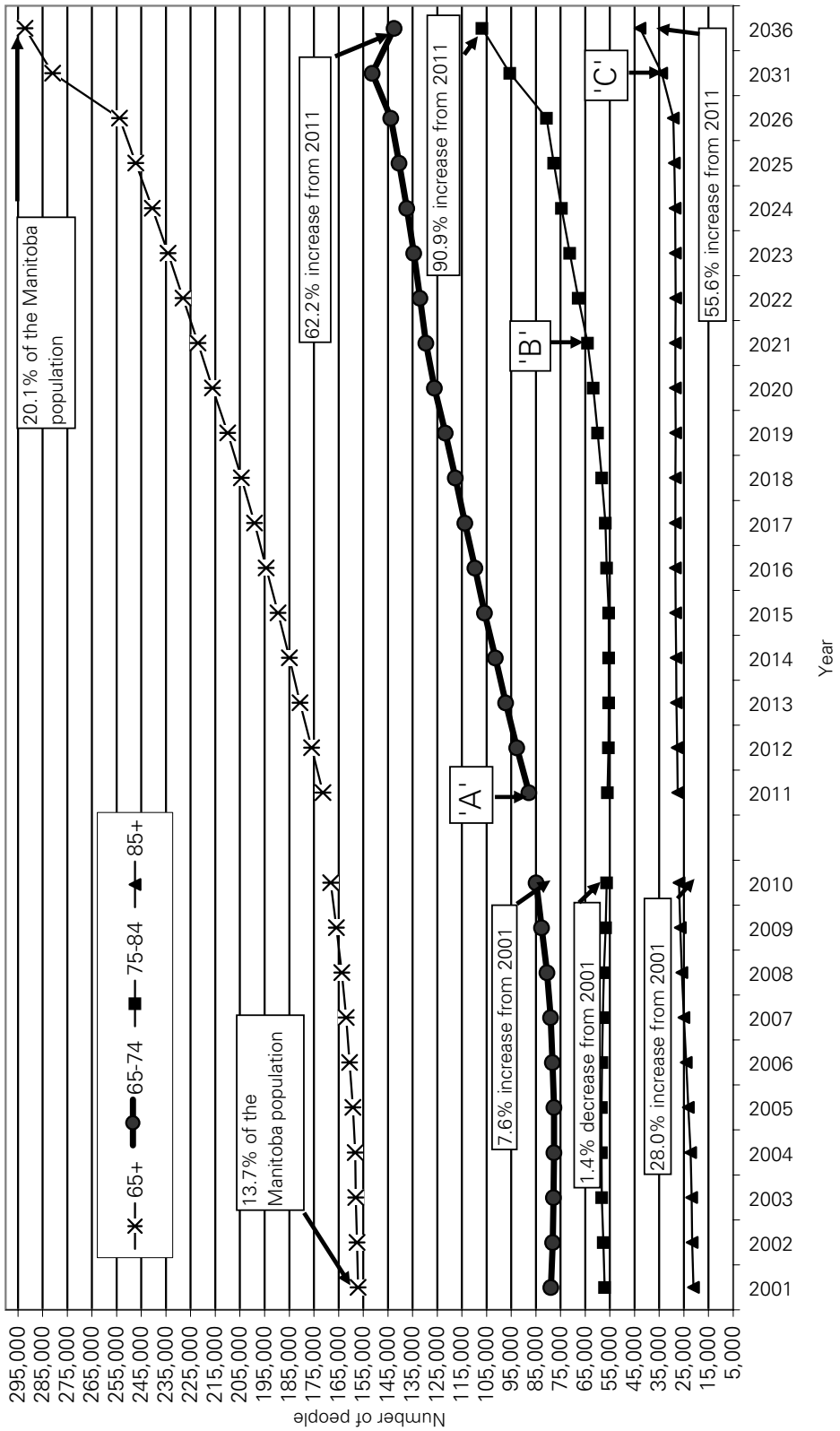
[1] Population projections are provided by the Manitoba Bureau of Statistics, using HIGH, MEDIUM and LOW scenarios, to reflect differences in the projection of total net migration rates (Manitoba Bureau of Statistics, 2004).

projected aging trend is expected to be relatively minimal until approximately the year 2010. As one exception, the population of 'old-old' individuals is projected to increase by 28.0% from 2001 to 2010 (from 21,100 individuals in 2001 to 27,000 individuals in 2010), due mainly to expected continued decreases in age-specific mortality rates (Manitoba Bureau of Statistics, 2004).

Commencing the year 2011, Baby Boomers will start to reach 65 years old, resulting in a growth of the 'young-old' Manitoba population (see 'A' in Figure 2.1). A similar trend is projected to occur by approximately the year 2021 at which time Baby Boomers will start to reach 75 years old (see 'B' in Figure 2.1). This trend can also be projected to the year 2031 at which time Baby Boomers will start to reach 85 years old (see 'C' in Figure 2.1). These projections demonstrate how the age structure of the older adult population is expected to change with time.

The temporality of this projected population aging trend is also demonstrated in Figure 2.1. For example, commencing the year 2031, the number of people 65-74 years old is projected to begin to decrease, as more Baby Boomers will start to reach 75+ years of age. While not yet projected by the Manitoba Bureau of Statistics (2004), similar trends in population aging will likely occur for people 75-84 years or older by about the year 2050 (data not shown in Figure 2.1). These projected population trends depend on the accuracy of the assumptions related to future trends in TFR and age-specific death rates, and especially on the accuracy of the assumptions related to projected trends in total net migration rates.

Figure 2.1: Current and Projected Aging Trends of the Manitoba Population



Source: Manitoba Bureau of Statistics, 2004

2.2 An Introduction to PCHs in Manitoba

In 1973, universal healthcare coverage was expanded in Manitoba to include care provided in PCHs (Kane, 1985). PCHs are residential facilities that are licensed by the Manitoba Personal Care Home Program to provide long-term personal and health services to people with chronic diseases or disabilities. PCHs are often referred to as nursing homes in other provinces in Canada. In Manitoba, PCHs should be distinguished from chronic care facilities such as Deer Lodge and Riverview in the Winnipeg Regional Health Authority (WRHA). These latter facilities are designed for individuals who require equipment, treatment or a level of professional supervision (e.g. nursing, medical, allied health) that cannot be provided in a PCH.

PCHs in Manitoba are typically referred to as proprietary (i.e., for profit) and non-proprietary (i.e., not-for-profit) facilities. All proprietary PCHs in Manitoba are free-standing facilities; non-proprietary PCHs are either free-standing or juxtaposed to another healthcare facility. For the purposes of this report, types of PCHs have often been defined as follows:

- Proprietary PCHs in the WRHA.
- Proprietary PCHs in non-Winnipeg RHAs.
- Free-standing PCHs (refers to free-standing non-proprietary facilities, which exist in all RHAs).
- Juxtaposed PCHs (refers to juxtaposed non-proprietary facilities, which exist in most but not all RHAs).

A map of the location of these different types of PCHs in Manitoba is provided in Figures 2.2 and 2.3, for the non-Winnipeg RHAs and the WRHA respectively.

Figure 2.2: A Map of the Location of PCHs in Manitoba (Non-Winnipeg RHAs), as of June 1, 2004

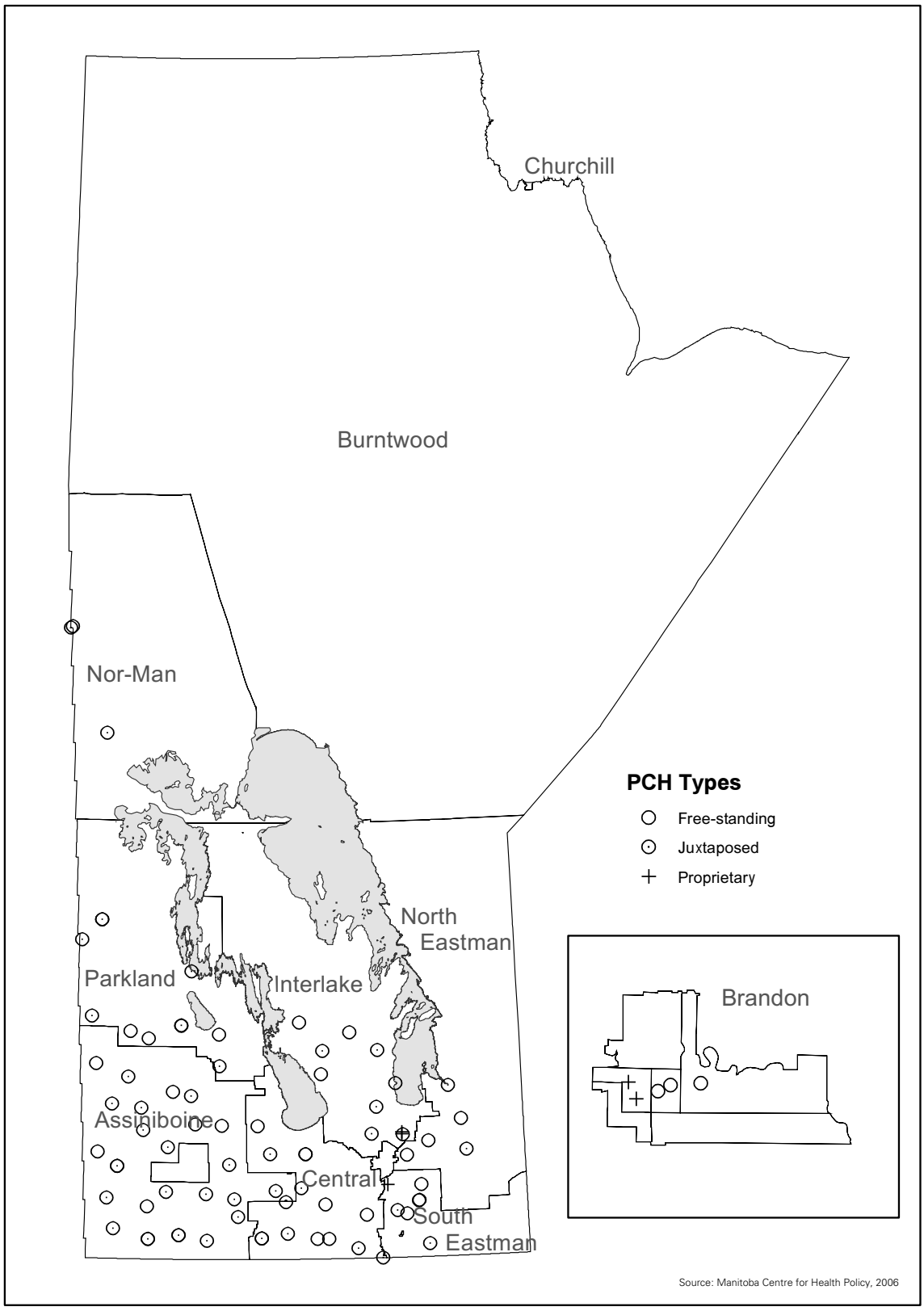
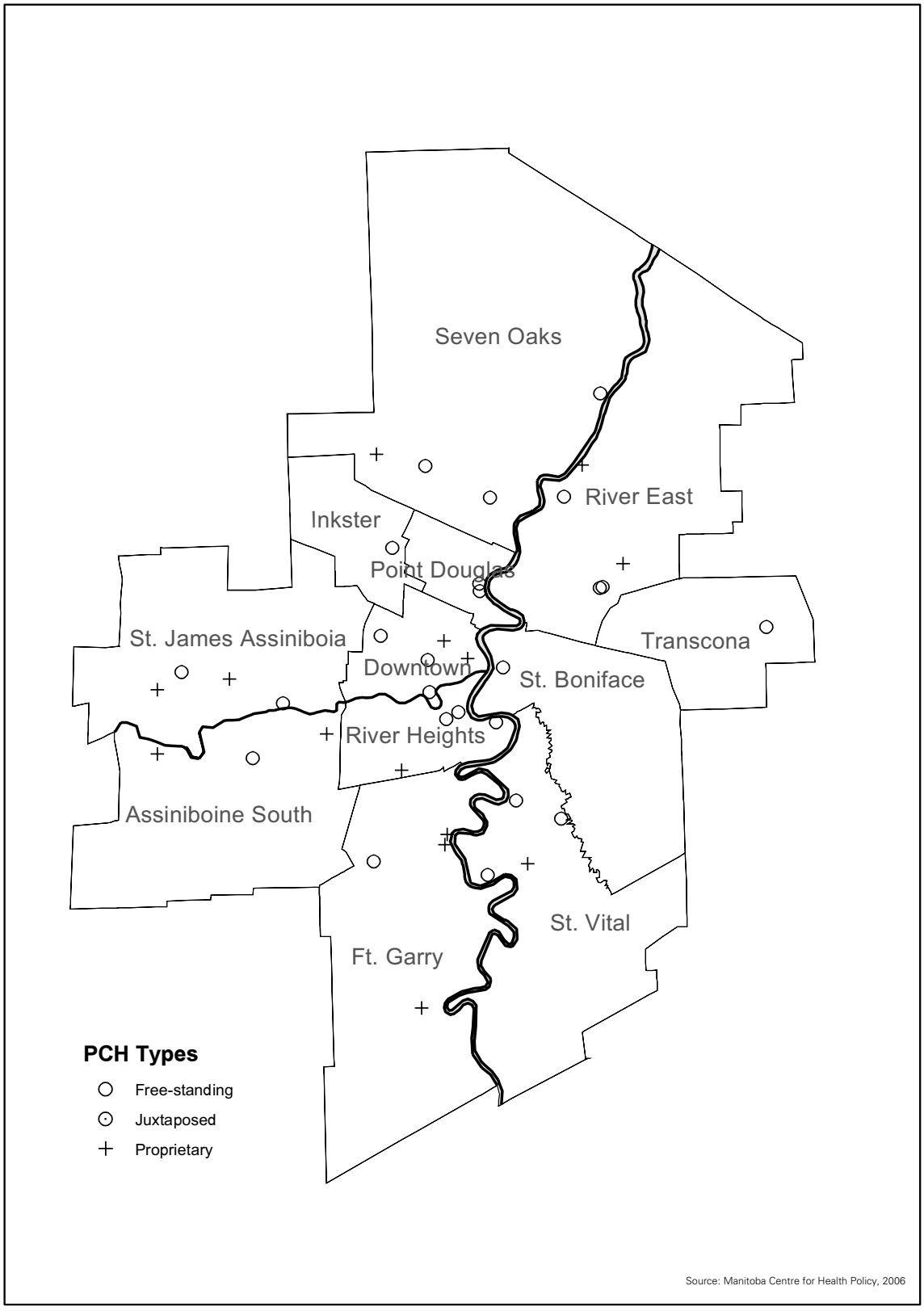


Figure 2.3: A Map of the Location of PCHs in the WRHA, as of June 1, 2004



In Manitoba, panelling for admission to a PCH is conducted usually by a Home Care Case Coordinator with input from a team of healthcare professionals including a physician, nurse and social worker. The decision to admit an individual to a PCH is based on factors such as the amount of assistance needed to complete activities of daily living, the degree of behavioural challenges exhibited by the individual, sources of informal support, and personal safety. The following services are provided to residents once they reside in a PCH in Manitoba (Manitoba Health, 2006b):

- Meal provision, including meals for special diets.
- Assistance with activities of daily living, like bathing, getting dressed and using the bathroom.
- Nursing care.
- Routine laundry and linen services .
- Prescription drugs eligible under Manitoba's Personal Care Home Program.
- Physiotherapy and occupational therapy, if the facility is approved to provide these services.

Individuals who are admitted to a PCH on a full-time and long-term basis are assigned a dependency level of 1 through 4. These dependency levels are referred to as levels of care, and are based primarily on the amount of assistance a person needs when performing activities of daily living.[2] PCH residents who are assigned a level of care of 1 are thought to require about 0.5 hours of nursing care in a 24 hour period, while individuals who are assigned a level of care of 2 are thought to require about 2.0 hours of nursing care during this time. PCH residents who are assigned a level of care of 3 or 4 are thought to require at least 3.5 hours of nursing care in a 24 hour period.

Most individuals who are accepted for admission to a PCH must wait for a PCH bed to become available. During this waiting period, Manitoba Health regulations state that individuals should be reassessed annually for changes in level of care or more frequently should their needs change (Manitoba Health, 1999). Commencing April 1, 2001, assessing changes in level of care once residents are admitted to a PCH was no longer mandated.[3]

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[2] Activities of daily living are basic daily functional tasks like being able to feed and dress one's self, be mobile, use the toilet and be continent. Individuals assigned a level of care of 4 have the most difficulties completing these tasks. Refer to the Glossary of this report for a more complete description of these levels of care.

[3] Changes in level of care post-PCH admission were recorded for proprietary PCHs in Manitoba until March 31, 2002.

In Manitoba, individuals residing in a PCH are required to pay a daily residential fee.[4] This fee is calculated according to the individual's net income and the income of his or her spouse if applicable. In June 2004, these fees ranged from $27.10 per day to $63.70 per day (Manitoba Health, 2006c). Select groups of individuals may be exempt from these residential fees, including individuals with Treaty Status and Veterans Affairs members. Residential fees may also be reduced or waived in the event that PCH residents have a net income below a minimum level, have dependents in the community, and are not eligible for select pensions or other forms of financial assistance (Manitoba Health, 2006c).

2.3 Past and Current Utilization Trends in PCHs

Older adults comprise at least 95% of the total admissions to PCHs in Manitoba, and more than 85% of all PCH admissions are made by people 75 years or older (Menec et al., 2002).

PCH utilization patterns have changed dramatically in recent years. As compared to the past, fewer older adults (per age-specific 1,000 population) currently reside in PCHs at any given time, and individuals are now typically admitted to a PCH later in life for a shorter period of time. As a result, the average per capita volume of PCH use (i.e., number of days) for older adults has decreased in the recent past, especially for males and females 85 years or older.

Expressing PCH use per capita does not consider the recent growth of the older adult population, especially for 'old-old' individuals. Indeed, the overall volume of PCH use (for an entire population) has remained stable for people 65-84 years old and has increased for people 85 years or older (Menec et al., 2002).[5] The overall volume of PCH use has therefore increased in the recent past, due to population growth patterns and despite lower average volumes of PCH use per capita for older adults. While community-based strategies will continue to be developed for older adults (Manitoba Health, 2006a), these utilization data when reviewed in conjunction with projected population aging trends, suggest that PCHs will continue to be important for use by older adults. It is important to develop QIs to help optimize the quality of care provided in PCHs.

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[4] For individuals residing in a hospital while waiting for placement into a PCH, this fee commences when individuals are panelled for admission to a PCH. For people living in the community while waiting for placement into a PCH, this fee commences upon admission to a PCH.

[5] From the data provided by Menec et al. (2002), the overall volume of PCH services used in Manitoba has remained quite consistent with time, with one exception. In 1985, females 85 years and older used 1,097,797 PCH days compared to 1,396,560 PCH days in 1999, an increase of 27.2%. A similar but less extreme trend is shown for males 85 years and older. In 1985, males 85 years and older used 353,735 PCH days compared to 405,795 PCH days in 1999, an increase in volume of 14.7%.

CHAPTER 3: HIGHLIGHTS OF RELEVANT LITERATURE

3.1 Defining Quality Indicators (QIs) of Healthcare

QIs are markers that reflect the presence or absence of potential shortcomings in the provision of healthcare (Zimmerman et al., 1995). Rather than identify definitive areas of good versus poor quality healthcare, QIs are intended as information triggers so that decision-makers know when to conduct follow-up activities. Used in this context, QIs help to target PCHs where successful quality care strategies may be emulated and also where problems may exist (Hirdes et al., 2004; Karon and Zimmerman, 1996; Moty et al., 2003; Zimmerman, 1998).

QIs are defined often as structural, process, and outcome values (McGlynn, 1997; Van Amringe and Oestreicher, 1980 ;Walsh and Kastner, 1999; Zimmerman, 2003; Zimmerman et al., 1995; Zimmerman, 1998). Structural QIs define the extent that a healthcare facility has proper standards in place to facilitate the appropriate delivery of care. Examples of structural QIs include having staff with required training and credentials, ensuring that facility space and equipment meet predetermined standards, and having policies and procedures in place to ensure appropriate care.

Process QIs reflect the standards of care provided by healthcare staff. Examples of process QIs include the use of select screening tests for higher risk patients, proper drug prescribing including the avoidance of contraindicated medications, and providing appropriate treatment strategies for patients with defined illnesses. Process QIs do not always consider how standards of care influence people's health status, and these QIs are therefore sometimes assessed in conjunction with indicators of patient health (i.e., outcome QIs).

Outcome QIs reflect most directly the health status of individuals, and researchers have used a range of these indicators to assess the quality of care provision in PCHs. Examples of outcome QIs include the occurrence of bed sores, infections, urinary incontinence, fractures, pneumonia, dehydration and depression (Bostick, 2004; Coleman et al., 2002; Georgiou et al., 2001; Kurfuerst, 2002; Moty et al., 2003; Mueller and Karon, 2004; Richards, 2002; Zimmerman et al., 2002), as well as outcomes such as preventable hospitalizations and the occurrence of accidental falls (Intrator et al., 2004; Mustard and Mayer, 1997). Additional outcomes such as patient satisfaction and quality of life have been used to assess aspects of quality care provided in a PCH (Challiner et al., 1996; DiBerardinis and Gitlin, 1980; Mueller and Karon, 2004).

Most researchers have utilized process or outcome QIs to describe the quality of care provided in PCHs. However, the selection of specific QIs varies between researchers and is based on a multitude of factors including the goals of the research and the availability of data. Some different strategies that have been used to assess QIs are presented in the next section.

3.2 Strategies Used to Assess QIs in PCHs

Researchers have used various strategies to describe the quality of care provided in PCHs. QIs have been measured using: i) standardized assessment instruments, ii) primary data collection techniques such as interviews, surveys and chart audits, and, iii) administrative healthcare data. A brief review of the QIs developed from these types of data is provided.

3.2.1 Standardized Assessment Instruments

Researchers at the Centre for Health Systems Research and Analysis at the University of Wisconsin have developed 24 process and outcome indicators to assess the quality of care provided in PCHs (Moty et al., 2003; Zimmerman et al., 1995). These QIs are a component of a Resident Assessment Instrument (RAI), designed to improve the quality of clinical needs assessments and care planning for PCH residents. This instrument has been mandated for use by PCHs in the United States, and is also being utilized currently by select provinces in Canada as well as by non-proprietary PCHs in the WRHA in Manitoba. Examples of QIs in the RAI include the occurrence of fractures, falls, urinary tract infections, bladder or bowel incontinence, bed sores, fecal impaction, functional loss, excessive use of medications, and the use of physical restraints daily. The presence or absence of these QIs are recorded by PCH staff providing care to the resident.

QIs in the RAI have been used by researchers to compare internationally the quality of care provided in PCHs, and to investigate how factors such as facility type, size and staffing levels influence this care provision (Bostick, 2004; Dhall et al., 2006; Jensdottir et al., 2003; Phillips et al., 2004; Wipke-Tevis et al., 2004). While these QIs and the overall RAI have undergone considerable tests of validity and reliability (Karon et al., 1999; Mor et al., 2003; Rantz et al., 1997b; Zimmerman et al., 1995), potential challenges to using these indicators include the costs associated with the purchase of technology, and the time required for staff training and for ongoing data entry. While the RAI has been implemented recently in non-proprietary PCHs in the WRHA, this instrument is not used currently by other RHAs in Manitoba. At present therefore, QIs from the RAI are not available to conduct a province-wide analysis of the quality of care provided in PCHs.

3.2.2 Primary Data Collection Techniques

Researchers have also used primary data collection techniques such as interviews, surveys and chart audits to assess the quality of care provided in PCHs. Examples of QIs documented using these techniques include the occurrence of anemia and falls (Artz et al., 2004a; Artz et al., 2004b), as well as the prescription of select medications (Beers et al., 1992; Fahey et al., 2003) and various constructs related to the quality of life of PCH residents (Challiner et al., 1996; Grant et al., 1996). Using these types of data, researchers have investigated how facility and resident characteristics influence QIs in a PCH (Bravo et al., 1999; Harrington et al., 2000; Zimmerman et al., 2002), and have assessed how certain interventions improve care provision (Baier et al., 2003). While these types of primary data collection techniques may provide a rich description of quality care, the costs and time associated with data collection make it difficult for research to be conducted on a larger population of PCH residents.

3.2.3 Administrative Healthcare Data

Researchers have used administrative healthcare data to describe patterns of drug prescribing to PCH residents (Bronskill et al., 2004; Dhalla et al., 2002; Wagner et al., 2004), and to assess the relationship between drug prescribing and the occurrence of certain events such as falls (Mustard and Mayer, 1997). In 1993, Shapiro and Tate (1993, 1995) used the administrative data in Manitoba to assess how frequently events such as anemia, pneumonia, falls, bed sores, and gangrene occurred in PCHs, by reporting how frequently PCH residents were admitted to a hospital for these reasons. QI rates can be compared between most PCHs in Manitoba using this strategy, which is a major advantage of the administrative data. The strategies used by Shapiro and Tate (1993) assume that the availability of hospital services is similar for all PCHs in Manitoba. In addition, basing QI rates on the frequency of physician visits assumes that salaried physicians are equally likely to 'shadow bill' in all PCHs, or to submit a medical claims record (i.e., ICD-9-CM code) to document the physician visit.

3.3 Setting Thresholds for QIs of Care in PCHs

Thresholds are essential to differentiate between PCHs where QIs are reported more and less frequently. As many extraneous factors influence the occurrence of QIs in a PCH (e.g., PCH resident age and frailty, compliance with treatment options, etc.), most experts agree that some negative outcomes should be expected. Healthcare experts have initiated panels to establish appropriate QI thresholds in a PCH (Rantz et al., 1997a; Rantz et al., 2000), however these thresholds have not been used extensively nor have they been validated for use with administrative data.

Relative thresholds have also been used to distinguish between PCHs where QIs are reported more and less frequently (Karon and Zimmerman, 1996; Zimmerman et al., 1995). This process entails rank ordering PCHs according to how frequently QIs are reported, and following up with facilities ranked above and below certain thresholds. The 90th percentile of PCH rankings has been used often to define facilities where QIs occur most frequently; problems with quality care may be most evident in these PCHs (Zimmerman et al., 1995). This technique does not consider scenarios where QI rates may be unacceptably high for all PCHs being investigated, in which case remedial activities may be required for all facilities. Relative thresholds may also have less value when QI rates may be considered as acceptable for all PCHs.

CHAPTER 4: RESEARCH METHODS

4.1 Data Sources Used in the Research

MCHP houses data collectively referred to as the Population Health Research Data Repository (Repository). These are derived from administrative claims data ('administrative data'), that is, data which are collected in order to administer the universal healthcare system within Manitoba. Prior to MCHP using these data, identifying information such as patient and provider name, street address and true health number are removed. Therefore, the Repository contains only anonymized information, which is only 'linkable' across files through a fictitious number assigned to the records. The Repository includes information of key interest to health planners, such as mortality and birth information, physician and hospital use, pharmaceutical use, and use of services such as home care and PCHs.

The following data files from the Repository were accessed to conduct this research:

- Personal care home
- Hospital discharge
- Medical claims
- Pharmaceutical
- The mortality file from vital statistics
- Payroll files from the management information system (MIS)

This research was reviewed by the Health Research Ethics Board (Bannatyne Campus) at the University of Manitoba in the spring of 2004. Additionally, a study description was sent to the Health Information Privacy Committee at Manitoba Health for review and comment.

4.2 Defining PCH Facilities and Residents Included in the Research

Administrative healthcare data from April 1, 1999 to March 31, 2004 were reviewed in this research. This five-year period of time was selected to include the most current data that were available at the time of the research, and also to ensure that a sufficient sample was available to report data for individual PCHs. As per regulations at MCHP, outcomes in this report have been suppressed (i.e., not reported) for PCHs when a QI was reported between one and five times during the study period.

Analyses were conducted on 122 PCHs in this research. The names and identification numbers (IDs) of these PCHs are presented in Appendix A of this report. A PCH facility was included in this research if it was registered

as a licensed facility by the Province of Manitoba, and also if operating funds for the PCH were provided in full by the Province of Manitoba. PCHs were excluded from this research if they were funded partially or completely by the Federal Government (e.g., Nisichawayasihk in Nelson House and Pinaow-Wachi in Norway House), as administrative healthcare data are not available for all of the residents in these facilities. PCH facilities were also excluded from this research if they were closed prior to March 31, 2004 (e.g., Concordia Hospital in the WRHA, Ebenezer Home in Altona and Victoria Park Lodge in Souris). Chronic care facilities such as Deer Lodge and Riverview in the WRHA were also excluded from this research.

Criteria were also developed to exclude certain residents as study participants, based on dependency levels that are assigned to people once they are accepted for care in a PCH. These dependency levels define people who are waiting for a PCH bed to become available and also differentiate part- or full-time PCH residents. Individuals who were assigned a dependency level (level of care) of 1 to 4 were included as study participants in this research, meaning that they were residing in a PCH on a full-time basis. These residents had to have lived in one or more of the PCHs listed in Appendix A for at least one full day during the study period. Residents were excluded from this research if they were discharged to a chronic care facility or died on the same day they were admitted to a PCH.

4.3 QIs Developed

The results for 10 QIs are assessed in this research. Six of these QIs were developed using ICD-9-CM codes, to assess how frequently PCH residents were visited by a physician or were admitted to a hospital for certain reasons. Four additional QIs are based on the proportion of PCH residents who were dispensed select higher risk medications.

Numerous QIs have been used by other researchers to assess the quality of care provided in PCHs. The QIs selected in this research have been used frequently in the past, and some are similar in principle to the QIs included in the inter-RAI assessment tools (Moty et al., 2003; Zimmerman et al., 1995). Input into the selection of these QIs was provided by a Working Group, and the names and affiliation of Working Group members is provided in the Acknowledgements section of this report. Further input into the selection of these QIs was provided by members of *The Need to Know* Team (funded by the Canadian Institutes of Health Research, Principal Investigator, Dr. Patricia Martens) (see Martens PJ and Roos NP, 2005), and by the Medical Directors of PCHs in the WRHA.[6]

While an attempt has been made to select a range of QIs in this study, these indicators do not encapsulate all aspects of care provision in a PCH. The data provided from these QIs are intended to serve as information triggers, to assist decision-makers and healthcare providers to conduct more thorough follow-up activities as required.

The following text describes in more detail the QIs developed for use in this research. The methodology that was used to define these indicators is provided separately for the diagnostic and drug-related QIs.

4.3.1 QIs Based on Ambulatory Care Physician Visits and/or Hospital Contacts

The following QIs were developed in this research based on ambulatory care physician visits and/or hospital contacts:

- Hip fractures
- Non-hip fractures
- Accidental falls
- Skin ulcers
- Respiratory infections
- Fluid and electrolyte imbalances

Rates of these QIs for RHAs and PCHs reflect how frequently select ICD-9-CM diagnostic codes appeared in the administrative healthcare data, using physician contacts and hospital records. For this reason, these indicators are referred to as *diagnostic QIs*. These QIs have been reported as a *rate* in this research (i.e., # of events per 100 person-years), to allow for the possibility that PCH residents could have experienced a given QI on more than one occasion.

Three guidelines were developed to help ensure that rates of diagnosed QIs were not exaggerated, and also to help ensure that they were compared fairly between PCHs. These guidelines are summarized with reference to Figure 4.1.

Guideline # 1: In order for a given QI event to be reported in this research, it had to occur while the resident resided in a PCH. QI events were not reported if they occurred when individuals were absent from a PCH. For example, person 'A' in Figure 4.1 experienced a QI on four separate occasions. One of these events was reported while this person was hospitalized and only three

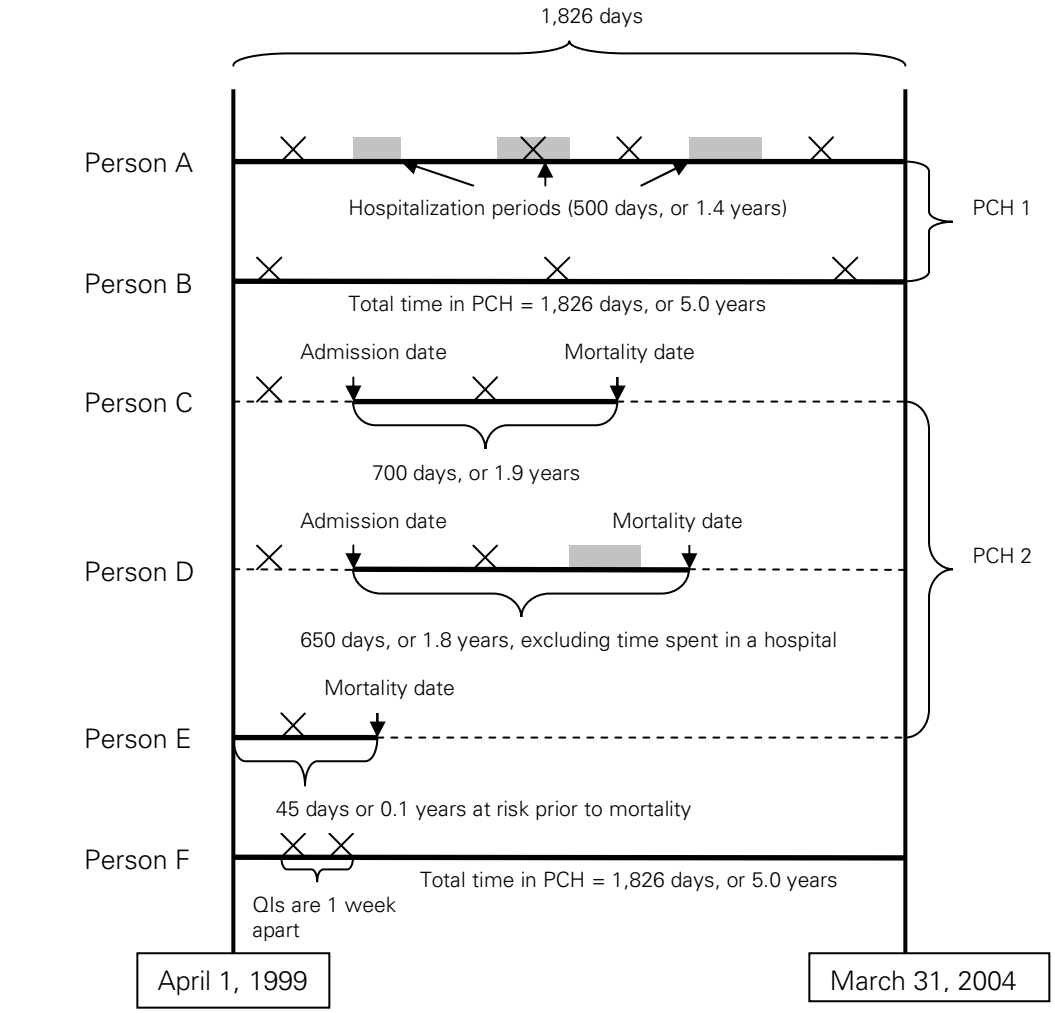
[6] A presentation was made to *The Need to Know* Team in September of 2004, followed by a discussion of QIs proposed for use in the research. A similar but less involved presentation was made to the WRHA Medical Directors of PCHs in October of 2004.

events occurred while the person was residing in the PCH. Similarly, this QI was reported twice for person 'C' during the five-year study period, however one of these events was reported before this person was admitted to a PCH.

Guideline # 2: QI events were expressed relative to the time that a resident resided in a PCH. This is also the length of time that a resident was considered to be at risk of experiencing a QI event. While the length of the study period was five years (1,826 days), residents were at risk of experiencing a QI for different lengths of time, depending on hospitalizations and admission dates to and discharge dates from a PCH. This 'time away' from a PCH was subtracted from the five-year study period for each resident to obtain a 'time at risk' value. For example, a given QI was reported for person 'A' in Figure 4.1 on 3 separate occasions (excluding the one which occurred in a hospital) in 1,326 (1,826-500) days or 3.6 years. This QI occurred at a rate of (3 events/3.6 years) 0.8 events/year for this person.

Rates of QI events were compared between PCHs in this research. Suppose persons 'A' and 'B' resided in the same PCH (PCH 1 in Table 4.1), while persons 'C', 'D' and 'E' resided in a different PCH (PCH 2). The total counts of a QI (e.g., skin ulcers) in PCH 1 were expressed relative to the total 'time at risk' for residents in this PCH. For PCH 1, this QI was reported 6 times in 8.6 years or at a rate of (6/6.4) 0.9 QI events per person-year. Comparatively, the same QI was reported 3 times in 3.8 years in PCH 2 or at a rate of 0.8 QI events per person-year. Expressing QI rates in this manner has enabled researchers to make comparisons between PCHs independent of how long residents resided in these facilities.

Figure 4.1: A Schematic of the Guidelines Used To Compare Diagnostic QIs Between PCHs



Source: Manitoba Centre for Health Policy, 2006

Guideline #3: Periods of time were established to differentiate between care provided for the same versus separate QI events for each resident. Person 'B' in Figure 4.1 experienced the same QI on three occasions while in a PCH, and the ICD-9-CM codes that reflect this QI were reported about two years apart. In this example, it is likely that person 'B' experienced three separate events of this QI. Conversely, the same ICD-9-CM codes were reported for person 'F' one week apart. In this instance, it is likely that the second ICD-

9-CM code represents follow-up care for the same QI event. Researchers selected 90 days as the minimum time to have lapsed between successive ICD-9-CM diagnostic codes, to differentiate between care provided for the same versus different events of accidental falls, respiratory infections, and fluid and electrolyte imbalances. A one year period of 'lapse time' was chosen between successive ICD-9-CM diagnostic codes for skin ulcers and for hip and non-hip fractures. The selection of 'lapse times' was based on the medical expertise of Working Group members. Analyses were also conducted for these lapse times, to ensure that the observed count of QI events per resident approximated the expected distribution of the data.

4.3.2 QIs Based on the Proportion of PCH Residents Who Were Dispensed Select Medications

Four drug-related QIs were assessed in the research, based on the proportion of PCH residents who were dispensed higher risk medications. Detailed definitions of these process QIs are provided in Chapter 7 of this report, and an introduction is provided as follows:

- *Polypharmacy*. This QI was defined as the proportion of PCH residents who were dispensed nine or more different categories of drugs. These drug categories were differentiated using the 4th level of the Anatomical, Therapeutic and Chemical (ATC) drug classification system (WHO Collaborating Centre for Drug Statistics Methodology, 2005). Medications that were dispensed in a solid and liquid format were included in the definition of polypharmacy. Drugs that were dispensed normally as over-the-counter (OTC) medications were excluded from these analyses.

- *Benzodiazepine dispensing*. This QI was defined as the proportion of PCH residents who were dispensed short-, intermediate- and-long-acting benzodiazepines. Use of these medications has been associated with an increased risk of falls and fractures in older adults, and also an increased prevalence of patient confusion, dependence and withdrawal.

- *Antipsychotic dispensing*. This QI was defined as the proportion of PCH residents who were dispensed typical or atypical antipsychotics. Use of these medications with older adults has been associated with an increased risk of adverse events such as Parkinsonism, cerebrovascular events, drowsiness and falls.

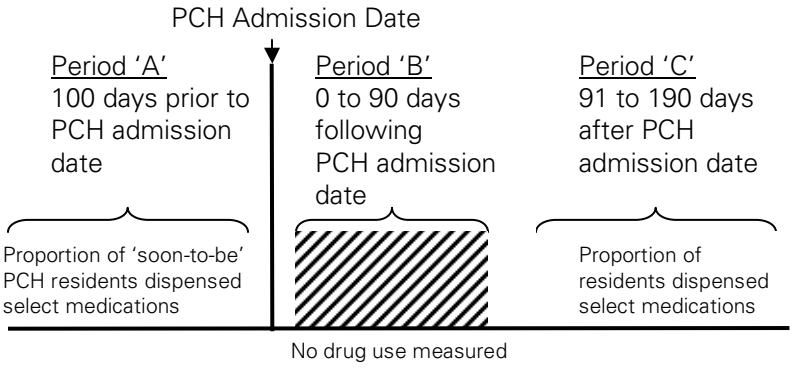
- *Beer's Criteria medications*. This QI was defined as the proportion of PCH residents who were dispensed higher risk medications that should not be dispensed to older adults, due to a limited efficacy

and/or significant contraindications of the drug. Investigators in this research have analyzed a subset of these medications that are considered to be higher risk independent of the prescription dose of the drug or of people's disease (i.e., some Beer's Criteria medications are only considered to be high risk if they are prescribed in certain doses or if they are given to people who have certain diseases).

Outcomes for the drug-related QIs have been expressed as a proportion in this research, defined as follows (Figure 4.2):

- The proportion of residents who were dispensed QI-related drugs was assessed 100 days before residents were admitted to a PCH (see period 'A' in Figure 4.2), and also 91 days to 190 days after this date (see period 'C' in Figure 4.2). Drug dispensing was not measured for 90 days following a person's PCH admission date; this period of time was considered as an adjustment period for PCH residents (period 'B', Figure 4.2). *For the remainder of this report, periods 'A' and 'C' in Figure 4.2 are generally referred to as the periods of time 'prior to' and 'shortly after' residents were admitted to a PCH.*
- Drugs dispensed from hospital-based pharmacies are not available to Manitoba Health for analysis. Drug dispensing patterns were only assessed for PCHs that were supplied medications from a retail pharmacy, for each year of the five-year study period. This means that 33 PCHs were excluded from analyses of the drug-related QIs in this research; the name and identification number of the 89 PCHs that were included in these analyses are provided in Appendix B.
- Drug-related QIs were assessed only for residents who were admitted to a PCH during the study period (Figure 4.2). In addition, PCH residents were excluded from these analyses if they resided in a hospital for more than 60 days in either of times 'A' or 'C' in Figure 4.2, or if that they died within 190 days of their PCH admission date. These individuals were excluded to prevent an under-reporting of drug dispensing during either measurement period.
- In each of periods 'A' or 'C' in Figure 4.2, an individual was counted as having been dispensed a medication if they received at least 30 equivalent full days use of the drug in two or more prescriptions. In a given 100-day period, a medication was not counted as having been dispensed if a person received less than 30 equivalent full days use of the drug, or if they received only one prescription for the drug during this time.

Figure 4.2: A Schematic of the Strategy Used to Report the Proportion of Participants Dispensed Drug-Related QIs, Prior to and Shortly After They Were Admitted to a PCH



Source: Manitoba Centre for Health Policy, 2006

4.4 Summarizing Strategies to Report QIs

To summarize, this report contains two types of QIs. QIs that are based on ambulatory care physician visits and/or hospital contacts (i.e., diagnostic QIs) have been reported as events, meaning that an individual could have been diagnosed with the same QI on more than one occasion. Events of these QIs have been expressed as a rate, after controlling for how long PCH residents were at risk of experiencing the event. Outcomes for these QIs are provided in Chapter 6 of the report, and comparisons are made between RHAs and individual PCHs.

Drug-related QIs have been calculated for individuals who were admitted to a PCH during the study period, focussing on the period of time prior to and shortly after the date that each person was admitted to a PCH. These QIs have been expressed as the proportion of PCH residents who were dispensed higher risk medications during each of these time periods. These outcomes are provided in Chapter 7 of the report, for RHAs and for individual PCHs.

4.5 A Note about Rates and Proportions

Outcomes for the diagnostic and drug-related QIs are often referred to generically in this report as rates. This is acceptable as proportions can be thought of as a type of rate (Last, 1995). However, it is important to keep in mind that diagnostic QIs are a 'true' rate (i.e., the count of events of diagnostic QIs are expressed per person-unit of time), while drug-related QIs are proportions (i.e., the number of residents dispensed medications divided by all possible residents).

4.6 A Note about Standardization

Diagnostic and drug-related QI rates are compared between RHAs and individual PCHs in Chapter 6 and Chapter 7 of this report. These outcomes have been adjusted (standardized) to reflect how frequently QIs would have been reported if all PCHs in Manitoba had the same age and sex distribution of residents, and also had the same proportion of residents assigned to each level of care. Inter-RHA and inter-PCH differences in QI rates are therefore independent of these resident characteristics.

Residents are assigned a level of care prior to being admitted to a PCH. During at least some of the five-year study period, changes in level of care were reported by Manitoba Health for residents after their PCH admission date.[7] Rates of diagnostic QIs were calculated for the entire time that residents resided in a PCH, and these outcomes were adjusted for the level of care assigned to residents at the time the diagnostic QI was reported. Conversely, the rates of drug-related QIs were calculated just after residents were admitted to a PCH; these outcomes were adjusted for the level of care assigned to residents at this time. Additional information about the processes used to standardize the rates of diagnostic and drug-related QIs is available from the first author of this report.

4.7 Testing for Significant Differences

Traditionally when making statistical comparisons between groups, a 5% test criterion statistic ($p<.05$) is used to determine if these differences are statistically significant.8 The caption '$p<.05$' means that a 5% level of error is permitted when making conclusions from these calculations, or that about 5% of the time, differences between groups are calculated to be statistically significant when in real life they are actually similar. This type of statistical error (i.e., concluding differences between groups are statistically significant when in reality they are not) is referred to using statistical terminology as a Type I error. Traditionally, this level of error is set at 5% for most statistical tests.

In many instances in this research, multiple statistical comparisons were conducted between different groups for the same outcome (i.e., in Chapter 6, the rates of diagnostic QIs for each RHA were compared separately to the Manitoba average), and multiple statistical tests were often conducted for

[7] Information about the levels of care assigned to residents at the time of admission to a PCH is provided in Chapter 5 of this report (see Figures 5.6 and 5.7). Information about changes in level of care reported after residents are admitted to a PCH is available in the text specific to these figures, and additional information is available from the first author of this report.

[8] Test criterion statistics are available in standard statistical tables to determine how big differences must be between groups, expressed in standard error units, in order say that they are statistically significant.

similar purposes on the same group of PCH residents (e.g., multivariate analyses in Chapter 8 were conducted on the same individuals for each QI). In these scenarios, a more stringent (larger) test criterion statistic is often used when determining if the differences between groups are statistically significant. While this sometimes makes it more difficult to find statistical differences between groups (i.e., an increase in Type II error using statistical terminology), this is an acceptable strategy when making multiple statistical comparisons, to help ensure that the differences reported between any two groups are not overstated (Hassard, 1991). To reflect the use of this strategy in the current research, statistical differences in this report are summarized using the caption 'p<.01'.

4.8 Limitations of the Research

Three potential limitations are reported with respect to using administrative data to conduct this research. Two of these limitations are specific to the diagnostic QIs, and one limitation is reported in relation to the drug-related QIs.

4.8.1 Limitations Specific to the Diagnostic QIs

QIs were included in this research if the event could be captured using the administrative data. Examples of QIs that are not recorded in these data include the prevalence of bed ridden residents, how frequently physical restraints and indwelling catheters were used, and residents' perspective on their quality of life. While these and other QIs would have helped to define further the quality of care provided in PCHs, these types of indicators cannot be assessed using administrative data.

Diagnostic QI events were counted using ICD-9-CM codes from the hospital abstract and/or the medical claims data. Medical claims data are generated by fee-for-service physicians, and by physicians who are funded alternatively but who continue to submit ICD-9-CM codes (i.e., 'shadow billing' claims). Rates of diagnostic QIs may therefore be biased if ICD-9-CM codes were submitted more or less regularly by physicians in select PCHs.

Based on conversations with decision-makers and healthcare providers, alternative funding structures exist in several PCHs in Manitoba, with no obvious trend in payment strategies for any one type of PCH. Also, analyses of the medical claims data during the five-year study period demonstrate that, on average, PCH residents in each RHA were visited by a physician about eight times per year. These counts of physician visits were totalled for each PCH, to measure physician 'contact bias' during multivariate analyses (Chapter 8). Results were generally not influenced by this variable, meaning that, on average, inter-PCH differences in QI rates were influenced minimally by differences in physician reporting strategies. Collectively, this infor-

mation demonstrates that use of the medical claims data does not appear to have introduced a significant amount of bias in this research. Exceptions may be noted for some PCHs, as outlined in Chapter 6 and Appendix C of this report.

4.8.2 Limitations Specific to the Drug-Related QIs

Changes in the proportion of residents who were dispensed QI-drugs are reported in this research, comparing the time prior to versus shortly after residents were admitted to a PCH (i.e., periods 'A' and 'C' in Figure 4.2). Drug data from hospital-based pharmacies are not available to Manitoba Health for analyses, and it is therefore challenging to accurately state how frequently residents were dispensed QI-drugs prior to being admitted to a PCH (period 'A' in Figure 4.2). This is because individuals often reside in a hospital while waiting to be placed in a PCH; as a general rule in Manitoba, hospitalization occurs less frequently once residents are admitted to a PCH.

In the current research, efforts were made to minimize this potential source of bias, for example, by confining these specific analyses to residents who resided in a hospital for less than 60 days during either of the times specified in Figure 4.2. However, even with this exclusion criterion, interim data still demonstrate that individuals in some RHAs were more likely to spend larger amounts of time in a hospital while waiting to be placed into a PCH. In the current research, it is therefore possible that in some instances, QI-drug dispensing is underestimated during the period before residents are admitted to a PCH. Consequently, changes in QI-drug dispensing patterns may be overestimated as residents were admitted to these PCHs. One of the recommendations made in this report is to gain access to the drug data from hospital-based pharmacies, so that in the future researchers can investigate more fully how drug dispensing patterns change as residents are admitted to a PCH.

CHAPTER 5: CHARACTERISTICS OF PCHS AND PCH RESIDENTS

One of the goals of this report is to describe how facility and resident characteristics influenced rates of QIs in PCHs. This chapter provides a descriptive analysis of these risk factors with comparisons between RHAs.

5.1 Important Points to Remember When Reviewing the Results in This Chapter

The following information helps to clarify how the results in this chapter should be interpreted:

- Some of the results in this chapter are provided descriptively with no statistical analyses. For example, the distribution of PCHs in Manitoba are reported as the percent of facilities located in each RHA. Data are reported using a similar format when discussing the distribution of PCH beds and the types of PCHs (e.g., proprietary and non-proprietary) between RHAs in Manitoba.
- Several characteristics of PCH residents are also reported in this chapter. These data are expressed, for example, as the proportion of PCH residents who are male (or female) in each RHA. Similar data are also provided to describe the age distribution of PCH residents in each RHA, as well the proportion of residents who were assigned different levels of care, who were diagnosed with two or more different categories of chronic health conditions, and who were diagnosed with dementia. Generalized linear modelling was conducted on these and other resident characteristics, to determine if the findings reported for each RHA were different statistically from the Manitoba average. Statistical differences between each RHA and the Manitoba average are summarized using the caption 'p<.01' (for more information on statistical testing, refer to Chapter 4, subsection 'Testing for Significant Differences').
- The demographic characteristics of PCH residents (e.g., age and sex distributions, the proportion of residents who were married, etc.) have been provided as 'crude' (not standardized) data. To facilitate comparisons between RHAs, indicators of resident frailty (i.e., level of care, and the diagnosis of dementia or comorbid chronic disease categories) have been adjusted (standardized) to control for differences in PCH resident age between RHAs, and also for differences in the proportion of PCH residents who were male (or female) in each RHA. Refer to Chapter 4 ('A Note about Standardization') for a more complete description of the process of standardization.
- Some of the resident-level outcomes in this chapter have been presented for individuals who were admitted to a PCH during the five-

year study period ('admitted residents') and also for the entire sample of PCH residents. The data provided for admitted individuals should be interpreted as the total proportion of admissions in five years (i.e., in five years, 50% of the total admissions to a PCH were made by people 85 years or older). The data provided for all PCH residents should be interpreted as an annualized average during the five-year study period (i.e., on average for each year of the study period, 55.2% of PCH residents were 85 years or older). These different strategies of summarizing data reflect that admitted persons are unique to a year, while residents often resided in a PCH for more than one year.

- Data for the figures in this chapter are available at the following MCHP website: http://www.umanitoba.ca/centres/mchp/reports.htm. These data include typically the crude and standardized outcomes, as well as actual counts of individuals. Data in the tables presented in this chapter are not provided at this website.

5.2 Highlights of the Results in This Chapter

Highlights of the results of this chapter are as follows:

- Research was conducted on 122 PCHs from April 1, 1999 to March 31, 2004; 23,048 residents resided in these facilities for at least one day during this time; 60.1% of these residents (n=14,002) were admitted to a PCH during this time while the remaining individuals (n=9,046) were admitted to a PCH prior to April 1, 1999.
- In the 2003/04 fiscal year, PCHs differed between RHAs by size and by facility type. Facilities in the Winnipeg and Brandon RHAs tended to be larger; all of these PCHs were free-standing facilities and close to 40% were proprietary (i.e., for profit). PCHs in most other RHAs were smaller, were usually non-proprietary (i.e., non-profit) facilities, and in some RHAs were often attached (juxtaposed) to a hospital.
- Different volumes of PCH staffing hours (nurses and aides) were reported for RHAs. PCHs in the Interlake, North Eastman and South Eastman RHAs reported providing the largest volume of staffing care to residents, while PCHs in the Central and Brandon RHAs reported providing smaller volumes of care. Within the WRHA, non-proprietary PCHs tended to provide larger volumes of staffing care as compared to proprietary PCHs. Collectively, these staffing differences were more pronounced for the volume of care provided by aides as opposed to volume of hours worked by nurses.
- The health and demographic characteristics of PCH residents are also described in this chapter. On average for each year of the study

period, 69.7% of PCH residents in Manitoba were assigned a level of care of 3 or 4 and 55.2% of all residents were 85 years or older. Also, 65.3% of PCH residents had been diagnosed with dementia and 70.0% of residents had been diagnosed with two or more different categories of chronic diseases. As compared to the Manitoba average, these resident characteristics differed for some RHAs, summarized as follows:

i) *RHAs with potentially less frail PCH residents*

- While PCH residents in the Assiniboine RHA tended to be older as compared to the Manitoba average, they were typically assigned a lower level of care, and were also less likely to have been diagnosed with dementia and also with two or more different categories of chronic diseases.
- PCH residents in the Brandon RHA tended to be younger as compared to the Manitoba average, and were also assigned typically a lower level of care. The 'turnover' of these residents was also typically slower, as characterized by lower annual admission rates and longer median lengths of stay.
- The 'turnover' of residents in WRHA non-proprietary PCHs was typically slower, as characterized by lower annual admission rates and longer median lengths of stay.

ii) *RHAs with potentially more frail PCH residents*

- While residents residing in proprietary PCHs in the WRHA tended to be younger as compared to the Manitoba average, they were assigned typically a higher level of care. These residents were also more likely to have been diagnosed with dementia and also with two or more different categories of chronic diseases. The 'turnover' of residents in these PCHs was reported to be faster during the five-year study period, as denoted by higher rates of admission and shorter median lengths of stay.
- PCH residents in the Central RHA were older and were assigned typically a higher level of care. However, these residents were less likely to have been diagnosed with two or more different categories of chronic diseases.
- PCH residents in the Interlake and North Eastman RHAs tended to be assigned a higher level of care. However, residents in both of these RHAs were less likely to have been diagnosed with two or more different categories of chronic diseases. Residents in the Interlake RHA were also less likely to have been diagnosed with dementia.

5.3 Detailed Results in This Chapter

5.3.1 General Characteristics of PCHs in Manitoba

Distribution of PCH Facilities and Beds

A summary of the distribution of PCHs in Manitoba is provided in Table 5.1. In the 2003/04 fiscal year, 38 PCHs (31.1% of all PCHs included in the research) were located in the WRHA while the remainder (84, or 68.9% of the total number of facilities) were located in other RHAs. Of the 'non-Winnipeg' RHAs, Assiniboine had the most PCHs (n=27), while five or fewer PCHs were located in each of the Nor-Man, Brandon and North Eastman RHAs.

Table 5.1: Number and percent of PCH facilities and PCH beds, in Manitoba and by RHA, 2003/04

RHA	Number (%) of PCHs	Number (%) of PCH Beds
Assiniboine	27 (22.1)	909 (9.5)
Brandon	5 (4.1)	597 (6.2)
Central	15 (12.3)	831 (8.7)
Interlake	11 (9)	552 (5.8)
Nor-Man	3 (2.5)	126 (1.3)
North Eastman	5 (4.1)	190 (2)
Parkland	11 (9)	544 (5.7)
South Eastman	7 (5.7)	334 (3.5)
Non-Winnipeg	84 (68.9)	4,083 (42.6)
Winnipeg	38 (31.1)	5,503 (57.4)
Manitoba	122 (100)	9,586 (100)

Source: Manitoba Centre for Health Policy, 2006

The distribution of PCH beds in Manitoba is quite different than that of PCH facilities (Table 5.1). For example, while 31.1% of PCHs were located in the WRHA during the 2003/04 fiscal year, these institutions comprised 57.4% of the total PCH beds in the province. This means that PCHs situated in the WRHA tended to be larger (i.e., contained more beds) as compared to PCHs in other RHAs. Conversely (for example), while 22.1% of PCHs were located in the Assiniboine RHA, these facilities comprised only 9.5% of the total PCH beds in the province and therefore tended to be smaller. A similar statement can be made for all other 'non-Winnipeg' RHAs except Brandon; 4.1% of the PCHs included in this research were located in the Brandon RHA while these facilities comprised 6.2% of the total number of PCH beds in the province.

Additional information about PCH facility size is provided in Table 5.2, summarized as follows:

- In the 2003/04 fiscal year, PCHs in Manitoba contained on average 78.6 beds, while PCHs in the Brandon RHA and WRHA contained on average 119.4 beds and 144.8 beds respectively. Further, 97.4% of the PCHs in the WRHA contained more than 60 beds, while four of the five PCHs in Brandon contained at least 60 beds.
- PCHs in non-Winnipeg RHAs contained on average 48.6 beds. PCHs in the Assiniboine and North Eastman RHAs tended to be smallest; 16 of the 27 PCHs in the Assiniboine RHA contained fewer than 31 beds, and three of the five PCHs in the North Eastman RHA contained fewer than 31 beds.

Table 5.2: Average number of beds per PCH, and counts of PCHs by bed size category, for Manitoba and by RHA, 2003/04

RHA	Average # of beds/PCH	Number (%) of PCHs with different categories of bed sizes			Total # of PCHs
		0-30	31-60	60+	
Assiniboine	33.6	16 (59.3)	10 (37)	1 (3.7)	27
Brandon	119.4	0 (0)	1 (20)	4 (80)	5
Central	55.4	6 (40)	4 (26.7)	5 (33.3)	15
Interlake	44.8	5 (45.5)	2 (18.2)	4 (36.4)	11
Nor-Man	42	1 (33.3)	2 (66.7)	0 (0)	3
North Eastman	38	3 (60)	1 (20)	1 (20)	5
Parkland	49.5	4 (36.4)	3 (27.3)	4 (36.4)	11
South Eastman	47.7	1 (14.3)	5 (71.4)	1 (14.3)	7
Non-Winnipeg	48.6	36 (42.9)	28 (33.3)	20 (23.8)	84
Winnipeg	144.8	0 (0)	1 (2.6)	37 (97.4)	38
Manitoba	78.6	36 (29.5)	29 (23.8)	57 (46.7)	122 (100)

Source: Manitoba Centre for Health Policy, 2006

PCH Facility Types

PCHs in Manitoba are defined as proprietary (for profit) and non-proprietary (not-for-profit) and these latter facilities are defined further as free-standing or juxtaposed to another healthcare facility. Differences in PCH type are reported between RHAs (Table 5.3), and the following trends are noted:

- The majority of PCHs in five of the nine RHAs included in the research (Brandon, Central, North Eastman, South Eastman and WRHA), were free-standing non-proprietary facilities.

- The WRHA and Brandon RHA had no PCHs juxtaposed to another healthcare facility. All other RHAs had at least one juxtaposed PCH and this type of facility was located most frequently in the Assiniboine (18 of 27 PCHs in this RHA were juxtaposed to another healthcare facility), Nor-Man (two of three PCHs in this RHA were juxtaposed to another healthcare facility) and Parkland RHAs (six of 11 PCHs were juxtaposed to another healthcare facility).
- 36.8% of PCHs in the WRHA and 40.0% of PCHs in the Brandon RHA were for profit, whereas all other RHAs had a smaller proportion of proprietary PCHs (Interlake and South Eastman), or had no proprietary PCHs (all other RHAs).

Table 5.3: Number and percent of PCHs by facility type, for Manitoba and by RHA, 2003/04

RHA	Number (%) of Non-Proprietary PCHs			Number (%) of	Total #
	Free-Standing	Juxtaposed	Total	Proprietary PCHs	of PCHs
Assiniboine	9 (33.3)	18 (66.7)	27 (100)	0 (0)	27
Brandon	3 (60)	0 (0)	3 (60)	2 (40)	5
Central	9 (60)	6 (40)	15 (100)	0 (0)	15
Interlake	5 (45.5)	4 (36.4)	9 (81.8)	2 (18.2)	11
Nor-Man	1 (33.3)	2 (66.7)	3 (100)	0 (0)	3
North Eastman	3 (60)	2 (40)	5 (100)	0 (0)	5
Parkland	5 (45.5)	6 (54.5)	11 (100)	0 (0)	11
South Eastman	4 (57.1)	2 (28.6)	6 (85.7)	1 (14.3)	7
Non-Winnipeg	40 (47.6)	39 (46.4)	79 (94)	5 (6)	84
Winnipeg	24 (63.2)	0 (0)	24 (63.2)	14 (36.8)	38
Manitoba	64 (52.5)	39 (32)	103 (84.4)	19 (15.6)	122 (100)

Source: Manitoba Centre for Health Policy, 2006

PCH Facility Staffing

PCH staffing data were obtained from MIS and in the case of proprietary PCHs from the Division of Long Term Care of the WRHA.[9] For select PCHs, staffing hours recorded in MIS were compared to staffing hours provided via survey format by members *The Need To Know* Team (Martens and Roos N, 2005).[10] Staffing hours from these two sources were similar for nurses (combined hours for Registered Nurses, Licensed Practical Nurses and Registered Psychiatric Nurses) and aides, and were less similar for other

[9] From the combined resources of MIS and the WRHA, staffing data were available on all but 26 of the 122 PCHs included in the research. PCHs without staffing data are (RHA followed by the PCH ID in brackets): Assiniboine (554, 601, 648, 664); Brandon (529, 557, 625); Central (600, 654, 659, 661, 689); Interlake (583, 604); Nor-Man (622); North Eastman (566, 598); Parkland (552); South Eastman (609, 576), and; Winnipeg (573, 587, 581, 595, 615, 699).

[10] Members of *The Need to Know* Team completed a survey about the current and past staffing hours for PCHs in select RHAs. These survey data were compared to staffing data provided from the MIS data.

types of staff such as Occupational Therapists, Recreational Staff and Spiritual Care Providers. For several PCHs, the hours of care provided by these latter staff seem to have been reported jointly in the administrative data (i.e., using the category of 'other staff'), although not necessarily consistently between years. In addition, the nursing hours provided for administrative and direct care duties seem to have been combined often in the MIS data. Staffing hours in this report are therefore discussed using the terminology 'hours worked'[11] for nursing staff, and the terminology 'hours of care provided' for PCH aides.

In the 2003/04 fiscal year, nurses and aides in Manitoba combined to work an average of 3.3 hours per PCH resident-day (Figure 5.1).[12] More staffing hours were reported in each of the North Eastman (4.0 hours per resident-day), Interlake (3.6 hours per resident-day), South Eastman (3.5 hours per resident-day), Nor-Man (3.4 hours per resident-day) and Assiniboine RHAs (3.4 hours per resident-day), and also for non-proprietary PCHs in the WRHA (3.4 hours per resident-day). Conversely, PCHs in the Brandon RHA and proprietary PCHs in the WRHA provided the fewest total staffing hours per resident-day (3.1 hours). Fewer total staffing hours were also reported in each of the Central and Parkland RHAs.[13]

In the 2003/04 fiscal year, aides provided more care daily to PCH residents (2.3 hours of care per resident-day) as compared to nurses (1.0 hours of work per resident-day) (Figure 5.1). Additional information for the volume of care provided by these types of staff is summarized as follows:

- The greater volume of total staffing care reported in the North Eastman and Interlake RHAs is evident for both nursing staff and aides. Conversely, the greater volume of total care reported in the Assiniboine RHA is evident for nurses, while that in the South Eastman RHA and for non-proprietary PCHs in the WRHA is evident for aides.

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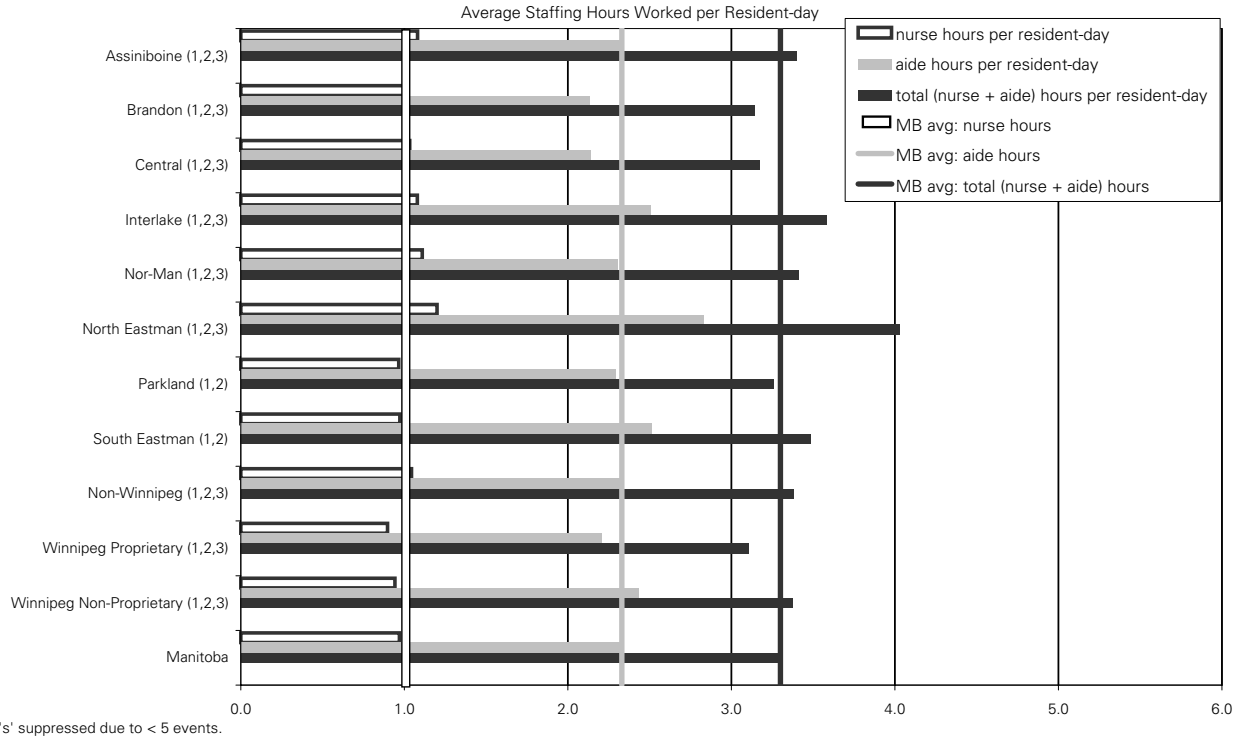
[11] These hours include sick, vacation, and statutory holiday benefit hours paid to nursing staff.

[12] This outcome was created by dividing the total number of staffing hours for the year by the total number of days that individuals resided in a PCH in this year (e.g., 'time at risk' as defined in Figure 4.1 of Chapter 4).

[13] The vast majority of results in Figure 5.1 were statistically different from the Manitoba average ($p<.01$), as the denominator of person-days was very large for all RHAs. In addition, small differences between RHAs reflect larger annual differences in care provision. For example, an annual difference of 0.1 hours of care per resident-day between two 40-bed PCHs (assuming the PCH beds are full all year) translates into approximately (0.1 hours x 40 beds x 365 days) 1,460 additional hours of care for one of the PCHs, or approximately (40 hours/week, 52 weeks) 0.7 additional full-time staff for the year.

- The lower volume of total care in the Brandon and Central RHAs is evident for aides, while that for proprietary PCHs in the WRHA is evident for both nurses and aides.

Figure 5.1: Average Staffing Hours Worked per Resident-Day, for Manitoba and by RHA, 2003/04



's' suppressed due to < 5 events.
'1' indicates that the total hours worked per resident-day was statistically different than the Manitoba average.
'2' indicates that the hours worked by aides per resident-day was statistically different than the Manitoba average.
'3' indicates that the hours worked by nurses was statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

5.3.2 PCH Utilization and Resident Characteristics

Counts of Residents, Admissions and Separations

Counts of PCH residents included in this research are provided in Table 5.4 for each year of the study period. In total, 23,048 PCH residents were counted during the five-year study period, with annual counts ranging from

11,415 PCH residents in 1999 to 12,334 residents in 2003.[14] On average in each year, 23.3% of PCH residents were newly admitted to a PCH while 21.3% of PCH residents died annually.[15]

Table 5.4: Count of PCH residents and the number of residents who were admitted to a PCH or died, annual and total five-year values

	1999	2000	2001	2002	2003	Total Count
Residents	11,415	12,037	12,128	12,261	12,334	60,175*
Admissions	2,571 (22.5%)	2,896 (24.1%)	2,790 (23.0%)	2,868 (23.4%)	2,877 (23.3%)	14,002 (23.3%)
Deaths	2,287 (20.0%)	2,538 (21.1%)	2,615 (21.6%)	2,668 (21.8%)	2,728 (22.1%)	12,836 (21.3%)

* Represents 23,048 unique PCH residents.

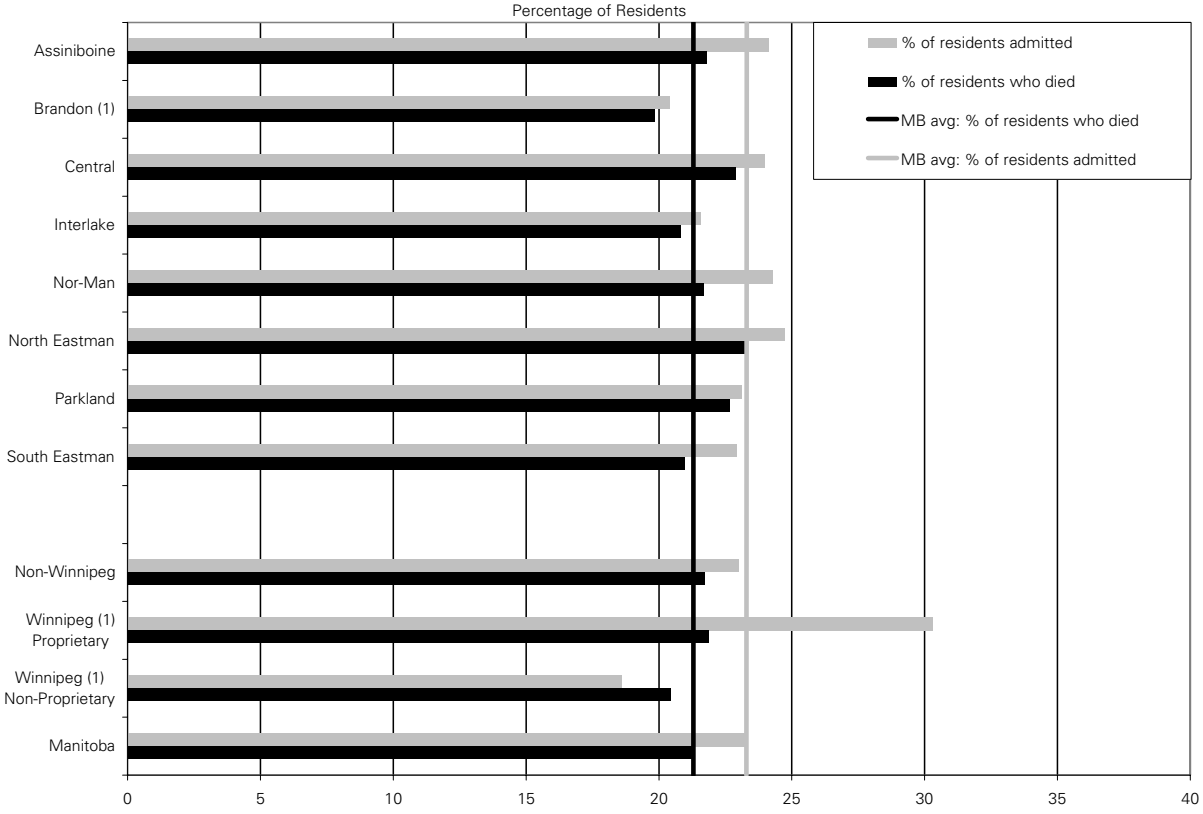
Source: Manitoba Centre for Health Policy, 2006

Annual admission and death rates were similar for most RHAs (Figure 5.2). As exceptions, fewer residents were admitted to PCHs in the Brandon RHA (20.4% of residents) and to non-proprietary PCHs in the WRHA (18.6% of residents) ($p<.01$). These data can be interpreted to mean that, on average, the 'turnover' of residents in these PCHs was slower. This statement is supported by median lengths of stay that were statistically greater for these PCH residents (data not shown) ($p<.01$). Conversely, the 'turnover' of residents was statistically faster in proprietary PCHs in the WRHA, as evidenced by greater annual admission rates during the five-year study period (Figure 5.2) ($p<.01$) and also by shorter median lengths of stay for these residents (data not shown) ($p<.01$).

[14] The number of PCH residents in Manitoba increased in each year of the study period (Table 5.4). Certain PCHs opened or expanded during this time. This trend may in part also be due to the turnover of PCH residents becoming increasingly faster (i.e., if residents reside in a PCH for a shorter period of time, more residents will have been housed in this PCH in a given year).

[15] In each year, the percent of residents admitted to a PCH exceeded the percent of residents who died. PCH residents who were transferred to a hospital and died after a two-week period were not counted as having died in a PCH.

Figure 5.2: Percent of Residents Who Were Admitted to a PCH and Also Who Died, for Manitoba and by RHA, 1999/2000 – 2003/04



's' suppressed due to ≤ 5 events.
'1' percent of residents admitted was statistically different than the Manitoba average.
'2' percent of residents who died was statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

PCH Resident Demographics

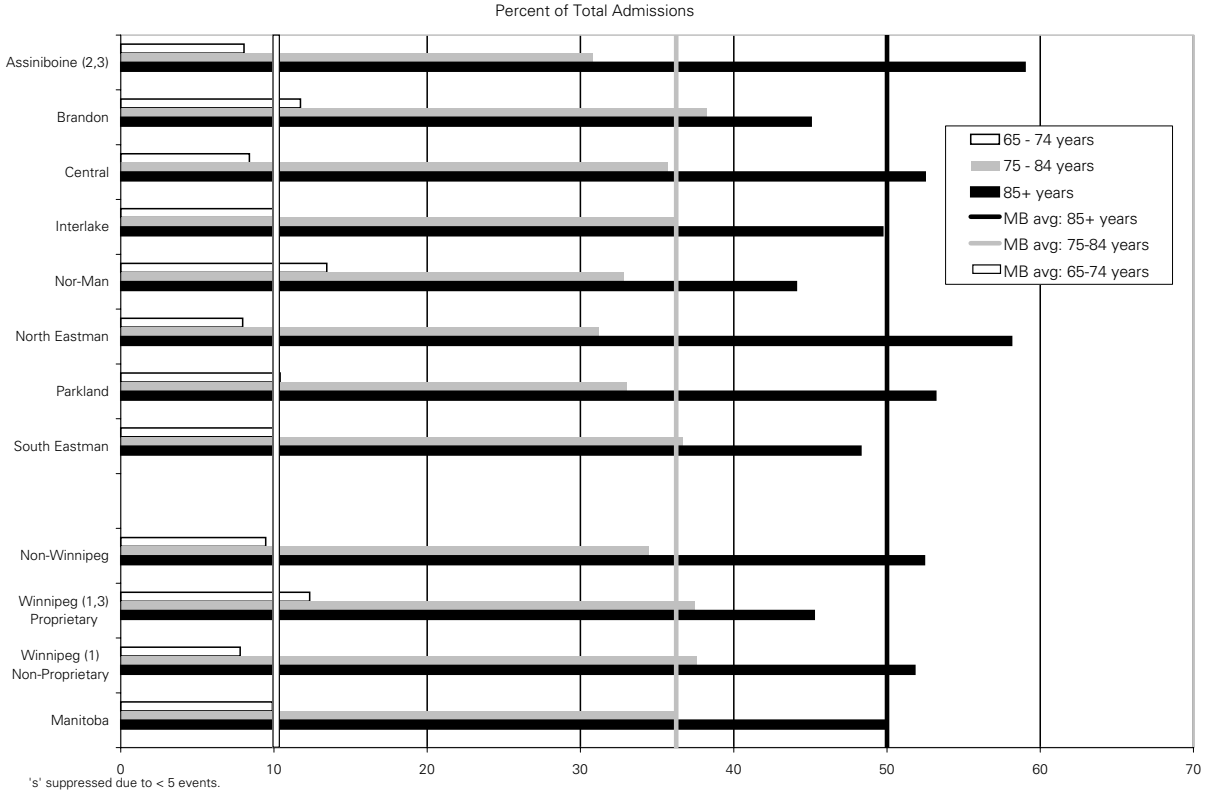
Age Distributions

PCH resident age distributions have been reported for individuals who were admitted to a PCH during the five-year study period (n=14,002), and also for the entire sample of residents (n=23,048). In the Province of Manitoba, people 85 years or older comprised 50% of all PCH admissions between April 1, 1999 and March 31, 2004 (Figure 5.3); 36.2% of all PCH admissions were attributed to people 75-84 years old, while 9.9% of admissions were made by people 65-74 years old and 3.9% of admissions were made by people 0-64 years old.16 Age-specific admissions were similar for all RHAs during the study period, with the following exceptions:

16 Data for admitted persons 0-64 years old are not provided in Figures 5.3 to 5.5. References to this age group are provided in text where significant differences were found. Data for residents 0-64 years old are provided at the following MCHP website: http://www.umanitoba.ca/centres/mchp/reports.htm.

- Residents admitted to PCHs tended to be older in the Assiniboine RHA. Individuals 85+ years old comprised a greater proportion of the total PCH admissions in this RHA, while a smaller proportion of admitted residents were 75-84 years old and 0-64 years old in this RHA (p<.01). Somewhat similar findings were reported for residents who were admitted to non-proprietary PCHs in the WRHA. In comparison to the Manitoba average, a smaller proportion of these residents were 0-64 and 65-74 years old (p<.01).
- Residents admitted to PCHs tended to be younger in proprietary PCHs in the WRHA. In comparison to the Manitoba average, individuals 0-64 and 65-74 years old comprised a greater proportion of admitted residents in these PCHs, while individuals 85 years and older comprised a smaller proportion of admitted residents (p<.01). Also, individuals 0-64 years old also comprised a greater proportion of the total PCH admissions in the Nor-Man RHA (p<.01, data not shown in Figure 5.3).

Figure 5.3: Percent of PCH Admissions by Age Category, for Manitoba and by RHA, 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' indicates that the percent of total PCH admissions for the people 65-74 years was statistically different than the Manitoba average.
'2' indicates that the percent of total PCH admissions for the people 75-84 years was statistically different than the Manitoba average.
'3' indicates that the percent of total PCH admissions for the people 85+ years years was statistically different than the Manitoba average.

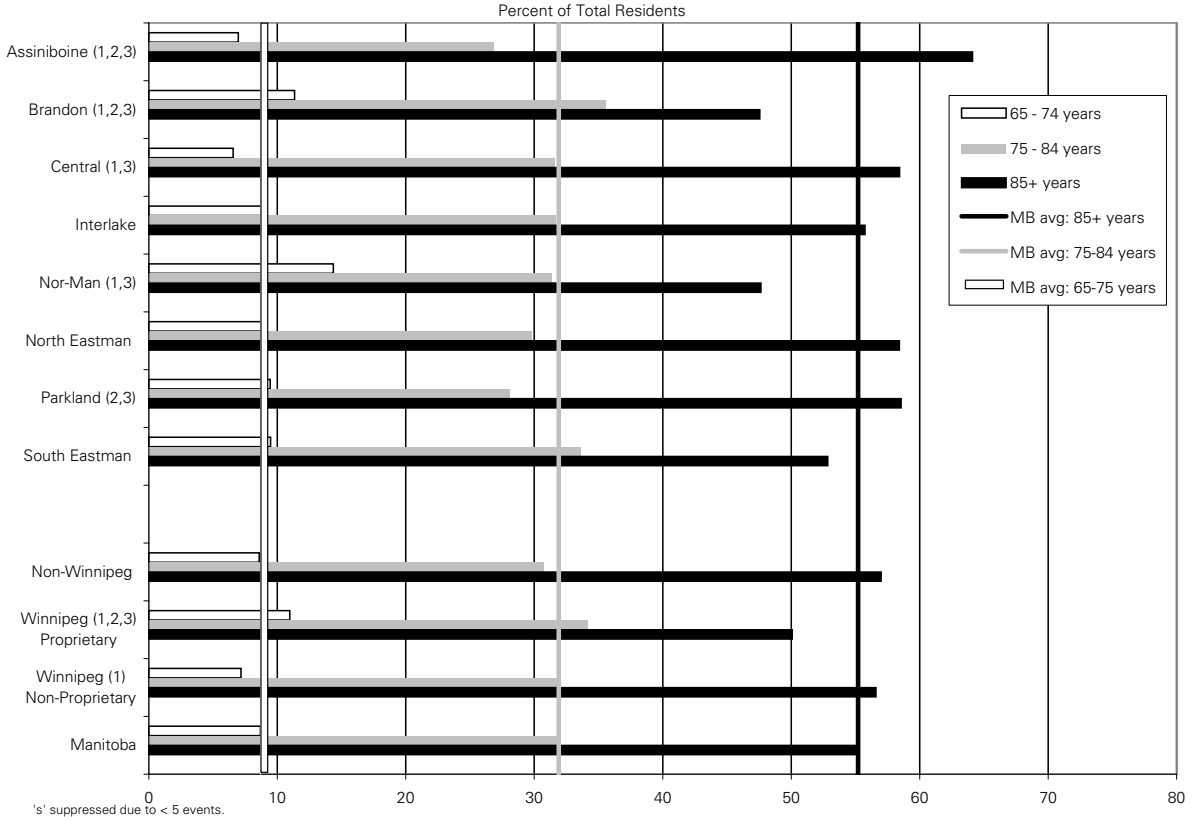
Source: Manitoba Centre for Health Policy, 2006

Similar findings were reported for the age distribution of all PCH residents (i.e., not just new admissions) in Manitoba (Figure 5.4). On average for each year of the study period, people 85 years or older comprised 55.2% of PCH residents in Manitoba while individuals 75-84 years made up 31.9%

of these residents; 8.7% of PCH residents were 65-74 years old and 4.2% of these residents were 0-64 years old. This age distribution of PCH residents was similar in most RHAs with the following exceptions:

- PCH residents tended to be older in the Assiniboine, Central and Parkland RHAs. Individuals 85 years or older comprised a larger proportion of PCH residents in each of these RHAs ($p<.01$). Individuals 0-84 years old comprised a smaller proportion of PCH residents in some but not all of these RHAs. While a smaller proportion of residents were 65-74 years old in non-proprietary PCHs in the WRHA ($p<.01$), no significant differences were reported for any other age categories in these PCHs.
- Residents of proprietary PCHs in the WRHA tended to be younger as did PCH residents in the Brandon RHA. In each of these RHAs, individuals 0-84 years old comprised a greater proportion of PCH residents while fewer residents were 85 years or older ($p<.01$). Similarly, a greater proportion of PCH residents in the Nor-Man RHA were 0-64 and 65-74 years old and fewer of these residents were 85 years or older.

Figure 5.4: Percent of PCH Residents by Age Category, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' indicates that the percent of total PCH residents 65-74 years old was statistically different than the Manitoba average.
'2' indicates that the percent of total PCH residents 75-84 years old was statistically different than the Manitoba average.
'3' indicates that the percent of total PCH residents 85+ years old was statistically different than the Manitoba average.

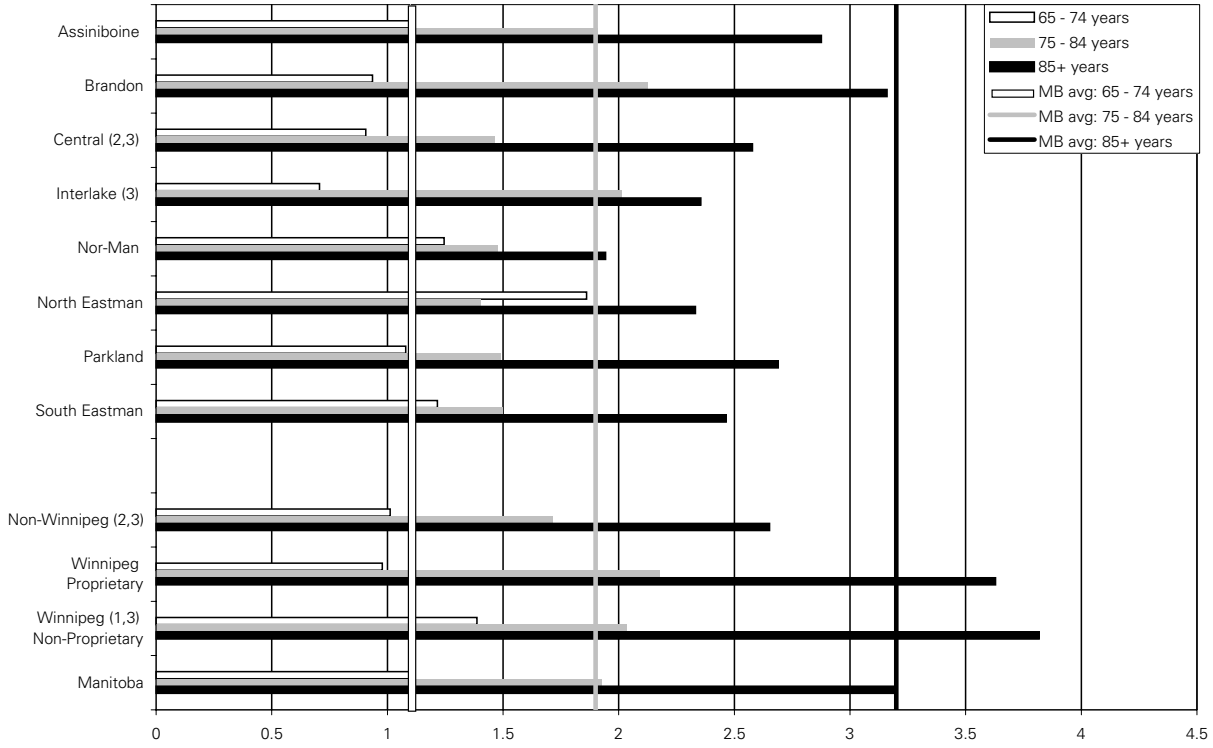
Source: Manitoba Centre for Health Policy, 2006

Female : Male Ratios

The ratio of female to male PCH residents (x females : 1 male) is provided in Figure 5.5 (n=23,048). In the Province of Manitoba, approximately half of the residents 0-64 and 65-74 years old were male (or female). However, residents 75-84 years old were almost twice as likely to be female, and residents 85 years or older were over three times as likely to be female. This age-specific distribution of male and female PCH residents was demonstrated in most but not all RHAs. A smaller proportion of females to males were reported in select age categories for the Central and Interlake RHAs (p<.01). Conversely, residents 65-74 years and 85+ years old in non-proprietary PCHs in the WRHA were more likely to be female. While not shown in Figure 5.5, PCH residents 0-64 years were more likely to be female in the Assiniboine RHA (2.3 females : 1 male), and were less likely to be female in the Nor-Man RHA (0.3 females : 1 male) (p<.01).

Figure 5.5: Female to Male Ratio of PCH Residents, by Age Category, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04

(x female : 1 male)



's' suppressed due to < 5 events.
'1' indicates that the male to female ratio of PCH residents 65 - 74 years old was statistically different than the Manitoba average.
'2' indicates that the male to female ratio of PCH residents 75 - 84 years old was statistically different than the Manitoba average.
'3' indicates that the male to female ratio of PCH residents 85+ years was statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

Indicators of PCH Resident Health

Levels of Care Assigned to Admitted and All PCH Residents

The proportion of residents who were admitted to a PCH (n=14,002) at different levels of care is summarized in Figure 5.6. To facilitate comparisons between RHAs, data in this figure have been standardized to control for differences in PCH resident age, and also for differences in the proportion of PCH residents who were male (or female).

During the five-year study period, 46.0% of Manitobans were assigned a level of care of 1 or 2 at the time they were admitted to a PCH, and were therefore less frail.[17] In comparison, 42.3% of admitted residents were assigned a level of care of 3 and 11.7% of these individuals were assigned a level of care of 4. Similar trends were reported for some but not all RHAs. Exceptions are noted as follows:

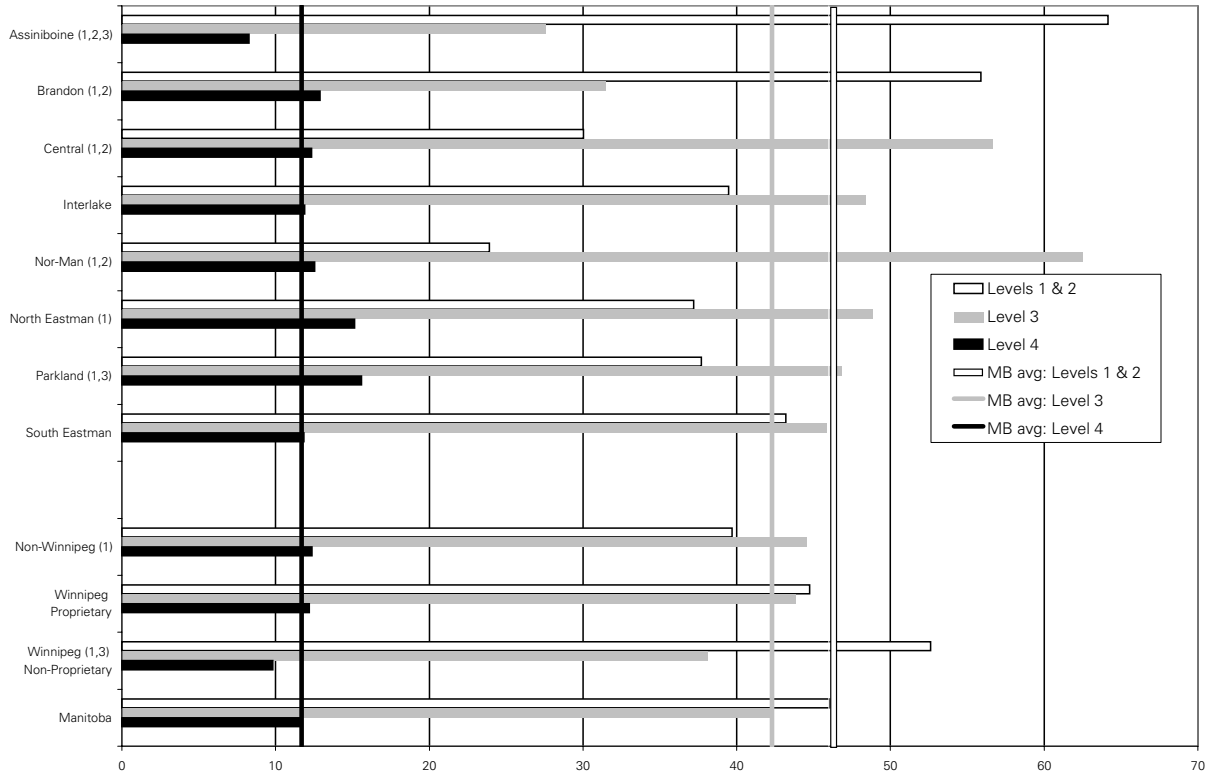
- Residents in the Central, Nor-Man, and Parkland RHAs were reported as being more frail at the time they were admitted to a PCH. Residents admitted to PCHs in these RHAs were more likely to have been assigned a level of care of 3 or 4, and were less likely to have been assigned a level of care of 1 or 2. Residents in the North Eastman RHA were also less likely to have been assigned a level of care of 1 or 2 at the time they were admitted to a PCH.
- Residents admitted to PCHs in the Assiniboine and Brandon RHAs were more likely to have been assigned a level of care of 1 or 2 and were therefore less frail. In addition, fewer of these admitted residents were assigned a level of care of 3 (both RHAs) and 4 (Assiniboine RHA) ($p<.01$).[18] Similar findings were reported for residents who were admitted to non-proprietary PCHs in the WRHA. As compared to the Manitoba average, a greater proportion of these individuals were assigned a level of care of 1 or 2 when they were admitted to a PCH, and fewer of these individuals were assigned a level of care of 4 at this time ($p<.01$).

[17] Data for these two levels of care have been combined in this research. During the five-year study period, 50 individuals were assigned a level of care of 1 at the time of admission to a PCH. This represents 0.4% of all admissions to a PCH during this time.

[18] Results for the Assiniboine RHA may be attributed somewhat to PCH ID 696 (a 42-bed facility) and PCH ID 681 (a 50-bed facility). These facilities are intended to provide care specifically to residents who are assigned a level of care of 1 or 2.

Figure 5.6: Percent of Admitted PCH Residents by Level of Care, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04

Percent of Admitted Residents (adjusted for resident age and sex



's' suppressed due to < 5 events.
'1' indicates that the percent of admitted residents assigned a level of care of 1 or 2 was statistically different than the Manitoba average.
'2' indicates that the percent of admitted residents assigned a level of care of 3 was statistically different than the Manitoba average.
'3' indicates that the percent of admitted residents assigned a level of care of 4 was statistically different than the Manitoba average

Source: Manitoba Centre for Health Policy, 2006

Levels of care are also reported for all PCH residents (n=23,048) (Figure 5.7). On average in each year of the study period, 30.3% of residents were assigned a level of care of 1 or 2, while 39.6% of residents were assigned a level of care of 3 and 30.1% of residents were assigned a level of care of 4. Differences in these findings between admitted persons (n=14,002) and PCH residents (n=23,048) are due mainly to changes in the level of care after residents were admitted to a PCH.[19]

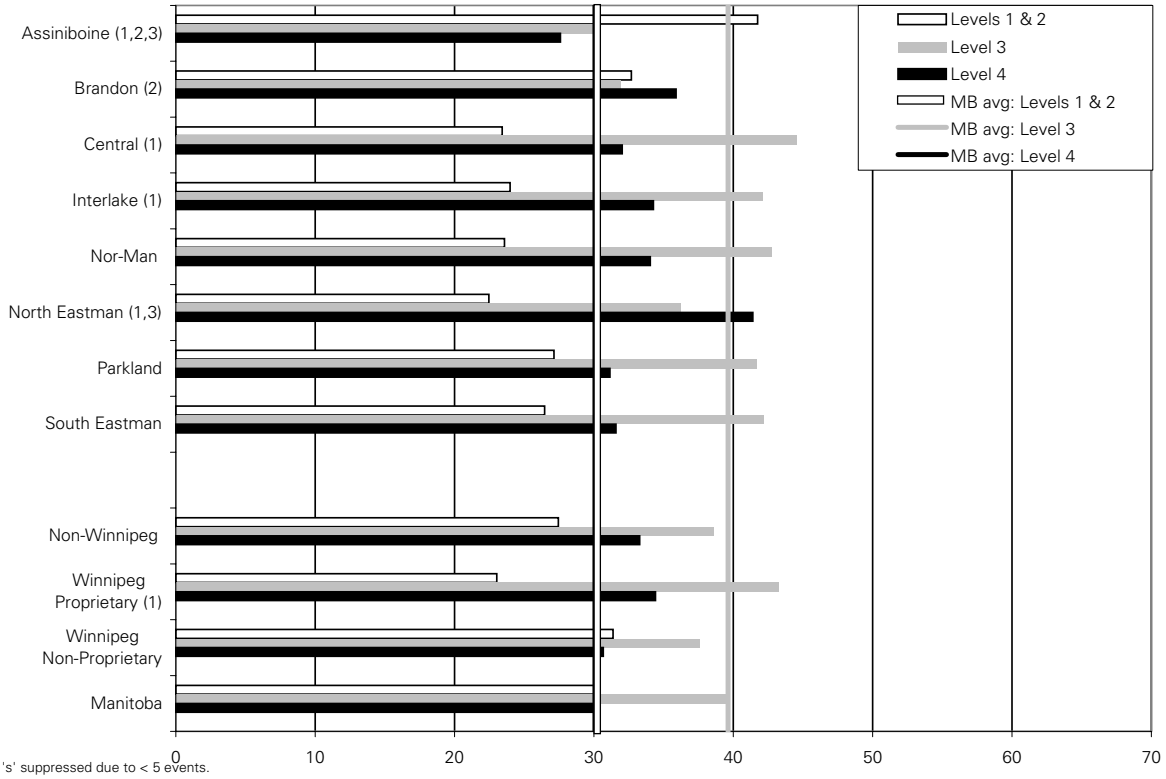
[19] Based on correspondence with Manitoba Health staff, changes in level of care were recorded after residents were admitted to a PCH until March 31, 2001. Analyses of level of care data confirm this trend, with the exception that proprietary PCHs in the WRHA and at least some PCHs in the Brandon RHA continued to provide these changes in level of care until March 31, 2002. The data provided in Figure 5.7 may therefore underestimate the level of care assigned to PCH residents in the five-year study period. Additional information about changes in level of care after residents are admitted to a PCH are available from the first author of this report.

The levels of care assigned to PCH residents were similar for most RHAs. Exceptions are summarized as follows:

- In each of the Central, Interlake and North Eastman RHAs as well as in proprietary PCHs in the WRHA, significantly fewer PCH residents were assigned a level of care of 1 or 2 ($p<.01$). In addition, significantly more residents in the North Eastman RHA were assigned a level of care of 4 ($p<.01$). PCH residents in these RHAs were therefore considered to be more frail.
- PCH residents in the Assiniboine and Brandon RHAs tended to be less frail. In comparison to the Manitoba average, fewer PCH residents in the Assiniboine RHA were assigned a level of care of 3 or 4, while more residents were assigned levels of care of 1 and 2 ($p<.01$). Fewer PCH residents in the Brandon RHA were assigned a level of care of 3 ($p<.01$).

Figure 5.7: Percent of Total PCH Residents by Level of Care, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04

Percent of All Residents (adjusted for resident age and sex)



's' suppressed due to < 5 events.
'1' indicates that the percent of PCH residents assigned a level of care of 1 or 2 was statistically different than the Manitoba average.
'2' indicates that the percent of PCH residents assigned a level of care of 3 was statistically different than the Manitoba average.
'3' indicates that the percent of PCH residents assigned a level of care of 4 was statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

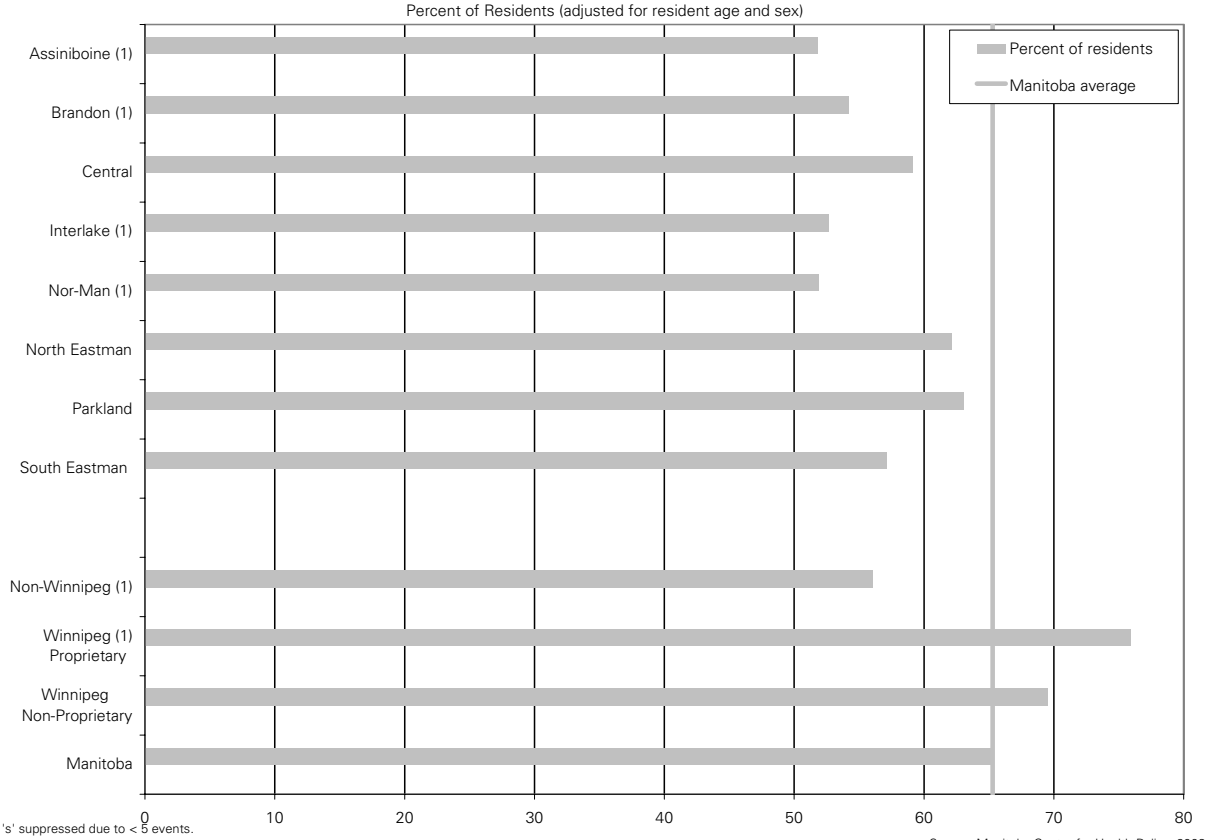
Residents Diagnosed with Dementia and with Multiple Categories of Chronic Diseases

Medical claims and hospital abstract data were reviewed to determine the proportion of residents who had been diagnosed with dementia. These data were reviewed five years prior to admitted residents' PCH admission date, and five years prior to April 1, 1999 for all other residents.

The majority (65.3%) of PCH residents had been diagnosed with dementia (Figure 5.8).20 After adjusting for differences in resident age and sex, similar findings were reported for most RHAs with the following exceptions:

- Residents who resided in proprietary PCHs in the WRHA were more likely to have been diagnosed with dementia (75.9% of residents) (p<.01).
- Significantly fewer residents had been diagnosed with dementia in each of the Assiniboine (51.8% of residents), Brandon (54.1% of residents), Interlake (52.6% of residents) and Nor-Man RHAs (51.9% residents) (p<.01).

Figure 5.8: Percent of Residents Diagnosed with Dementia, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' indicates that the percent of residents diagnosed previously with dementia was statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

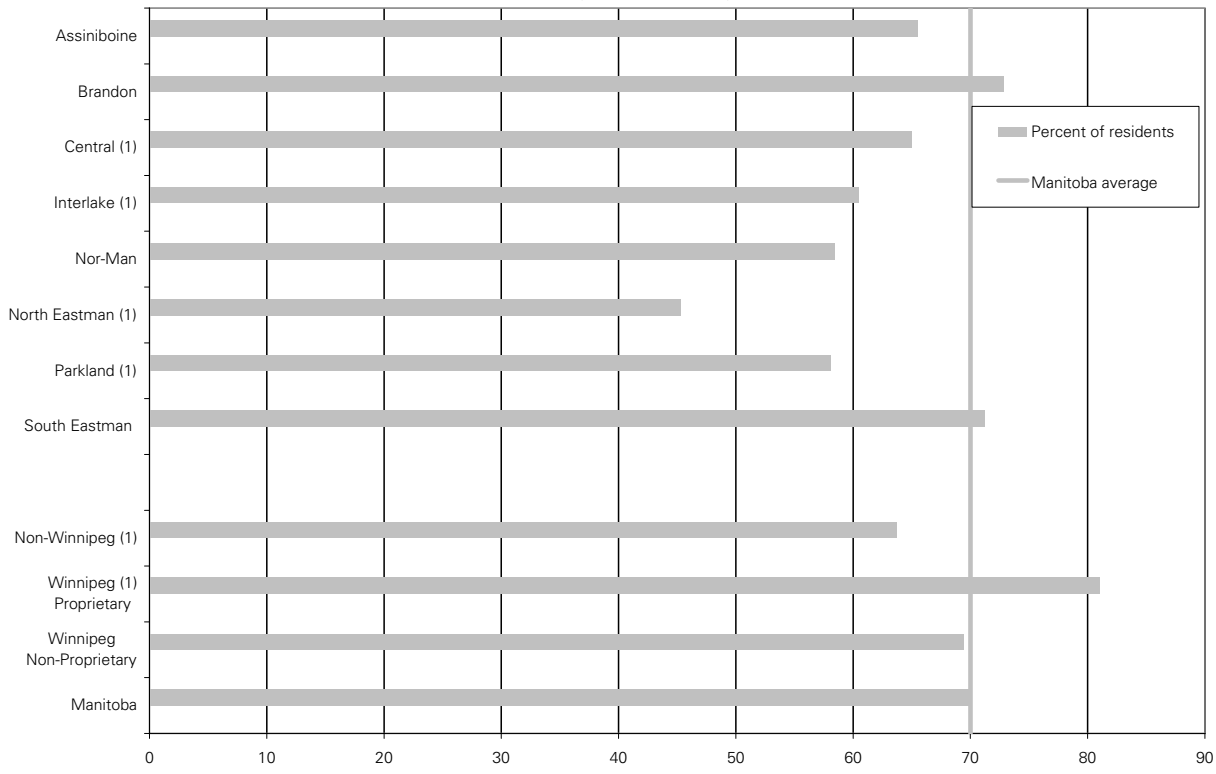
20 Caution should be used when comparing this result to data provided in other MCHP reports (e.g., Martens et al., 2004). These latter data focus on individuals 75 years and older residing in PCHs, and exclude people who were diagnosed with dementia but no other mental illnesses.

Similar results are provided for residents who had been diagnosed with two or more different categories of chronic diseases (Figure 5.9). These diseases were defined using Ambulatory Diagnostic Groups (ADGs) and categories of these chronic diseases are provided in the Glossary of this report. Data for chronic diseases were reviewed one year prior to residents' PCH admission date for individuals admitted to a PCH during the study period, and one year prior to April 1, 1999 for all other residents.

During the five-year study period, 70.0% of PCH residents had been diagnosed with two or more different categories of chronic diseases. After adjusting for differences in resident age and sex, similar findings were reported for most RHAs. Exceptions are noted as follows:

- A higher proportion (81.0%) of residents who resided in proprietary PCHs in the WRHA had been diagnosed with two or more different categories of chronic diseases (p<.01).
- A smaller proportion of PCH residents had been diagnosed with two or more different categories of chronic diseases in each of the Central (65.0% of residents), Interlake (60.5%), North Eastman (45.3%), and Parkland RHAs (58.1%) (p<.01).

Figure 5.9: Percent of Residents Diagnosed with Two or More Categories of Chronic Diseases, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' indicates that the percent of residents diagnosed previously with two or more chronic diseases was statistically different than the Manitoba average.

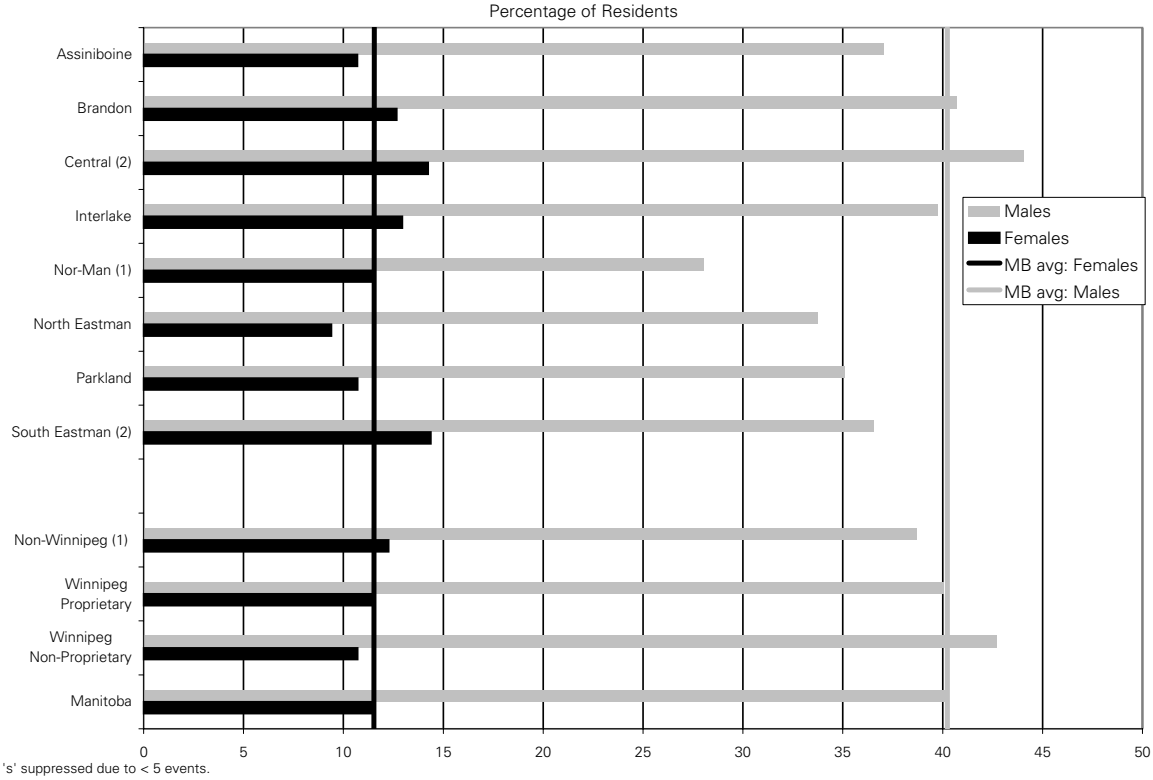
Source: Manitoba Centre for Health Policy, 2006

Additional Characteristics of PCH Residents

Marital status was assessed as an indicator of potential informal support. This outcome does not consider if spouses were able to provide this type of support. On average for each year of the study period, approximately 26% of male and female PCH residents 0-74 years old in Manitoba were married (data not shown in Figure 5.10). Conversely, 40.2% of male and 11.5% of female residents 75+ years old were married. Similar findings were reported in most RHAs, with the following exceptions:

- Compared to the Manitoba average, males 75+ years old in the Nor-Man RHA were less likely to be married (28.1% of individuals) ($p<.01$).
- Females 75+ years old were more likely to be married in the Central (14.2% of these individuals) and South Eastman RHAs (14.4% of these individuals) ($p<.01$).

Figure 5.10: Percent of Residents 75+ Who Were Married, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' indicates that the percent of male residents 75 years and older who were married was statistically different than the Manitoba average.
'2' indicates that the percent of female residents 75 years and older who were married was statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

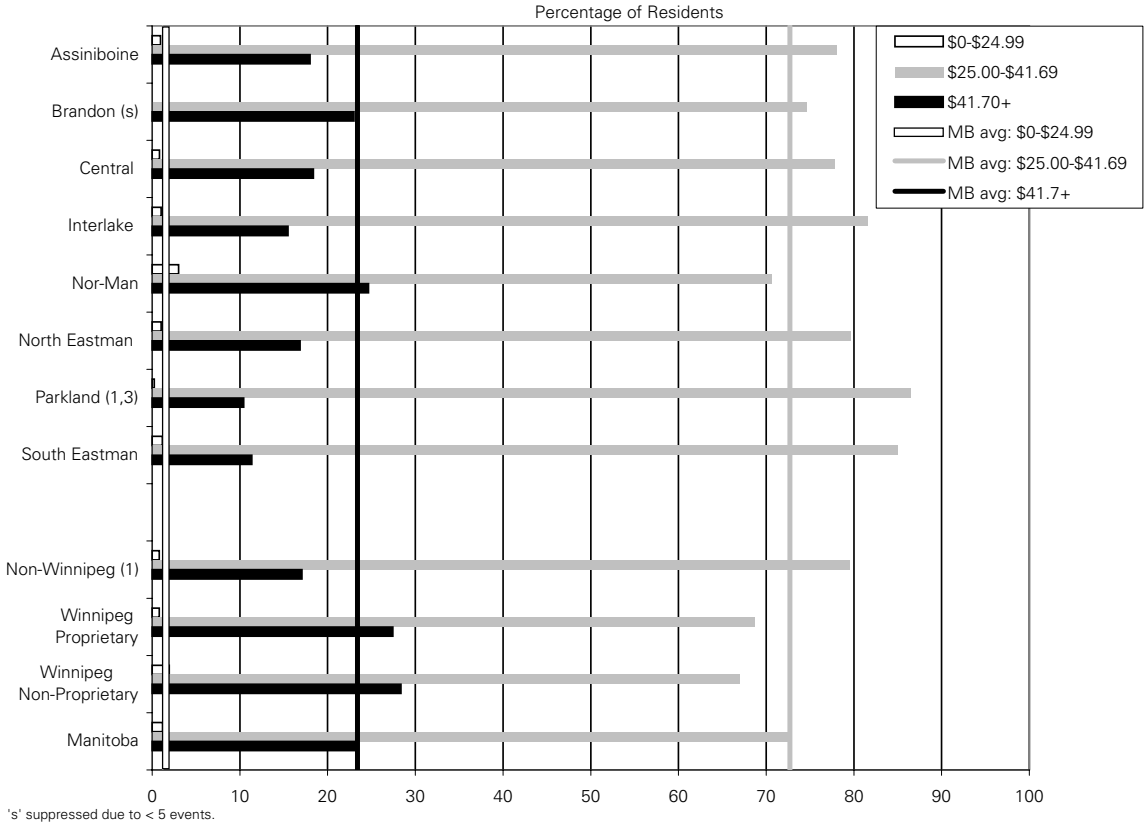
Daily residential fees were included as an indicator of socioeconomic status (SES) for PCH residents, as these fees are based in part on a person's net income.[21] Effective April 1, 1999 these charges ranged from $25.00 per day to $58.40 per day. Categories of these charges are provided in Figure 5.11. These payment categories include residents who were exempt from or paid less than the minimum residential fee ($0 to $24.99 in Figure 5.11), as well as those who paid somewhat more than the minimum amount ($25.00 to $41.69), and those who paid closer to the maximum residential fee ($41.70 or more).[22]

On average for each year of the study period, 1.2% of PCH residents in Manitoba paid a residential fee less than the minimum daily amount; 72.7% of these residents paid a residential fee that was somewhat more than the minimum daily amount while 23.4% of residents paid a residential fee that was closer to the maximum daily amount. These proportions of residents were similar in all RHAs. As one exception, as compared to the Manitoba average, fewer residents in the Parkland RHA (10.4%) paid residential fees that were closer to the maximum daily amount ($41.70 or more). Fewer residents in this RHA (0.2%) also paid residential fees that were less than the minimum daily amount ($0 to $24.99). From these criteria, at least some PCH residents in the Parkland RHA may have a lower SES as compared to the majority of PCH residents in Manitoba.

[21] Income is used commonly as an indicator of SES. PCH residents with a higher net income pay more residential fees, and these individuals were considered as having a greater SES.

[22] Residential fees were not provided for 2.8% of study participants. This percent of participants was similar in all RHAs (data not shown in Figure 5.11).

Figure 5.11: Residential Fees Paid by PCH Residents, for Manitoba and by RHA, Annual Average from 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' indicates that the percent of residents who paid fees ranging from $0 - $24.99 was statistically different than the Manitoba average.
'2' indicates that the percent of residents who paid fees ranging from $25.00-$41.69 was statistically different than the Manitoba average.
'3' indicates that the percent of residents who paid fees greater than $41.70 was statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

CHAPTER 6: INDICATORS OF QUALITY CARE BASED ON AMBULATORY CARE PHYSICIAN VISITS AND/OR HOSPITAL CONTACTS

The results for six diagnostic QIs are presented in this chapter, based on how frequently PCH residents were diagnosed with select medical conditions during ambulatory care physician visits and/or admissions to a hospital. These diagnostic QIs include:

- Hip fractures
- Non-hip fractures
- Accidental falls
- Skin ulcers
- Respiratory infections
- Fluid and electrolyte imbalances

Data for each of these diagnostic QIs are presented for the RHAs and for individual PCHs in Manitoba.

6.1 How to Interpret the Results in This Chapter

Data for each of the figures provided in this chapter are available at the following MCHP website: http://www.umanitoba.ca/centres/mchp/reports.htm. These data include typically the standardized and crude QI rates, as well as the actual number of QI events.

6.1.1 Interpreting the Results Presented for Regional Health Authorities (RHAs)

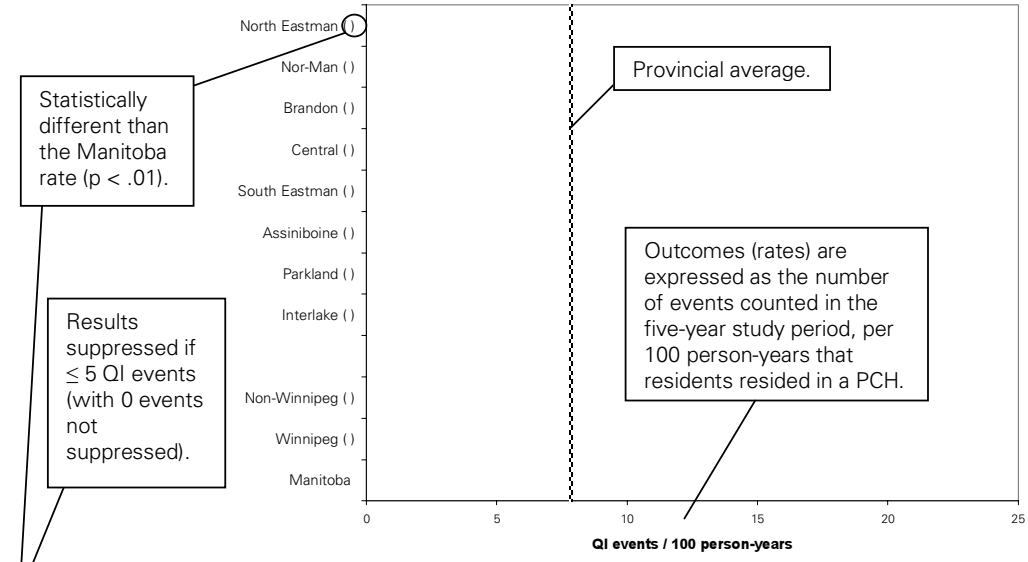
An explanation of how to interpret findings for RHAs is provided with reference to Figure 6.1. The following information is key to interpreting these results:

- As described in Chapter 4, events of diagnostic QIs have been reported as a rate (i.e., the number of QI events reported per 100 person-years that residents were at risk of experiencing this QI). *Often when presenting the results of this chapter, these units of measurement have been summarized using the term 'event rate'*.
- The units of measurement in this chapter (QI events/100 person-years) are difficult to interpret, however, can be approximated as the percent of beds where an event was reported annually. This assumes that an equivalent of one QI event occurred for each PCH bed, and that these beds were occupied 100% of the time. For example, if 10 events of hip fractures were recorded in a PCH per 100 person-years in a five-year period, this means that hip fractures

occurred in about 10% of the beds in this PCH annually, with the above stated assumptions.

- Rates of diagnostic QIs for the RHAs have been standardized to reflect how frequently events would have been reported, if all PCHs in Manitoba had the same age and sex distribution of residents, and also had the same proportion of residents assigned to each level of care. Inter-RHA and inter-PCH differences in QI rates are therefore independent of these resident characteristics. For more information about standardizing outcomes by age, sex and level of care, refer to Chapter 4, subsection 'A Note about Standardization'.

Figure 6.1: The Format of Figures Used to Present Rates of Diagnostic QIs for the RHAs in Manitoba



's' Results are suppressed due to ≤ 5 events (with 0 events not suppressed).
'1' Indicates that the diagnostic QI rate was significantly different from the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

- The rate that diagnostic QIs were reported for each RHA has been compared statistically to the Manitoba average. The caption 'p<.01' has been used to emphasize RHA-level data that were statistically different than the overall results for the province. For more information on statistical testing, refer to Chapter 4, subsection 'Testing for Significant Differences'.

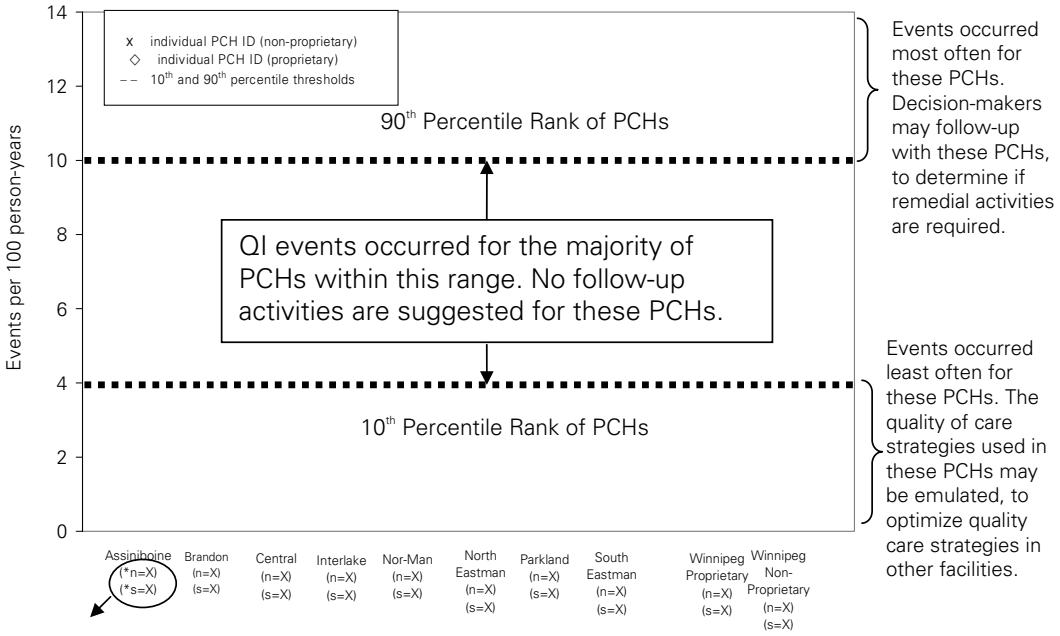
- The ordering of 'non-Winnipeg' RHAs is not necessarily the same for all diagnostic QIs. RHAs that are listed at the top of the vertical axis denote where rates of QI events were lowest. As per MCHP regulations and to protect the anonymity of study participants, data in this chapter have been suppressed when between one and five QI events were reported for an RHA during the five-year study period.
- A 'non-Winnipeg' value was included for each QI, to reflect how frequently QI events were reported for all 'non- Winnipeg' RHAs. Also, results for the WRHA have been divided into proprietary and non-proprietary PCHs. The ordering of non-Winnipeg, proprietary WRHA and non-proprietary WRHA PCHs is consistent for all of the figures in this chapter.

6.1.2 Interpreting the Results Presented for Individual PCHs

Strategies to compare diagnostic QI rates between PCHs are provided with reference to Figure 6.2.

- For individual PCHs, diagnostic QI rates were: i) expressed per 100 person-years, ii) standardized to account for inter-PCH differences in resident age, sex and level of care, and, iii) suppressed if between one and five events were counted in a PCH.
- PCHs were rank ordered according to how frequently diagnostic QIs were reported. These QI rates were lowest in PCHs that were ranked below the 10th percentile, and highest in PCHs that were ranked above the 90th percentile. PCH IDs have been included to identify facilities where QI events were reported most and least frequently, and the link between the PCH ID and PCH name is provided in Appendix A.

Figure 6.2: Format of Figures Used to Present Diagnostic QI Rates for Individual PCHs



*n = number of PCHs included in the analysis, by RHA.
*s = number of PCHs suppressed during the analysis, by RHA.

6.2 Highlights of the Results in This Chapter

6.2.1 A Summary of Results Provided for RHAs

Data for each of the six diagnostic QIs are presented separately in this chapter. Trends in results for the RHAs are summarized as follows (Table 6.1):

- In Manitoba, the rate that diagnostic QI events were reported varied considerably during the five-year study period, ranging from 2.7 events of hip fractures per 100 person-years (n=1,231 total events of this QI), to 17.3 events of respiratory infections per 100 person-years (n=7,958 total events of this QI). Events of accidental falls, skin ulcers, non-hip fractures, and fluid and electrolyte imbalances were reported at a rate between 4.5 events and 8.0 events per 100 person-years. In total, between 2,000 and 4,000 events were counted for each of these latter QIs during the five-year study period.

Table 6.1: A summary of diagnostic QI rates: Statistical significances for RHAs as compared to the Manitoba average, 1999/2000 – 2003/04

RHA	Hip Fractures	Non-Hip Fractures	Accidental Falls	Skin Ulcers	Respiratory Infections	Fluid & Electrolyte Imbalances
Assiniboine	ns	↓	ns	ns	ns	ns
Brandon	ns	ns	ns	↓	↑	↑
Central	ns	ns	ns	↓	ns	↓
Interlake	ns	ns	ns	ns	ns	ns
Nor-Man	ns	ns	ns	ns	ns	ns
North Eastman	ns	ns	ns	↓	ns	↓
Parkland	↓	ns	↓	ns	ns	ns
South Eastman	ns	ns	ns	ns	ns	ns
Winnipeg (Non-Proprietary)	ns	ns	ns	ns	ns	ns
Winnipeg (Proprietary)	↑	↑	↑	↑	↑	↑
Manitoba (events/100 person-years)	2.7	4.9	4.5	7.9	17.3	6.6
Manitoba (total count of events)	1,231	2,263	2,089	3,614	7,958	3,031

ns Denotes RHAs with QI rates that were non-significantly different compared to the Manitoba average.
↓ Denotes RHAs with QI rates that were significantly lower (p<.01) than the Manitoba average (after controlling for differences in resident age, sex, and level of care).
↑ Denotes RHAs with QI rates that were significantly greater (p<.01) than the Manitoba average (after controlling for differences in resident age, sex, and level of care).

Source: Manitoba Centre for Health Policy, 2006

- As compared to the Manitoba average, QIs were reported at a similar rate for most RHAs during the five-year study period (denoted by 'ns' in Table 6.1). As exceptions, these rates were lower for two diagnostic QIs in each of the Parkland, Central, and North Eastman RHAs (denoted by '↓' in Table 6.1).
- As compared to the Manitoba average, all diagnostic QIs were reported more frequently for proprietary PCHs in the WRHA.[23] Also, two diagnostic QIs were reported more frequently for PCHs in the Brandon RHA (denoted by '↑' in Table 6.1). These RHA-level rates were standardized for PCH resident age, sex and level of care, and differences should not be attributed to these resident characteristics. However, other factors such as the 'rate of turnover' of PCH residents and differences in access to healthcare may have influenced these trends in results. The extent that these and other risk factors influenced QI rates are discussed in Chapter 8 of this report.

[23] Results for Chapters 6 through 8 are divided into proprietary and non-proprietary PCHs for the WRHA. Researchers have demonstrated that QI-related adverse events often occur more frequently in proprietary versus non-proprietary PCHs (Hillmer et al., 2005; McGregor et al., 2005).

6.2.2 A Summary of Results Provided for Individual PCHs

With an RHA, diagnostic QIs are likely to be reported at different rates for PCHs. Individual PCHs were therefore rank ordered according to how frequently QI events were reported, emphasizing facilities where these events were reported least (below the 10th percentile threshold) and most (above the 90th percentile threshold) often. These PCHs are illustrated in Tables 6.2 and 6.3, using the combined results for all diagnostic QIs.

In total, 42 PCHs in Manitoba were ranked below the 10th percentile for at least one of the six diagnostic QIs that were investigated in this research (Table 6.2). This means that diagnostic QIs occurred least frequently in these PCHs compared to other PCHs in the province. These lower rates were reported for one of the six diagnostic QIs in 29 of these PCHs, and for two or more of the diagnostic QIs in 13 PCHs. The IDs for these latter PCHs are presented in Table 6.2, and a link between these IDs and PCH names is provided in Appendix A of this report.

Particular attention may be warranted for the 13 PCHs that ranked more consistently below the 10th percentile. In particular, one PCH in each of the Assiniboine and Central RHAs was ranked below this threshold for three diagnostic QIs, and one non-proprietary PCH in the WRHA was ranked below this threshold for four diagnostic QIs. Rates of diagnostic QIs were consistently lower in these PCHs, and it may be possible to use the quality of care strategies in these PCHs to optimize the quality of care provision in other facilities.[24]

Table 6.2: PCHs that were ranked below the 10th percentile threshold for one or more diagnostic QIs, by RHA (QIs were reported least frequently in these PCHs), 1999/2000 – 2003/04

RHA	# (%) of PCHs below threshold		Below threshold for one QI	Below threshold for 2 QIs*	Below threshold for 3 QIs*	Below threshold for 4 QIs*
Assiniboine (n=27)	11	(40.7%)	5	550, 584, 591, 650, 698	608	/
Brandon (n=5)	0	(0.0%)	0	/	/	/
Central (n=15)	6	(40.0%)	5	/	503	/
Interlake (n=11)	3	(27.3%)	2	593	/	/
Nor-Man (n=3)	1	(33.3%)	1	/	/	/
North Eastman (n=5)	4	(80.0%)	3	566	/	/
Parkland (n=11)	7	(63.6%)	5	669, 683	/	/
South Eastman (n=7)	4	(57.1%)	3	645	/	/
Winnipeg (n=24) (Non-Proprietary)	5	(20.8%)	4	/	/	657
Winnipeg (n=14) (Proprietary)	1	(7.1%)	1	/	/	/
Manitoba (n=122)	42	(34.4%)	29	10	2	1

* IDs are presented for PCHs that ranked below the 10th percentile for multiple diagnostic QIs.
See Appendix A for a link between the ID and name of these PCHs.

Source: Manitoba Centre for Health Policy, 2006

[24] Caution may be required when interpreting the results for some PCHs identified in Table 6.2. See Appendix C for more information.

PCHs are also emphasized where diagnostic QIs were reported more frequently (Table 6.3). In total, 40 PCHs in Manitoba ranked above the 90th percentile for at least one diagnostic QI. This means that diagnostic QIs occurred most frequently in these PCHs compared to other PCHs in the province. For 29 of these PCHs, QI rates were highest for one of the six QIs, while 11 PCHs in Manitoba were ranked above the 90th percentile for two or more QIs. Five of these latter PCHs were proprietary facilities in the WRHA, while two of these PCHs were located in the Assiniboine RHA. Decision-makers may decide to conduct follow-up activities with these PCHs, in particular those where trends in results are reported, to help determine if problems with quality of care provision exist and also to suggest remedial activities as required.

Table 6.3: PCHs that were ranked above the 90th percentile threshold for one or more diagnostic QIs, by RHA (QIs were reported most frequently in these PCHs), 1999/2000 – 2003/04

RHA	# (%) of PCHs above threshold		Above threshold for one QI	Above threshold for 2 QIs*	Above threshold for 3 QIs*	Above threshold for 4 QIs*
Assiniboine (n=27)	8	(29.6%)	6	602, 682	/	/
Brandon (n=5)	2	(40.0%)	2	/	/	/
Central (n=15)	3	(20.0%)	3	/	/	/
Interlake (n=11)	4	(36.4%)	3	606	/	/
Nor-Man (n=3)	2	(66.7%)	2	/	/	/
North Eastman (n=5)	1	(20.0%)	0	504	/	/
Parkland (n=11)	2	(18.2%)	2	/	/	/
South Eastman (n=7)	2	(28.6%)	1	/	576	/
Winnipeg (n=24) (Non-Proprietary)	6	(25.0%)	5	636	/	/
Winnipeg (n=14) (Proprietary)	10	(71.4%)	5	508, 559, 574	537	521
Manitoba (n=122)	40	(32.8%)	29	8	2	1

* IDs are presented for PCHs that ranked above the 90th percentile for multiple diagnostic QIs.
See Appendix A for a link between the ID and name of these PCHs.

Source: Manitoba Centre for Health Policy, 2006

6.3 Results for Individual QIs

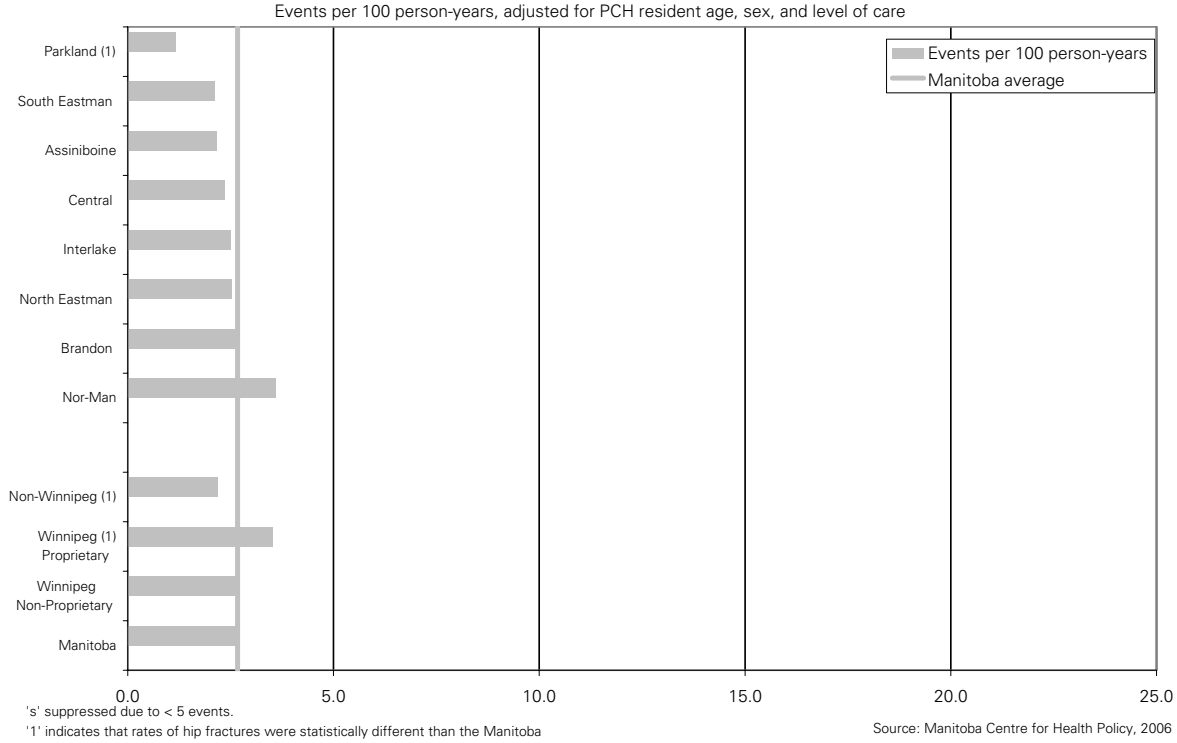
6.3.1 Hip Fractures

Hip fractures were counted using the ICD-9-CM codes 820 (fracture of the neck of the femur) and 821 (fracture of other and unspecified parts of the femur) using both the medical claims data and the hospital abstract data. These diagnostic codes were only counted in the event that select tariff codes (0865, 0868, 0870, 0872, 0874, denoting a reduction of the hip or a prosthetic replacement) were also reported within a two-week period of the hip fracture diagnostic claim. A 365-day period of time was used to differentiate between follow-up care provided for the same hip fracture and separate hip fracture events. Using this counting strategy, 1,231 hip fractures were counted for 1,216 PCH residents; 98.8% of these residents experienced only one hip fracture during the five-year study period and 1.2% of these residents experienced two hip fractures during this time.

For PCHs in Manitoba, hip fractures were reported at a rate of 2.7 events per 100 person-years (Figure 6.3). This rate of events was similar for most but not all RHAs. Events of this QI were reported less frequently in the Parkland RHA (1.2 event rate) and also for non-Winnipeg RHAs in general (2.2 event rate) ($p<.01$). Conversely, hip fractures were reported more frequently for proprietary PCHs in the WRHA (3.5 event rate) ($p<.01$).

Figure 6.3: Rates of Hip Fractures, for Manitoba and by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



's' suppressed due to < 5 events.
'1' indicates that rates of hip fractures were statistically different than the Manitoba

Source: Manitoba Centre for Health Policy, 2006

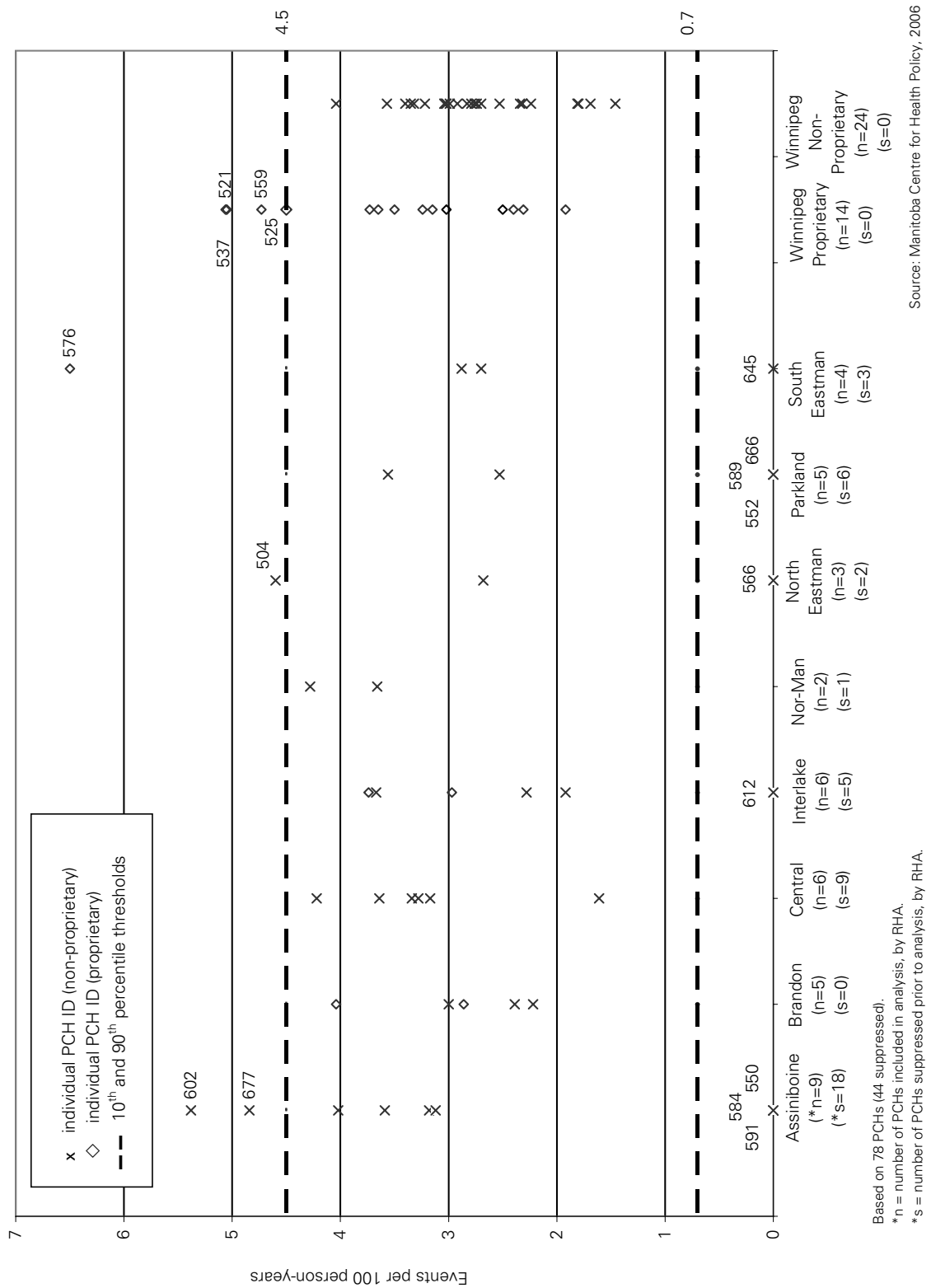
Rates of hip fracture events are shown for individual PCHs in Figure 6.4. To protect the anonymity of study participants, data were suppressed for 44 out of 122 PCHs prior to conducting any analyses (between one and five hip fractures were reported in these PCHs during the study period). For the remaining 78 PCHs, the 10th and 90th percentiles were identified as facilities where hip fractures were reported at a rate of 0.7 and 4.5 events per 100 person-years respectively. Seven PCHs in Manitoba ranked above the 90th percentile for this QI and nine PCHs ranked below the 10th percentile. Rates of hip fractures for these PCHs are summarized as follows (Figure 6.4):

- After adjusting for differences between PCHs in resident age, sex and, level of care, rates of hip fractures for PCHs ranged from zero events (several PCHs) to 6.5 events / 100 person-years (ID 576 in the South Eastman RHA).

- No hip fractures were reported for each of the nine PCHs that ranked below the 10th percentile. Of these PCHs:
  - Three were located in each of the Assiniboine (IDs 591, 584, 550), and Parkland RHAs (IDs 552, 589, 666).
  - One was located in each of the South Eastman (ID 645), North Eastman (ID 566), and Interlake RHAs (ID 612).
- Of the seven PCHs that ranked above the 90th percentile for this QI (i.e., where rates of hip fractures were highest in Manitoba):
  - Three of the PCHs were proprietary facilities located in the WRHA (ID 537, 5.1 event rate; ID 521, 5.1 event rate; ID 559, 4.7 event rate).
  - Two PCHs were located in the Assiniboine RHA (ID 602, 5.4 event rate; ID 677, 4.8 event rate).
  - One PCH was located in each of the North Eastman (ID 504, 4.6 event rate) and South Eastman RHAs (ID 576, 6.5 event rate).

Figure 6.4: Rates of Hip Factures, by PCH, by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



Based on 78 PCHs (44 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

6.3.2 Non-Hip Fractures

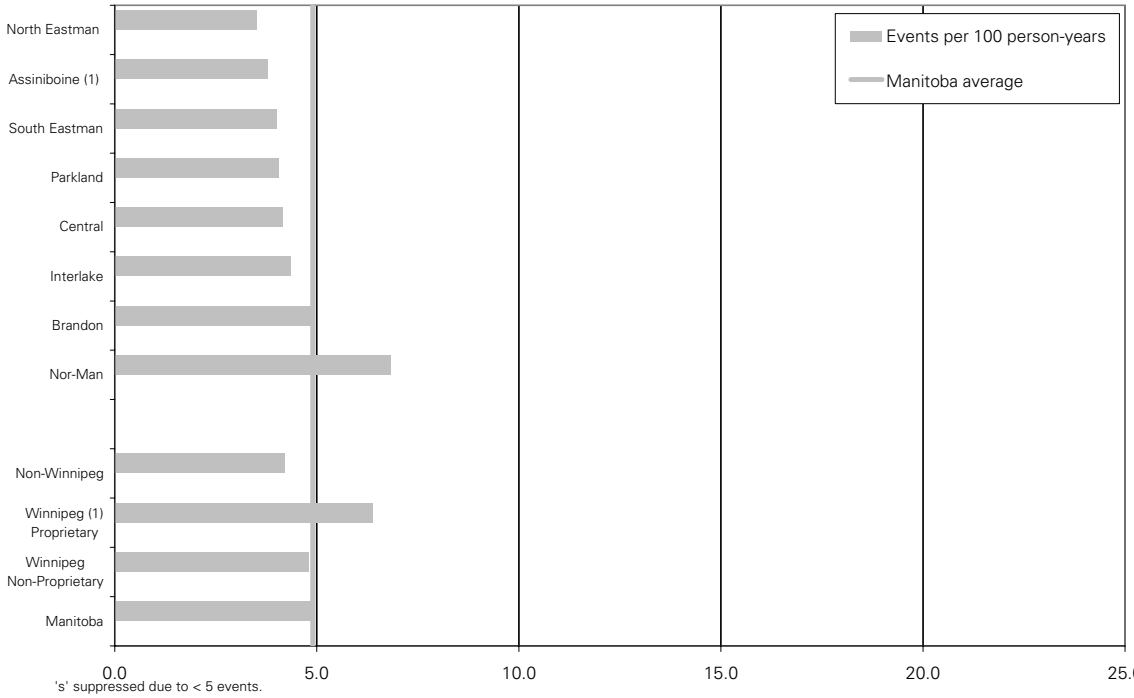
Events of non-hip fractures were counted using the ICD-9-CM codes 800 through 829 using both the medical claims data and the hospital abstract data, and excluding hip fractures as defined in the previous section. The majority of these fractures were specific to the upper limbs (34.6% of events) and neck or trunk (29.6%); 23.6% of these fractures were specific to the upper or lower leg, while 2.7% involved the skull and 9.6% involved multiple fracture sites.

A period of time of 365 days was used to differentiate between repeated physician visits or hospital contacts to care for the same and separate non-hip fracture events. Using this counting strategy, 2,263 non-hip fractures were counted for 2,136 PCH residents; 94.5% of these individuals were diagnosed as having one non-hip fracture while 5.0% and 0.5% of these residents were diagnosed as having two and three or more non-hip fractures respectively.

Rates of non-hip fractures are compared between the RHAs in Figure 6.5. During the five-year study period, non-hip fractures were reported at a rate of 4.9 events per 100 person-years. Non-hip fractures were reported less frequently in the Assiniboine RHA (3.8 event rate) and more frequently in proprietary PCHs in the WRHA (6.4 event rate) ($p<.01$).

Figure 6.5: Rates of Non-Hip Fractures, for Manitoba and by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



's' suppressed due to < 5 events.

'1' indicates that rates of non-hip fractures were statistically different than the Manitoba average.

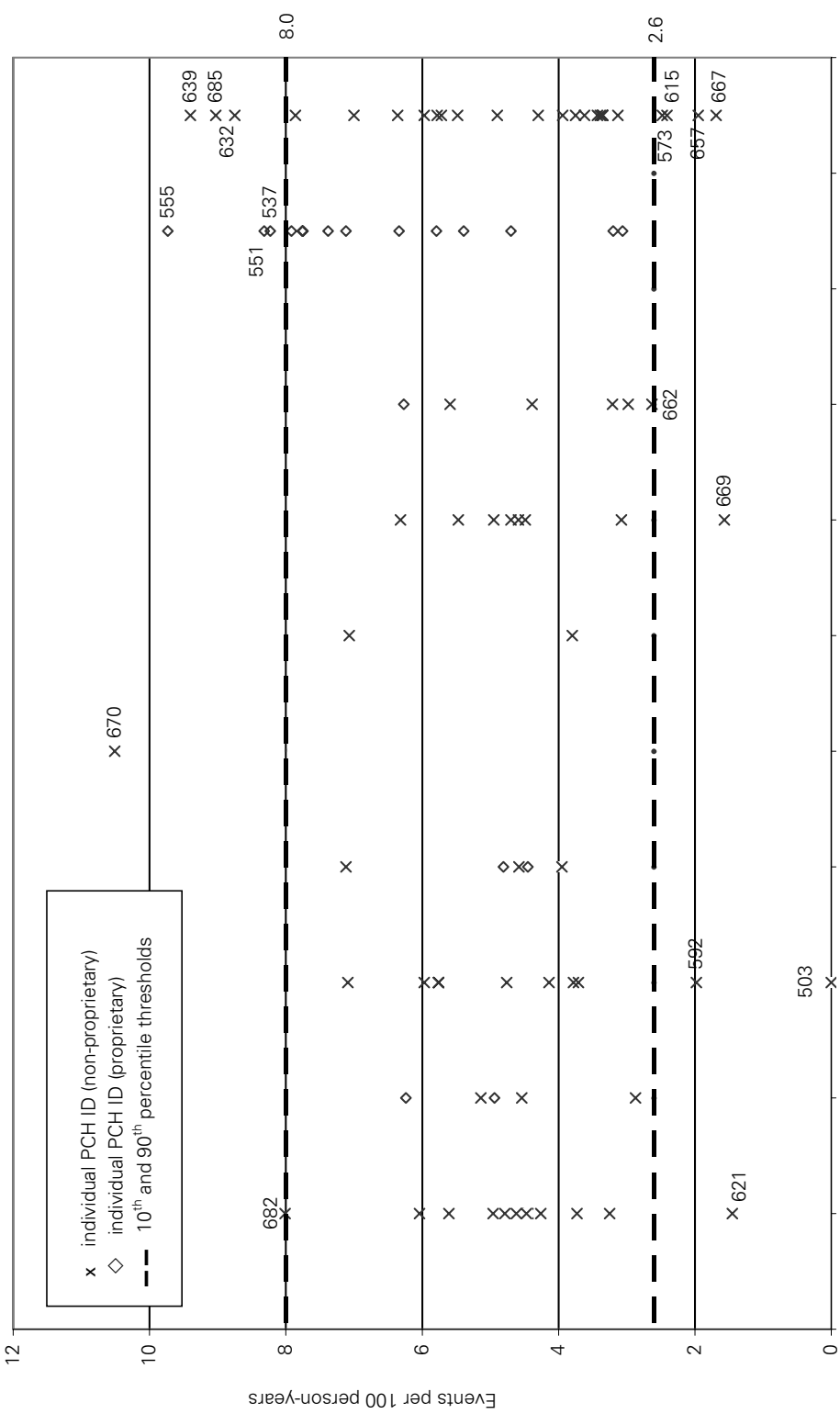
Source: Manitoba Centre for Health Policy, 2006

Rates of non-hip fractures are shown for individual PCHs in Figure 6.6. To protect the anonymity of study participants, data were suppressed for 35 out of 122 PCHs prior to conducting any analyses (between one and five events of non-hip fractures were reported in these PCHs during the study period). For the remaining 87 PCHs, the 10th and 90th percentiles were identified as facilities where non-hip fractures were reported at a rate of 2.6 and 8.0 events per 100 person-years respectively. Eight PCHs in Manitoba ranked above the 90th percentile for this QI and nine PCHs ranked below the 10th percentile. The results for these PCHs are summarized as follows:

- After adjusting for differences between PCHs in resident age, sex and level of care, rates of non-hip fractures ranged from zero events in PCH ID 503 (Central RHA) to 10.5 events / 100 person-years (ID 670 in the Nor-Man RHA).
- Of the nine PCHs that ranked below the 10th percentile for this QI (i.e., where rates of non-hip fractures were lowest in Manitoba):
  - Four were non-proprietary PCHs in the WRHA (ID 615, 2.4 event rate; ID 573, 2.5 event rate; ID 657, 2.0 event rate; ID 667, 1.7 event rate).
  - One was located in each of the South Eastman (ID 662, 2.6 event rate), Assiniboine (ID 621, 1.5 event rate), and Parkland RHAs (ID 662, 1.6 event rate).
  - Two PCHs were located in the Central RHA (ID 592, 2.0 event rate; ID 503, 0 events).
- Of the eight PCHs that ranked above the 90th percentile for this QI (i.e., where rates of non-hip fractures were highest in Manitoba):
  - Six were located in the WRHA. Three of these PCHs were non-proprietary facilities (ID 639, 9.4 event rate; ID 685, 9.0 event rate; ID 632, 8.8 event rate), while three were proprietary PCHs (ID 555, 9.7 event rate; ID 551, 8.3 event rate; ID 537, 8.2 event rate).
  - One PCH was located in each of the Nor-Man (ID 670, 10.5 event rate) and Assiniboine RHAs (ID 682, 8.0 event rate).

Figure 6.6: Rates of Non-Hip Fractures, by PCH, by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



Based on 87 PCHs (35 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

6.3.3 Accidental Falls Resulting in Hospitalization

Accidental falls are recorded in hospital abstracts using an ICD-9-CM 'E–code'. E codes represent environmental causes, circumstances and conditions that result in an injury. Accidental falls were categorized using the ICD-9-CM E-codes 880 through 888, to represent (for example) falls from a chair or a bed (E884.2), and falls that resulted from the use of stairs or steps (E880.9) or related to slipping, tripping or stumbling on a surface (E885).

Events of accidental falls were confined to those that resulted in a hospitalization, as E-codes are not recorded during ambulatory care physician visits. A period of 90 days was used to differentiate between repeated hospital contacts for the same versus different accidental falls. Using this counting strategy, 2,089 accidental falls were reported for 2,003 PCH residents; 96.0% of these individuals experienced one accidental fall during the five-year study period, while 3.8% and 0.2% of these residents were reported as having two and three or more accidental falls respectively.

We were interested in determining the relationship between accidental falls and each of hip and non-hip fractures. Overall, 97% of PCH residents who experienced a hip fracture during the study period also had an accidental fall (data not shown).[25] Conversely, 41% of PCH residents who fell did not experience a hip fracture during the five-year study period. From these data, we concluded that most hip fractures were associated with accidental falls, however, residents fell often without fracturing a hip.

A similar conclusion was reached for accidental falls and non-hip fractures; 32.7% of PCH residents who experienced a non-hip fracture also fell accidentally in the five-year study period (data not shown).[26] Conversely, 65% of residents who fell did not experience a non-hip fracture during the study period. From these results, we felt that it was appropriate to consider accidental falls separately from each of hip and non-hip fractures.

For PCHs in Manitoba, accidental falls were reported at a rate of 4.5 events per 100 person-years (Figure 6.7). This rate was similar for most RHAs after adjusting for differences in resident age, sex and level of care. As exceptions, accidental falls were reported less frequently in the Parkland RHA (3.2 event rate) ($p<.01$), and more frequently in proprietary PCHs in the WRHA (5.2 event rate) ($p<.01$).

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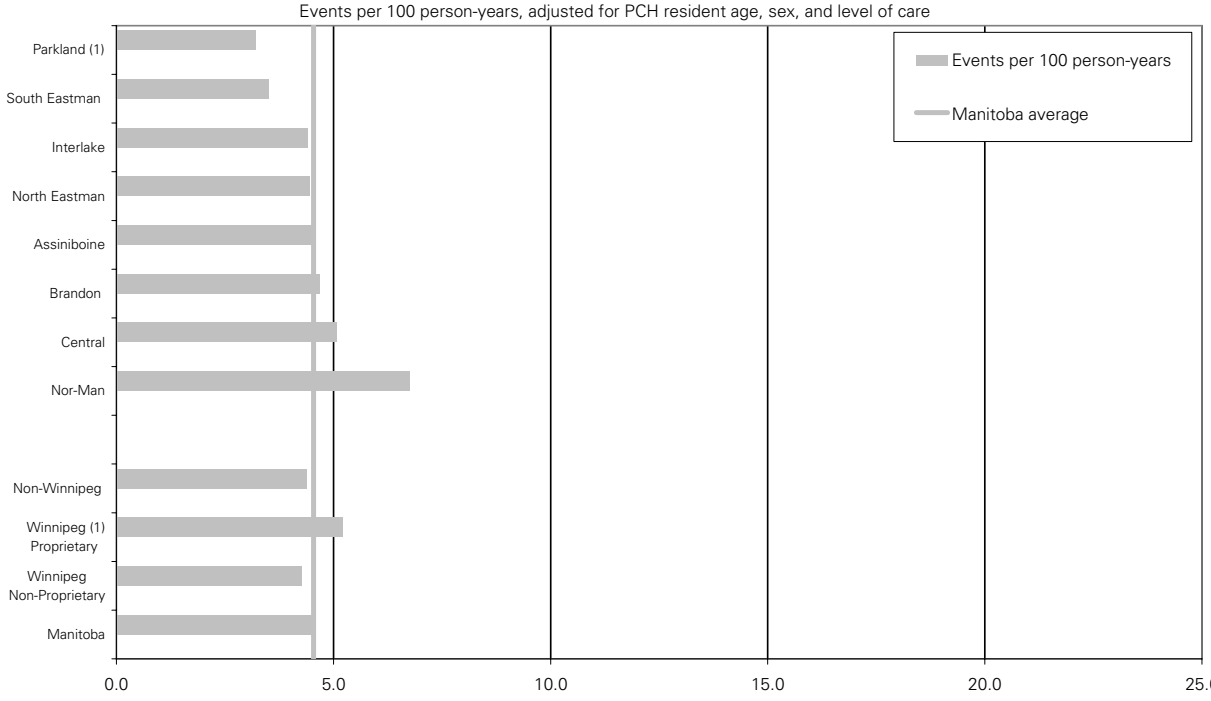
[25] Of the individuals who experienced both of these QIs, 98.3% reported falling accidentally and having a hip fracture on the same day.

[26] Of the individuals who experienced both of these QIs, 48.8% falling accidentally and having a non-hip fracture on the same day.

Figure 6.7: Rates of Accidental Falls Resulting in Hospitalization, for Manitoba and by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



's' suppressed due to < 5 events.
'1' indicates that rates of accidental falls resulting in a hospitalization were statistically different than the Manitoba

Source: Manitoba Centre for Health Policy, 2006

Rates of accidental falls are reported for individual PCHs in Figure 6.8. To protect the anonymity of study participants, data were suppressed for 28 out of 122 PCHs prior to conducting any analyses (between one and five events of accidental falls were reported in these PCHs during the study period). For the remaining 94 PCHs, the 10th and 90th percentiles were identified as facilities where accidental falls were reported at a rate of 3.0 and 7.1 events per 100 person-years respectively. Nine PCHs ranked above the 90th percentile and 10 PCHs ranked below the 10th percentile. Rates of accidental falls for these PCHs are summarized as follows (Figure 6.8):

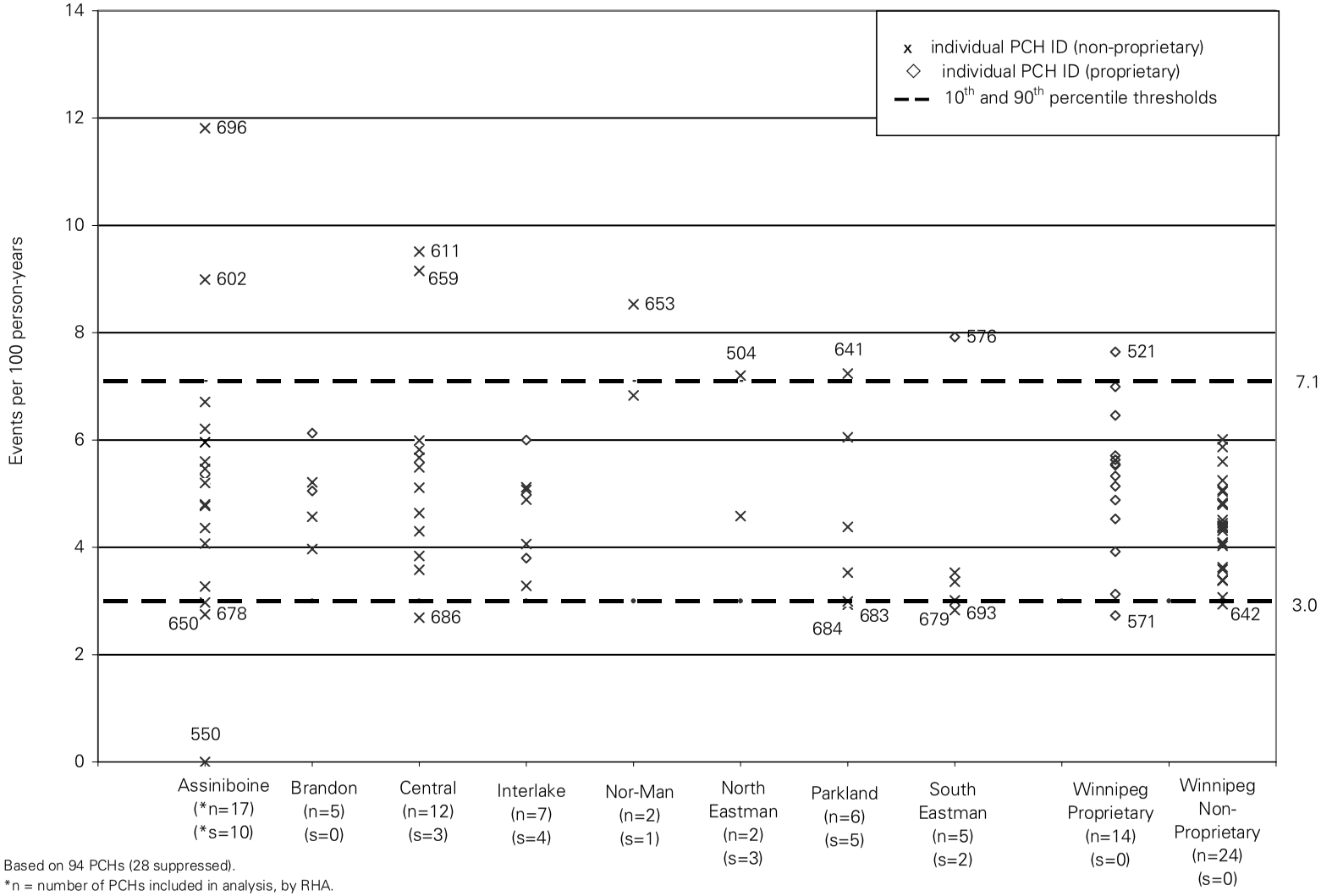
- After adjusting for resident age, sex and level of care, the rate of accidental falls ranged from zero events in PCH ID 550 (Assiniboine RHA) to 11.8 events per 100 person-years (ID 696 in Assiniboine).
- Of the 10 PCHs that ranked below the 10th percentile for accidental falls (i.e., where rates of accidental falls were lowest in Manitoba):
  - Three of these PCHs were located in the Assiniboine RHA (ID 650, 2.8 event rate; ID 678, 3.0 event rate; ID 550, 0 events).
  - Two PCHs were located in each of the Parkland (ID 684, 2.9 event rate; ID 683, 3.0 event rate), South Eastman (ID 679, 2.8 event rate; ID 693, 3.0 event rate) and Winnipeg (ID 642, a non-proprietary PCH, 2.9 event rate; ID 571, a proprietary PCH, 2.7 event rate) RHAs.

- One PCH was located in the Central RHA (ID 686, 2.7 event rate).

- Of the nine PCHs that ranked above the 90th percentile for this QI (i.e., where rates of accidental falls were highest in Manitoba):
  - One was located in each of the Winnipeg (ID 521, a proprietary PCH, 7.6 event rate), South Eastman (ID 576, 7.9 event rate), Nor-Man (ID 653, 8.5 event rate), North Eastman (ID 504, 7.2 event rate) and Parkland (ID 641, 7.2 event rate) RHAs.
  - Two were located in each of the Assiniboine (ID 696, 11.8 event rate; ID 602, 9.0 event rate) and Central RHAs (ID 611, 9.5 event rate; ID 659, 9.2 event rate).

Figure 6.8: Rates of Accidental Falls Resulting in Hospitalization, by PCH, by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



Based on 94 PCHs (28 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

6.3.4 Skin Ulcers

Decubitus ulcers are defined by a four-digit ICD-9-CM code in the administrative data (707.0) and are therefore usually counted using hospital abstracts. Medical claims data consist of three-digit ICD-9-CM codes (e.g., 707), which in this instance represents diagnoses of decubitus ulcers and other skin ulcers related to poor nutrition and neurodegenerative diseases. ICD-9-CM codes were combined from these different administrative files to count events of skin ulcers during the five-year study period.27

Events of skin ulcers were not counted if individuals had been diagnosed previously with diabetes,[28,29] to account for people who may have been more susceptible to skin ulcers because of sensitive skin. Further, a period of time of 365 days was used to differentiate between care provided for the same versus separate events of this QI. In total, 3,614 events of skin ulcers were counted for 3,242 PCH residents; 89.2% of these residents were diagnosed as having one skin ulcer during the study period, while 10.1% and 0.7% of these individuals were diagnosed as having two and three or more skin ulcers respectively.

For PCHs in Manitoba, skin ulcers were reported at a rate of 7.9 events per 100 person-years (Figure 6.9). Skin ulcers were reported at similar rates for most RHAs, with the exception that this QI was reported less frequently in each of the North Eastman (2.0 event rate), Brandon (5.3 event rate), and Central RHAs (5.3 event rate) ($p<.01$). Events of skin ulcers were reported more frequently in proprietary PCHs in the WRHA (14.0 event rate) ($p<.01$).

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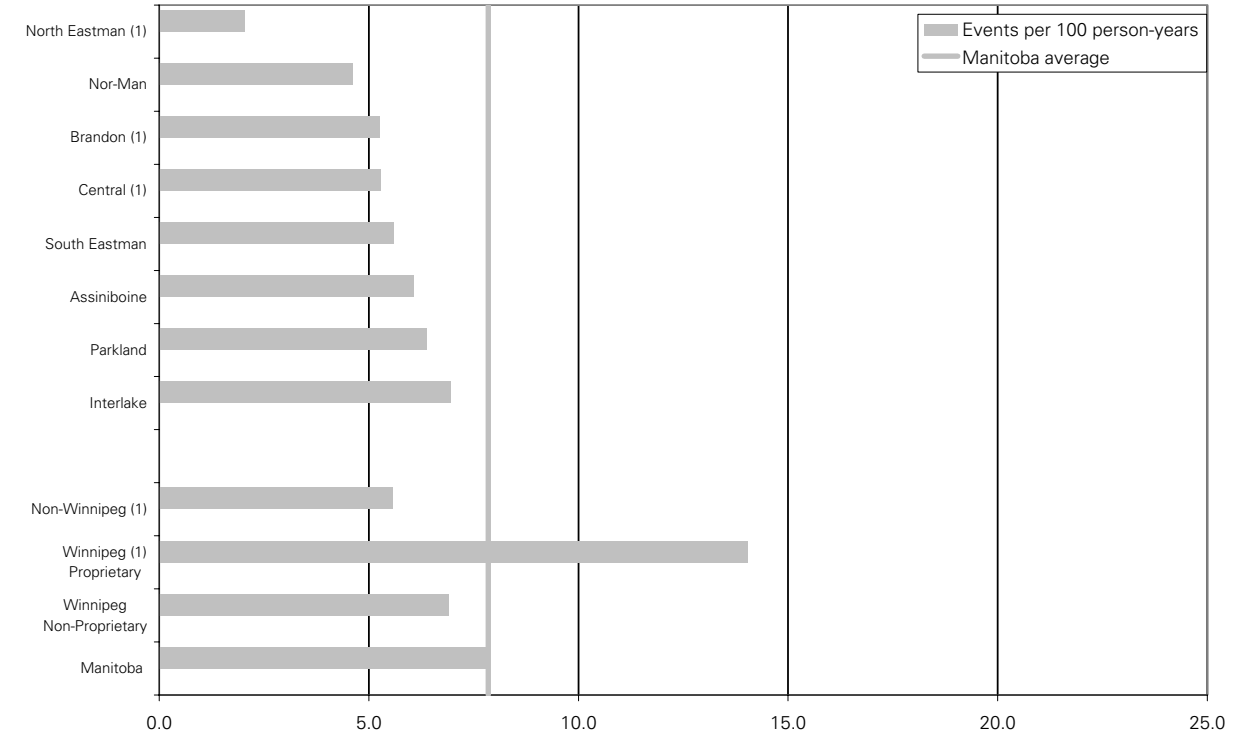
[27] Researchers first counted events of decubitus ulcers using the hospital abstract data only (i.e., using ICD-9-CM code 707.0). Only 93 events of decubitus ulcers were reported for PCH residents using this counting strategy. After consulting with the Working Group, skin ulcers were defined using the ICD-9-CM code 707.0 to count hospitalizations related to events of decubitus ulcers, and the ICD-9-CM code 707 to count ambulatory care physician visits to care for skin ulcers.

[28] For the purposes of this research, a person was considered as diabetic with the presence of ICD-9-CM code 250 in one hospitalization or two or more physician claims during the five-year study period. This definition is similar to that which has been used by other researchers at MCHP (Fransoo et al., 2005).

[29] Researchers considered first standardizing rates of skin ulcers to account for residents with diabetes. However, several PCHs were too small to standardize rates of this QI for people with diabetes, while also standardizing this outcome for differences in PCH resident age, sex, and level of care.

Figure 6.9: Rates of Skin Ulcers, for Manitoba and by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



's' suppressed due to < 5 events.
'1' indicates that rates of skin ulcers were statistically different than the Manitoba average.

Source: Manitoba Centre for Health Policy, 2006

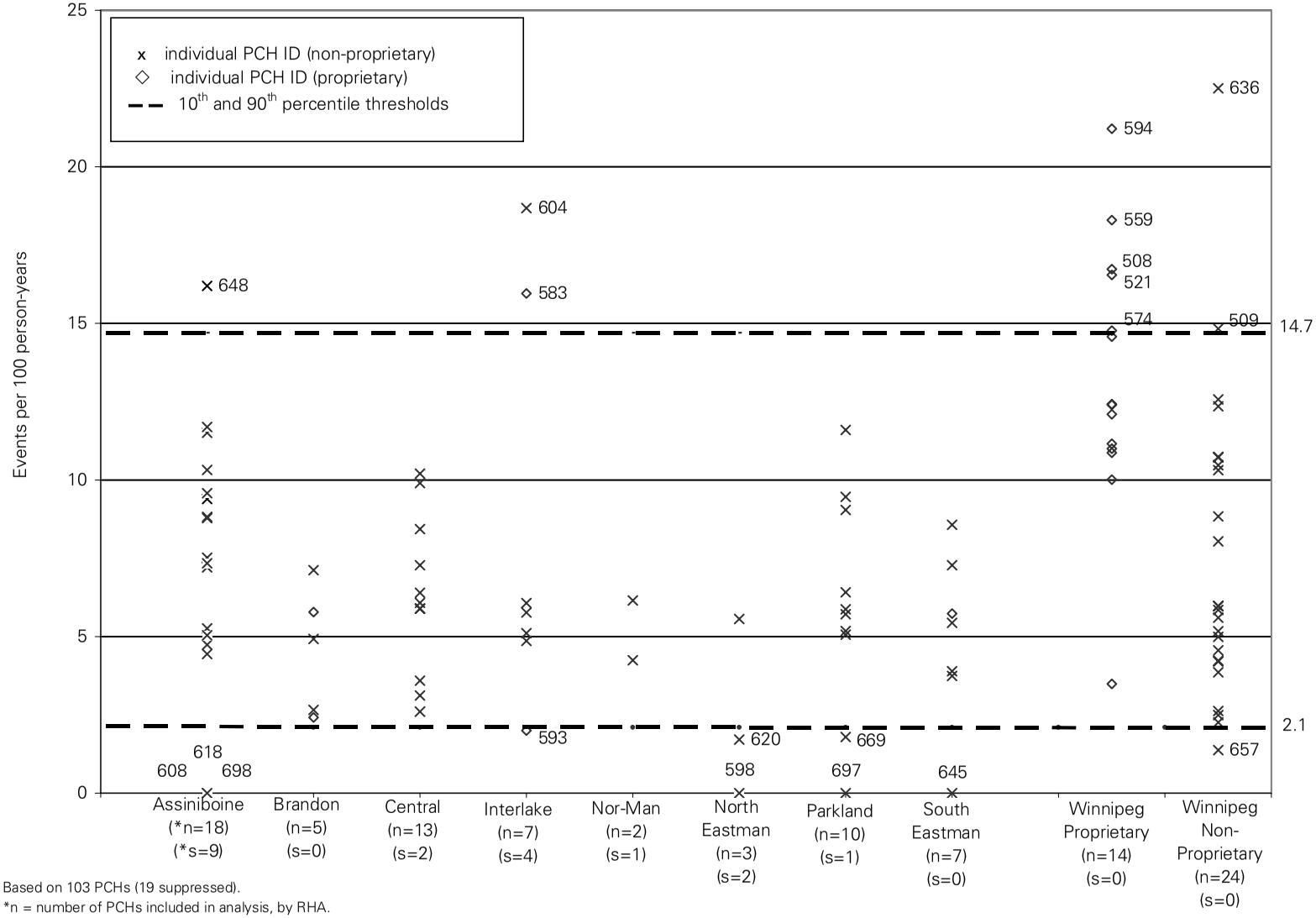
Rates of skin ulcers are reported for individual PCHs in Figure 6.10. To protect the anonymity of study participants, data were suppressed for 19 out of 122 PCHs prior to conducting any analyses (between one and five events of skin ulcers were reported in these PCHs during the study period). For the remaining facilities, the 10th and 90th percentiles were identified as PCHs where skin ulcers were reported at a rate of 2.1 and 14.7 events per 100 person-years respectively. Ten PCHs in Manitoba ranked above and below these percentiles. Data for these PCHs are summarized as follows:

- After adjusting for resident age, sex and level of care, rates of skin ulcers ranged from zero events (several PCHs) to 22.5 events per 100 person-years (ID 636 in the WRHA, a non-proprietary PCH).
- Of the PCHs that ranked below the 10th percentile for this QI (i.e., where rates of skin ulcers were lowest in Manitoba):
  - Six reported having no diagnosed cases of skin ulcers in the five-year study period. Three of these PCHS were located in the Assiniboine RHA (IDs 608, 618, 698), and one of these PCHs was located in each of the North Eastman (ID 598),

Parkland (ID 697) and South Eastman RHAs (ID 645).
    - Of the four remaining PCHs, one was located in each of the Winnipeg (ID 657, non-proprietary PCH, 1.4 event rate), North Eastman (ID 620, 1.7 event rate), Parkland (ID 669, 1.8 event rate), and Interlake RHAs (ID 593, 2.0 event rate).
- Of the 10 PCHs that ranked above the 90th percentile for this QI (i.e., where rates of skin ulcers were highest in Manitoba):
    - Five of these PCHs were proprietary facilities in the WRHA (ID 594, 21.2 event rate; ID 559, 18.3 event rate; ID 508, 16.7 event rate; ID 521, 16.6 event rate; ID 574, 14.8 event rate).
    - Two of these facilities were non-proprietary PCHs in the WRHA (ID 636, 22.5 event rate; ID 509, 14.8 event rate), while two PCHs were located in the Interlake RHA (ID 583, 16.0 event rate; ID 604, 18.7 event rate).
    - One PCH was located in the Assiniboine RHA (ID 648, 16.2 event rate).

Figure 6.10: Rates of Skin Ulcers, by PCH, by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



Based on 103 PCHs (19 suppressed).

*n = number of PCHs included in analysis, by RHA.

*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

6.3.5 Respiratory Infections

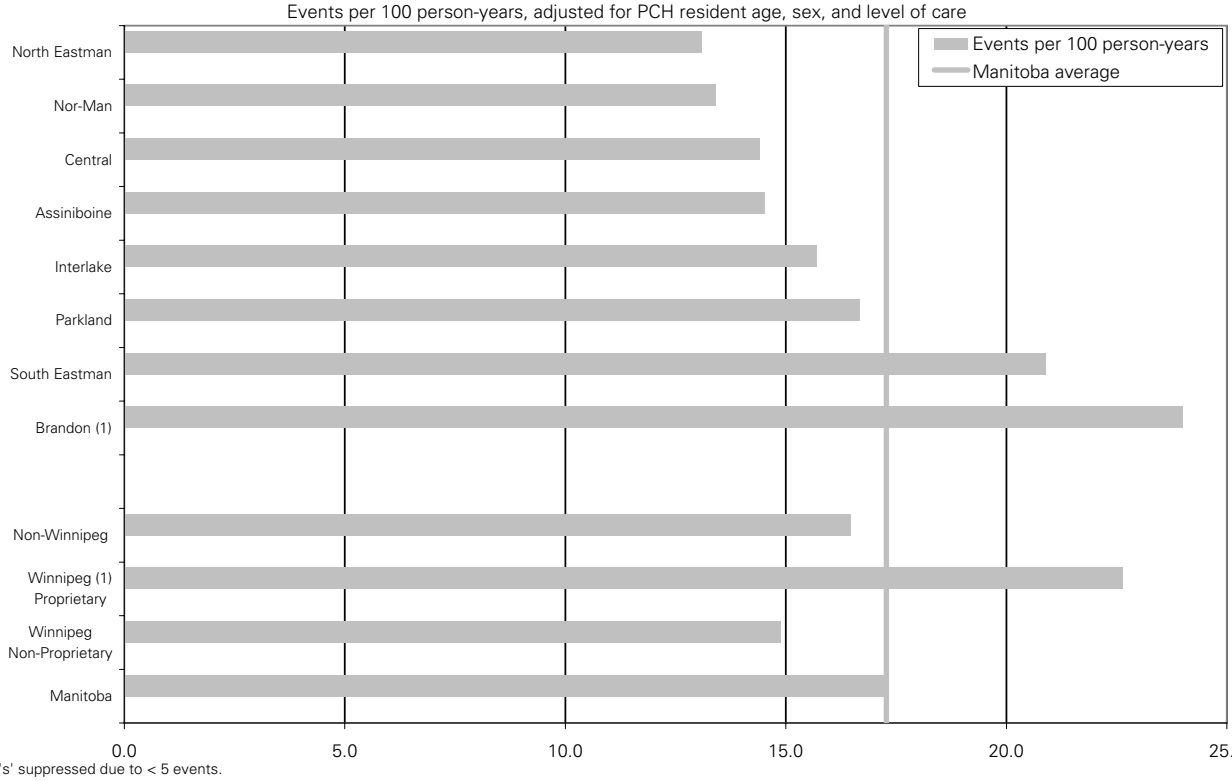
Respiratory infections were counted using the ICD-9-CM codes 480 through 487 using both the medical claims data and the hospital abstract data. These ICD-9-CM codes are used to diagnose various strains of viral and bacterial pneumonia (480, 481, 482, 483), as well as pneumonia derived from various strains of infectious diseases (484, 485, 486) and cases of influenza (487).

A period of 90 days was used to differentiate between care provided for the same versus different events of respiratory infections. In total, 7,958 cases of respiratory infections were reported for 6,109 residents; 77.5% of these residents experienced one respiratory infection during the study period, while 17.3% and 5.3% of these residents experienced two and three or more events of this QI respectively.

For PCHs in Manitoba, respiratory infections were reported at a rate of 17.3 events per 100 person-years. Events of this QI were reported at a similar rate in most RHAs, except that respiratory infections were reported more frequently in the Brandon RHA (24.0 event rate) and were also reported more frequently in proprietary PCHs in the WRHA (22.6 event rate) (p<.01).

Figure 6.11: Rates of Respiratory Infections, for Manitoba and by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



's' suppressed due to < 5 events.

'1' indicates that rates of respiratory infections were statistically different than the Manitoba average.

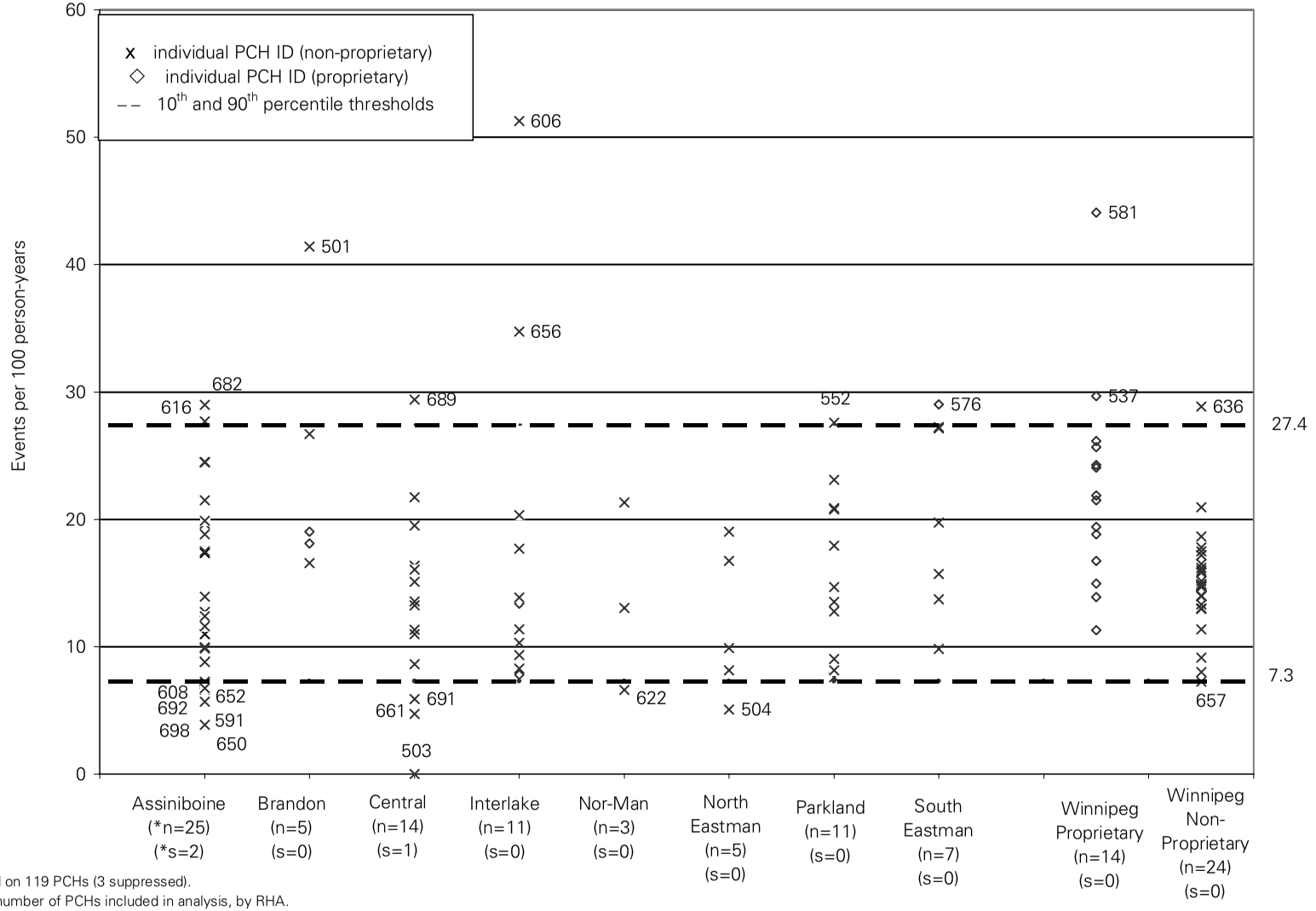
Source: Manitoba Centre for Health Policy, 2006

Rates of respiratory infections are reported for individual PCHs in Figure 6.12. To protect the anonymity of study participants, data were suppressed for three out of 122 PCHs prior to conducting any analyses (between one and five events of respiratory infections were reported in these PCHs during the study period). For the remaining 119 PCHs, the 10th and 90th percentiles were identified as facilities where respiratory infections were reported at a rate of 7.3 and 27.4 events per 100 person-years respectively. Eleven PCHs in Manitoba ranked above the 90th percentile and 12 PCHs ranked below the 10th percentile. Data for these PCHs are summarized as follows (Figure 6.12):

- After adjusting for resident age, sex and level of care, rates of respiratory infections in PCHs ranged from zero events (ID 503 in the Central RHA) to 51.3 events per 100 person-years (ID 606 in the Interlake RHA).
- Of the 12 PCHs that ranked below the 10th percentile for this QI (i.e., where rates of respiratory infections were lowest in Manitoba):
  - Six of these PCHs were located in the Assiniboine RHA (ID 692, 7.1 event rate; ID 698, 5.7 event rate; ID 652, 6.8 event rate; ID 591, 6.7 event rate; ID 650, 3.9 event rate; ID 608, 7.3 event rate).
  - Three of these PCHs were located in the Central RHA (ID 691, 5.9 event rate; ID 661, 4.7 event rate; ID 503, 0 events).
  - One PCH was located in each of the Nor-Man (ID 622, 6.6 event rate) and North Eastman RHAs (ID 504, 5.1 event rate) and the WRHA (ID 657, non-proprietary PCH, 7.3 event rate).
- Of the 11 PCHs that ranked above the 90th percentile (i.e., where rates of respiratory infections were highest in Manitoba)::
  - Three were located in the WRHA. Two of these PCHs were proprietary facilities (ID 581, 44.1 event rate; ID 537, 29.7 event rate), while one PCH was a non-proprietary facility (ID 636, 28.8 event rate).
  - Two were located in each of the Assiniboine (ID 616, 27.7 event rate; ID 682, 29.0 event rate) and Interlake RHAs (ID 656, 34.8 event rate; ID 606, 51.3 event rate).
  - One PCH was located in each of the Brandon (ID 501, 41.4 event rate), Central (ID 689, 29.4 event rate), Parkland (ID 552, 27.6 event rate), and South Eastman RHAs (ID 576, 29.0 event rate).

Figure 6.12: Rates of Respiratory Infections, by PCH, by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



Based on 119 PCHs (3 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

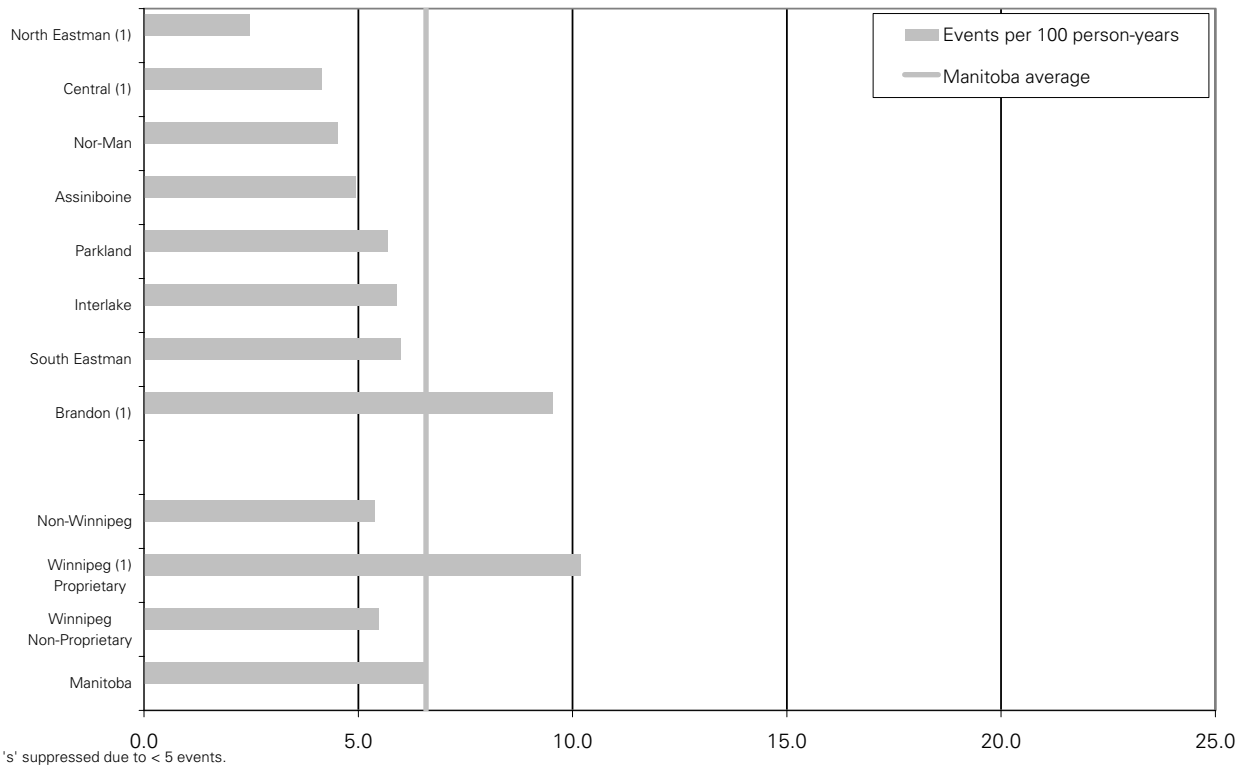
6.3.6 Fluid and Electrolyte Imbalances

The ICD-9-CM codes for this QI assess dehydration (276.5, from the hospital abstract data) and also related conditions such as hyperosmolality and hyposmolality (276, from the medical claims data). A 90-day period of time was used to differentiate between care provided for the same versus separate events of this QI. In total, 3,031 events of fluid and electrolyte imbalances were counted involving 2,575 PCH residents; 86.2% of these residents experienced one event of this QI, while 10.9% and 2.9% of these residents experienced this QI on two and three or more separate occasions respectively.

For PCHs in Manitoba, fluid and electrolyte imbalances were reported at a rate of 6.6 events per 100 person-years (Figure 6.13). These results were similar for the most RHAs. As exceptions, this QI was reported less frequently in each of the North Eastman (2.5 event rate) and Central RHAs (4.1 event rate). Conversely, rates of fluid and electrolyte imbalances were higher in the Brandon RHA (9.5 event rate) and also for proprietary PCHs in the WRHA (10.2 event rate) ($p<.01$).

Figure 6.13: Rates of Fluid and Electrolyte Imbalances, for Manitoba and by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



's' suppressed due to < 5 events.

'1' indicates that rates of fluid and electrolyte imbalances were statistically different than the Manitoba average.

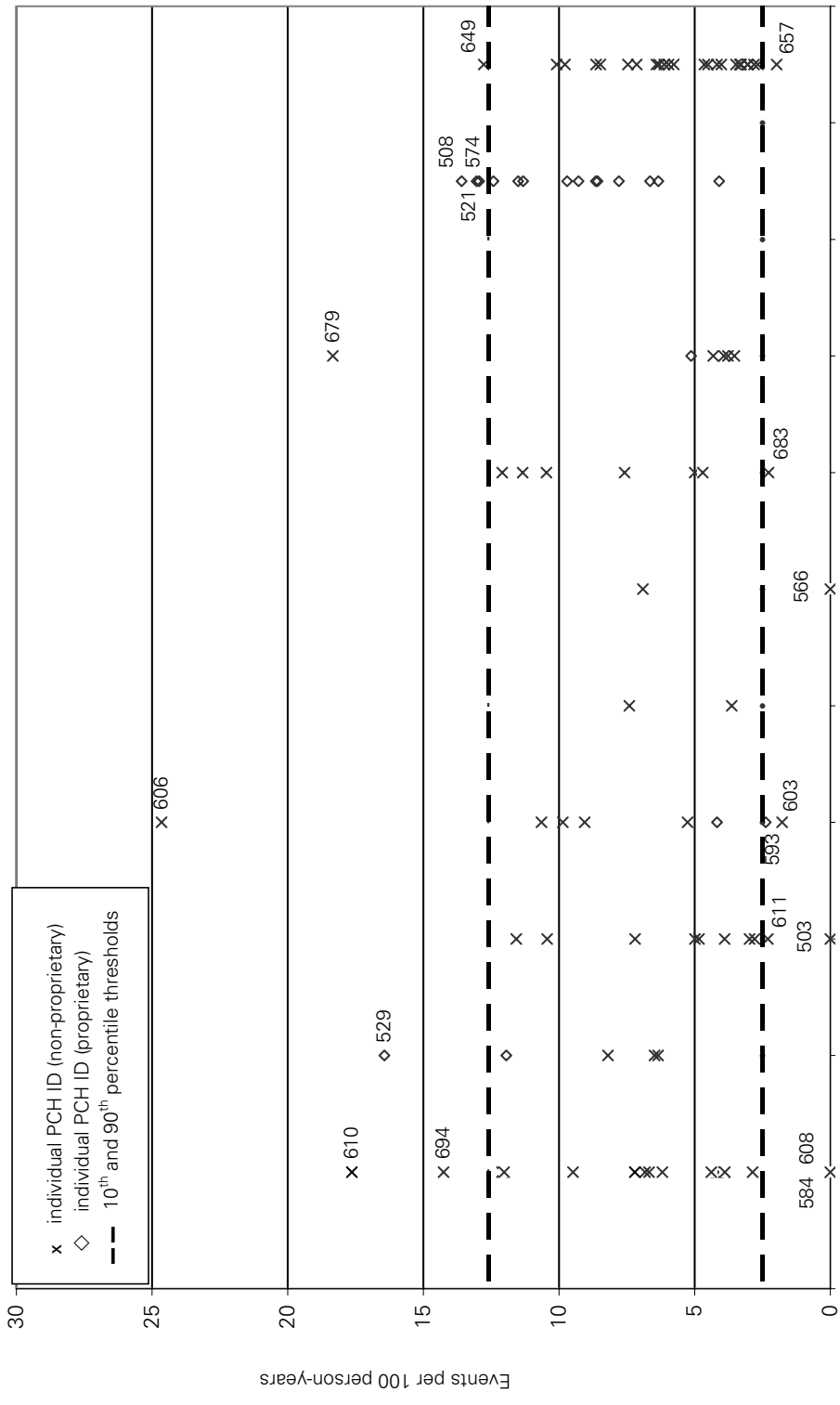
Source: Manitoba Centre for Health Policy, 2006

Rates of fluid and electrolyte imbalances are reported for individual PCHs in Figure 6.14. To protect the anonymity of study participants, data were suppressed for 28 out of 122 PCHs prior to conducting any analyses (between one and five events of fluid and electrolyte imbalances were reported in these PCHs during the study period). Based on data from the remaining 94 PCHs, the 10th and 90th percentiles were identified as facilities where fluid and electrolyte imbalances were reported at a rate of 2.5 and 12.6 events per 100 person-years respectively. Data for these PCHs are summarized as follows:

- After adjusting for resident age, sex and level of care, rates of fluid and electrolyte imbalances ranged from zero events (several PCHs), to 24.7 events per 100 person-years (ID 606 in the Interlake RHA).
- Nine PCHs ranked below the 10th percentile threshold for this QI (i.e., rates of respiratory infections were lowest in these PCHs).
  - Two of these PCHs were located in each of the Assiniboine (ID 584, 0 events; ID 608, 0 events), Central (ID 503, 0 events; ID 611, 2.3 event rate), and Interlake RHAs (ID 593, 2.4 event rate; ID 603, 1.8 event rate).
  - One PCH was located in each of the North Eastman (ID 566, 0 events) and Parkland RHAs (ID 683, 2.3 event rate), and the WRHA (ID 657, a non-proprietary PCH, 2.0 event rate).
- Nine PCHs ranked above the 90th percentile threshold (i.e., rates of respiratory infections were highest in these PCHs):
  - Four of these PCHs were located in the WRHA. Three of these PCHs were proprietary facilities (ID 508, 13.6 event rate; ID 521, 13.0 event rate; ID 574, 12.9 event rate), while one PCH was a non-proprietary facility (ID 649, 12.8 event rate).
  - Two of these PCHs were located in the Assiniboine RHA (ID 610, 17.6 event rate; ID 694, 14.3 event rate).
  - One PCH was located in each of the Interlake (ID 606, 24.7 event rate), South Eastman (ID 679, 18.3 event rate), and Brandon RHAs (ID 529, 16.4 event rate).

Figure 6.14: Rates of Fluid and Electrolyte Imbalances, by PCH, by RHA, from 1999/2000 – 2003/04

Events per 100 person-years, adjusted for PCH resident age, sex, and level of care



Source: Manitoba Centre for Health Policy, 2006

Based on 94 PCHs (28 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

CHAPTER 7: INDICATORS OF QUALITY CARE BASED ON MEDICATIONS THAT WERE DISPENSED TO PCH RESIDENTS

The QIs discussed in this chapter reflect the proportion of PCH residents who were dispensed select higher risk medications. These drug dispensing patterns are reported before residents were admitted to a PCH (i.e., commencing 100 days before their PCH admission date), and also shortly after they were admitted to a PCH (i.e., from 91 to 190 days after being admitted to a PCH). In each of these 100-day periods, outcomes for the drug-related QIs focus on the proportion of residents who were dispensed each of:

- Nine or more different categories of medications (polypharmacy).
- Short, intermediate and long-acting benzodiazepines.
- Typical as well as atypical antipsychotic medications.
- Select Beer's Criteria medications.

RHA-level comparisons in this chapter focus on changes in drug dispensing patterns as residents were admitted to a PCH. Comparisons between PCHs focus on the time shortly after residents were admitted to a PCH. Details about these drug-related QIs and specific study methodologies are provided in Chapter 4 of this report (see subsection titled 'QIs Based on the Proportion of PCH Residents Who Were Dispensed Select Medications'; Figure 4.2).

7.1 How to Interpret the Results in This Chapter

Data for each of the figures provided in this chapter are available at the following MCHP website:
http://www.umanitoba.ca/centres/mchp/reports.htm. These data include typically the standardized and crude proportion of residents who were dispensed QI-related drugs, as well as counts of these residents.

7.1.1 Interpreting the Results Presented for RHAs

Important points to recall when interpreting RHA-level data in this chapter are summarized as follows (Figure 7.1):

- Terminology in this chapter differentiate between prescribed and dispensed medications. The former of these terms refers to drugs prescribed by a physician compared to medications dispensed by a pharmacist. Administrative data at MCHP provides information about dispensed medications.
- Analyses in this chapter focus on a subset of residents who were admitted to a PCH during the study period (n=4,930 after excluding residents from PCHs where drugs were received from hospital-based pharmacies, residents who resided in a hospital for more than

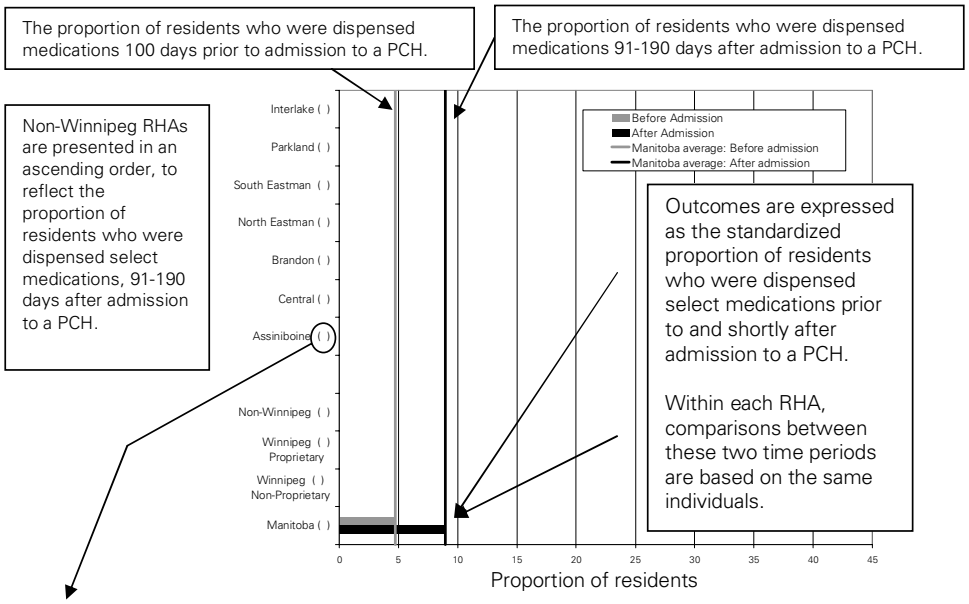
60 days before and shortly after they were admitted to a PCH, and also residents who died within 190 days of being admitted to a PCH).

- During each of the 100-day periods before and shortly after residents were admitted to a PCH, statistical testing was conducted to determine if RHA-level results were different than the Manitoba average (see symbols '1' and '2' in Figure 7.1). The caption 'p<.01' has been used to denote these statistical differences, after adjusting outcomes for differences in PCH resident age, sex and level of care. For more information on statistical testing, refer to Chapter 4, subsection 'Testing for Significant Differences'. Also refer to Chapter 4 for more information about the process of standardization (subsection 'A Note about Standardization'). Lastly, when reviewing the findings of this chapter, it is important to keep in mind that these results are at times based on a smaller sample of PCH residents; large inter-RHA differences in drug dispensing patterns are often reported that are not statistically significant.
- Within an RHA, changes in drug dispensing were also reported as residents were admitted to a PCH (i.e., using standardized data, comparing the proportion of residents who were dispensed QI-drugs before versus shortly after they were admitted to a PCH). Based on consultations with Working Group members, these intra-RHA changes in drug dispensing patterns were considered to be 'substantive' if this proportion of residents changed by more than 20% (see the symbol 't' in Figure 7.1).
- As per the methods described in Chapter 4 of this report (refer to Figure 4.2), participants were excluded from these analyses if they were hospitalized for more than 60 days, during *either* of the 100 days prior to or shortly after they were admitted to a PCH. These exclusion criteria do not consider inter-RHA differences in hospital lengths of stay less than 60 days, which may have influenced some of the results in this chapter. For example, a greater proportion of individuals were hospitalized for between 30 and 60 days while waiting for placement into proprietary PCHs in the WRHA versus PCHs in most other RHAs.[31] Drug-related data are not available during hospital lengths of stay, and these inter-RHA differences in

[31] Of the residents included in the analyses in this chapter (n=4,930), 21.7% resided in a hospital for between 31 and 60 days during the 100 days before they were admitted to a PCH. This result was similar in most RHAs, except that less than 20% of residents resided in a hospital for 31 to 60 days before being admitted to a PCH in the North Eastman, Interlake and Parkland RHAs, and also before being admitted to non-proprietary PCHs in the WRHA. Conversely, in the 100-day period before being admitted to a PCH, 29.0% of residents resided in a hospital for 31 to 60 days before they were admitted to proprietary PCHs in the WRHA.

hospital lengths of stay may help to explain some of the variation in drug dispensing patterns reported in this chapter. One of the recommendations of this research is to obtain the data on drugs dispensed from hospital-based pharmacies, for future analyses of changes in drug dispensing with admission to a PCH.

Figure 7.1: The Format of Figures Used to Present Rates of Drug-Related QIs, for the RHAs in Manitoba



's' suppressed if between one and five residents were dispensed QI-drugs during either time period.
'1' In the period 100 days before residents were admitted to a PCH, denotes significant differences compared to the Manitoba average (p<.01).
'2' In the period 91-190 days after residents were admitted to a PCH, denotes significant differences compared to the Manitoba average (p<.01).
't' Within each RHA, indicates if the standardized proportion of residents who were dispensed select drugs changed by more than 20% (i.e., was 'substantive'), as residents were admitted to a PCH (i.e., comparing the time 100 days before admission, to 91-190 days after admission to a PCH). Statistical testing was not used to compare these changes within an RHA due to the smaller sample used in these analyses.

Source: Manitoba Centre for Health Policy, 2006

- RHA-level data are provided for each of the drug-related QIs, using a format similar to Figure 7.1. The ordering of 'non-Winnipeg' RHAs is not necessarily the same for each of these drug categories. RHAs that are listed at the top of the vertical axis denote where residents were dispensed QI-related drugs least frequently, shortly after they were admitted to a PCH.
- A 'non-Winnipeg' value has been included for each QI-drug to reflect drug dispensing practices for all non-Winnipeg RHAs. Also, results for the WRHA have been divided into proprietary and non-proprietary PCHs. The ordering of non-Winnipeg, proprietary Winnipeg and non-proprietary Winnipeg PCHs is consistent for all of the figures in this chapter.

7.1.2 Interpreting Results Presented for Individual PCHs in Manitoba

PCH-level data focus on dispensing patterns 91 to 190 days (i.e., 'shortly after') residents were admitted to a PCH; 10th and 90th percentiles were used to denote PCHs where residents were least and most likely to have been dispensed QI-drugs during this period. This proportion of residents has been compared between PCHs after standardizing for differences in PCH resident age, sex and level of care.

Changes in drug dispensing patterns with admission to a PCH (i.e., 't' in Figure 7.1) are also reported in the text of this chapter, for PCHs that ranked above the 90th percentile. These changes in drug dispensing patterns are provided for the remaining PCHs at the following MCHP website: http://www.umanitoba.ca/centres/mchp/reports.htm. Data have been suppressed for PCHs when between one and five residents were dispensed QI-related drugs during either measurement periods. This is a standard practice at MCHP, conducted to protect the anonymity of study participants.

7.2 Highlights of the Results in This Chapter

7.2.1 A Summary of Results Provided for RHAs

For the RHAs, changes in drug dispensing patterns have been described for residents as they were admitted to a PCH. A summary of these changes is provided in Table 7.1 with the following highlights:

- In general, PCH residents in Manitoba were more likely to have been dispensed QI-drugs after versus before they were admitted to a PCH. For example, 4.8% of residents met the criteria for polypharmacy before they were admitted to a PCH compared to 9.0% of residents after this date (an 88.8% increase in these residents). Similar increases in drug dispensing were noted for antipsychotics (16.5% of residents were dispensed these medications before they were admitted to a PCH compared to 30.2% of residents after this date). Increases in drug dispensing were less extensive for benzodiazepines and Beer's Criteria medications; approximately 40% more residents were dispensed each of these types of drugs after versus before they were admitted to a PCH (16.8% of residents were dispensed benzodiazepines before they were admitted to a PCH compared to 23.7% of residents after this date; 7.6% of residents were dispensed Beer's Criteria medications before they were admitted to a PCH compared to 10.5% of residents after this date).

- Substantive increases in QI-drug dispensing were reported in most RHAs, for residents after versus before they were admitted to a PCH (see Table 7.1, column '% change after vs. prior to PCH admission'). In some but not all instances where less substantive increases in drug dispensing were reported, residents were more likely to have been already taking these medications before they were admitted to a PCH. For example, the proportion of residents in the North Eastman RHA who were dispensed antipsychotics increased minimally with admission to a PCH as compared to most other RHAs. However, in comparison to the Manitoba average, a greater proportion of these residents (32.0%) were already receiving antipsychotics when they were admitted to a PCH. These data demonstrate the complexity of assessing changes in drug utilization patterns with admission to a PCH.
- Despite inter-RHA differences in these aforementioned trends, a similar proportion of residents in most RHAs were dispensed QI-drugs once they were admitted to a PCH (see Table 7.1, column labelled 'Inter-RHA differences after PCH admission'). For example, 23.7% of individuals in Manitoba were dispensed benzodiazepines shortly after they were admitted to a PCH in Manitoba. This proportion of residents was similar in most RHAs, except that individuals in proprietary PCHs in the WRHA were less likely to have been dispensed these medications, and residents in the Brandon RHA were more likely to have been dispensed these medications ($p<.01$). In many instances these inter-RHA differences seem quite large (e.g., shortly after they were admitted to a PCH, 3.9% of Parkland residents were dispensed Beer's Citeria drugs versus 10.5% of PCH residents in Manitoba), but are not statistically significant. A relatively small sample was used to assess drug dispensing patterns in this research.

Table 7.1: The proportion of residents who were dispensed QI-drugs prior to and shortly after admission to a PCH: A summary of RHA-level results (results are adjusted for differences between RHAs in resident age, sex and level of care*)

Polypharmacy

RHA	% dispensed drug prior to PCH admission	Inter-RHA differences prior to PCH admission **	% dispensed drug after PCH admission	Inter-RHA differences after PCH admission †	% change after vs. prior to PCH Admission ^
Assiniboine	6.6	ns	13.2	↑	100.6
Brandon	5.6	ns	11.1	ns	100.0
Central	6.9	ns	12.5	ns	81.2
Interlake	7.4	ns	8.6	ns	17.3
North Eastman	9.4	ns	9.9	ns	5.2
Parkland	8.5	ns	9.8	ns	15.3
South Eastman	9.1	↑	9.8	ns	7.7
Winnipeg (Non-Proprietary)	3.5	ns	7.8	ns	121.7
Winnipeg (Proprietary)	3.1	↓	7.9	ns	156.5
Manitoba	4.8		9.0		88.8

Antipsychotics

RHA	% dispensed drug prior to PCH admission	Inter-RHA differences prior to PCH admission **	% dispensed drug after PCH admission	Inter-RHA differences after PCH admission †	% change after vs. prior to PCH Admission ^
Assiniboine	12.4	ns	26.3	ns	112.9
Brandon	9.2	↓	17.0	↓	84.2
Central	23.9	↑	35.4	ns	48.0
Interlake	19.3	ns	30.7	ns	58.9
North Eastman	32.0	↑	34.5	ns	7.7
Parkland	15.5	ns	27.3	ns	76.1
South Eastman	18.6	ns	28.5	ns	53.5
Winnipeg (Non-Proprietary)	14.0	ns	27.7	ns	98.1
Winnipeg (Proprietary)	17.8	ns	34.3	↑	92.1
Manitoba	16.5		30.2		83.7

Benzodiazepines

RHA	% dispensed drug prior to PCH admission	Inter-RHA differences prior to PCH admission **	% dispensed drug after PCH admission	Inter-RHA differences after PCH admission †	% change after vs. prior to PCH Admission ^
Assiniboine	26.1	↑	29.5	ns	13.3
Brandon	29.9	↑	32.9	↑	10.1
Central	22.6	ns	28.1	ns	24.5
Interlake	18.4	ns	22.7	ns	23.3
North Eastman	21.8	ns	21.8	ns	0.0
Parkland	22.4	ns	21.8	ns	-2.9
South Eastman	25.9	↑	31.0	ns	20.0
Winnipeg (Non-Proprietary)	13.5	↓	23.8	ns	77.0
Winnipeg (Proprietary)	12.6	↓	19.5	↓	55.4
Manitoba	16.8		23.7		40.6

Table 7.1 continued

Beer's Criteria

RHA	% dispensed drug prior to PCH admission	Inter-RHA differences prior to PCH admission **	% dispensed drug after PCH admission	Inter-RHA differences after PCH admission †	% change after vs. prior to PCH Admission ^
Assiniboine	9.9	ns	13.8	ns	39.5
Brandon	11.5	ns	15.4	ns	33.3
Central	13.3	↑	12.8	ns	-3.4
Interlake	8.1	ns	10.6	ns	31.3
North Eastman	13.8	ns	13.8	ns	0.0
Parkland	4.6	ns	3.9	ns	-14.2
South Eastman	13.9	↑	11.7	ns	-15.7
Winnipeg (Non-Proprietary)	5.6	↓	9.4	ns	69.1
Winnipeg (Proprietary)	6.6	ns	9.8	ns	48.5
Manitoba	7.6		10.5		37.6

* Results for antipsychotic medications are also adjusted for differences between RHAs in the proportion of residents who were diagnosed with dementia.

** Statistically compares (p<.01) the column '% dispensed drug prior to PCH admission' between each RHA and the Manitoba average. For example, in the period shortly before residents were admitted to a PCH, the proportion of individuals who were dispensed polypharmacy medications was similar between most RHAs and the Manitoba average ('ns'). However, significantly more soon-to-be residents were dispensed polypharmacy medications in the South Eastman RHA versus the Manitoba average (' ↑ '), and significantly fewer soon-to-be residents were dispensed polypharmacy medications in Winnipeg proprietary PCHs versus the Manitoba average ('↓'). In many instances these inter-RHA differences seem quite large but are not statistically significant, as a relatively small sample was used to assess drug dispensing patterns in this research.

† Statistically compares (p<.01) the column '% dispensed drug after PCH admission' between each RHA and the Manitoba average. For example, in the period shortly after residents were admitted to a PCH, the proportion of residents who were dispensed polypharmacy medications was similar between most RHAs and the Manitoba average ('ns'). However, significantly more residents were dispensed polypharmacy medications in the Assiniboine RHA versus the Manitoba average (' ↑ '). In many instances these inter-RHA differences seem quite large but are not statistically significant, as a relatively small sample was used to assess drug dispensing patterns in this research.

^ Calculated using Manitoba data for polypharmacy as an example: (9.0 – 4.8) / 4.8 x 100 = an 88.8% increase in the proportion of residents who were dispensed polypharmacy medications (with rounding). In each RHA, a 20% change in the proportion of residents who were dispensed QI-drugs with admission to a PCH, was considered as substantive.

Source: Manitoba Centre for Health Policy, 2006

7.2.2 A Summary of Results Provided for Individual PCHs

PCH-level data in this chapter focus on drug dispensing patterns shortly after residents were admitted to a PCH (i.e., during the period 91 to 190 days after residents were admitted to a PCH). Of the 89 PCHs that were included in these analyses,[32] 24 ranked below the 10th percentile for at least

one of the QI-drugs (Table 7.2). This means that QI-drugs were dispensed least frequently in these PCHs. Two of these PCHs ranked below this threshold for two of the drug-related QIs, and one of these PCHs ranked below the 10th percentile threshold for three of the four drug-related QIs

[32] The results of this chapter exclude PCHs in which medications were provided from a hospital-based pharmacy for at least a portion of the five-year study period.

assessed in this report. It may be possible to emulate the drug prescribing practices in these PCHs, to help reduce the use of higher risk drugs in select other PCHs.

Table 7.2: PCHs that were ranked below the 10th percentile threshold for one or more drug-related QIs, by RHA (drug-related QIs were reported least frequently in these PCHs)

RHA	# (%) of PCHs below threshold		Below threshold for one QI	Below threshold for 2 QIs*	Below threshold for 3 QIs*
Assiniboine (n=19)	7	(36.8%)	5	687	671
Brandon (n=4)	1	(25.0%)	1	/	/
Central (n=7)	3	(42.9%)	3	/	/
Interlake (n=11)	4	(36.4%)	4	/	/
North Eastman (n=3)	1	(33.3%)	1	/	/
Parkland (n=6)	1	(16.7%)	1	/	/
South Eastman (n=7)	1	(14.3%)	0	645	/
Winnipeg (n=18) (Non-Proprietary)	3	(16.7%)	3	/	/
Winnipeg (n=14) (Proprietary)	3	(21.4%)	3	/	/
Manitoba (n=89)	24	(27.0%)	21	2	1

* IDs are presented for PCHs that ranked below the 10th percentile for multiple QI-drugs.
See Appendix B for a link between the ID and name of these PCHs.

Source: Manitoba Centre for Health Policy, 2006

Of the 89 PCHs that were included in these analyses, 16 ranked above the 10th percentile for at least one of the QI-drugs (Table 7.3). This means that QI-drugs were dispensed most frequently in these PCHs. Three of these PCHs ranked above this threshold for two of the drug-related QIs and one of these PCHs ranked above the 90th percentile threshold for three of the four drug-related QIs assessed in this research.

Table 7.3: PCHs that were ranked above the 90th percentile threshold for one or more drug-related QIs, by RHA (drug-related QIs were reported most frequently in these PCHs)

RHA	# (%) of PCHs above threshold		Above threshold for one QI	Above threshold for 2 QIs*	Above threshold for 3 QIs*
Assiniboine (n=19)	4	(21.1%)	3	682	/
Brandon (n=4)	1	(25.0%)	0	529	/
Central (n=7)	1	(14.3%)	0	/	659
Interlake (n=11)	3	(27.3%)	3	/	/
North Eastman (n=3)	0	(0.0%)	0	/	/
Parkland (n=6)	1	(16.7%)	1	/	/
South Eastman (n=7)	2	(28.6%)	1	679	/
Winnipeg (n=18) (Non-Proprietary)	0	(0.0%)	0	/	/
Winnipeg (n=14) (Proprietary)	4	(28.6%)	4	/	/
Manitoba (n=89)	16	(18.0%)	12	3	1

* IDs are presented for PCHs that ranked above the 90th percentile for multiple QI-drugs.
See Appendix B for a link between the ID and name of these PCHs.

Source: Manitoba Centre for Health Policy, 2006

7.3 Results for Individual Drug-Related QIs

7.3.1 PCH Residents Who Were Dispensed Nine or More Medications (Polypharmacy)

An Introduction to Polypharmacy

Most researchers have defined polypharmacy as people's use of more than one type of medication at the same time. The number of medications used to define polypharmacy varies substantially in the literature, and includes people who have been prescribed two or more medications (Rosholm et al., 1998; Veehof et al., 2000), five or more medications (Fillit et al., 1999; Flaherty et al., 2000; Koh et al., 2003; Mamun et al., 2004), as well as nine or more medications (Jensdottir et al., 2003; Zimmerman, 1998). Researchers have typically assessed polypharmacy using chart reviews (e.g., (Fillit et al., 1999; Flaherty et al., 2000; Koh et al., 2003; Mamun et al., 2004) or prescription databases (Rosholm et al., 1998; Veehof et al., 2000). Some of these latter researchers have used three consecutive months of prescription data to estimate the prevalence of polypharmacy drug prescribing. Regardless of the strategy used to define polypharmacy, the major caution related to this phenomenon is an increased risk of adverse drug reactions (Clatney et al., 2006; Wyles and Rehman, 2005).

The number of different categories of drugs dispensed to residents before and after they were admitted to a PCH are presented in Table 7.4. In Manitoba, 25.2% of study participants received no medications 100 days before they were admitted to a PCH, as compared to 5.9% of these individuals shortly after they were admitted to a PCH. About 47% of participants

were dispensed between one and four different categories of medications during either of these time periods. While 22.5% of residents were dispensed between five and eight different categories of medications before being admitted to a PCH, 37.3% of residents were dispensed this number of medications shortly after this time.

Table 7.4: Percent of PCH residents who were dispensed drugs from various medication categories, prior to and shortly after they were admitted to a PCH

Categories of Different Medications*	100 Days Prior to PCH Admission	91-190 Days Following Admission to a PCH
0	1,244 (25.2)	293 (5.9)
1-4	2,343 (47.5)	2,355 (47.8)
5-8	1,109 (22.5)	1,840 (37.3)
9-12	214 (4.4)	406 (8.2)
13+	20 (0.4)	36 (0.8)

* Categories of medications were differentiated using the 4th level of the Anatomical, Therapeutic and Chemical (ATC) drug classification system (WHO Collaborating Centre for Drug Statistics Methodology, 2005), including drugs that were dispensed in a solid and liquid format. Drugs that were dispensed normally as OTC medications were excluded from these analyses. See the Glossary in this report for a definition of OTC medications.

Source: Manitoba Centre for Health Policy, 2006

In this research, polypharmacy is defined as the proportion of PCH residents who were dispensed nine or more different categories of medications during a 100-day period. This definition of polypharmacy has some similarities to the definition for polypharmacy used in the Resident Assessment Instrument for PCHs (Moty et al., 2003; Zimmerman et al., 1995). Using this definition, 4.8% of Manitobans met the criteria for polypharmacy before they were admitted to a PCH compared to 9.0% of residents shortly after this date.

For people meeting the criterion for polypharmacy, what types of medications were they taking? In total, 70.4% of polypharmacy residents were dispensed sulfonamides (diuretics) shortly after they were admitted to a PCH, while 53.6% of these residents were dispensed ACE-inhibitors during this time (data not shown). Between 30% and 40% of polypharmacy residents were also dispensed each of proton pump inhibitors, potassium, cardiac glycosides and vasodilators used in cardiac diseases, as well as benzodiazepine derivatives and selective serotonin reuptake inhibitors.[33] These follow-up data provide some further understanding as to the breakdown of medications that were included in the definition of polypharmacy, for residents shortly after they were admitted to a PCH.

[33] These values exceed 100% as residents were dispensed several categories of medications.

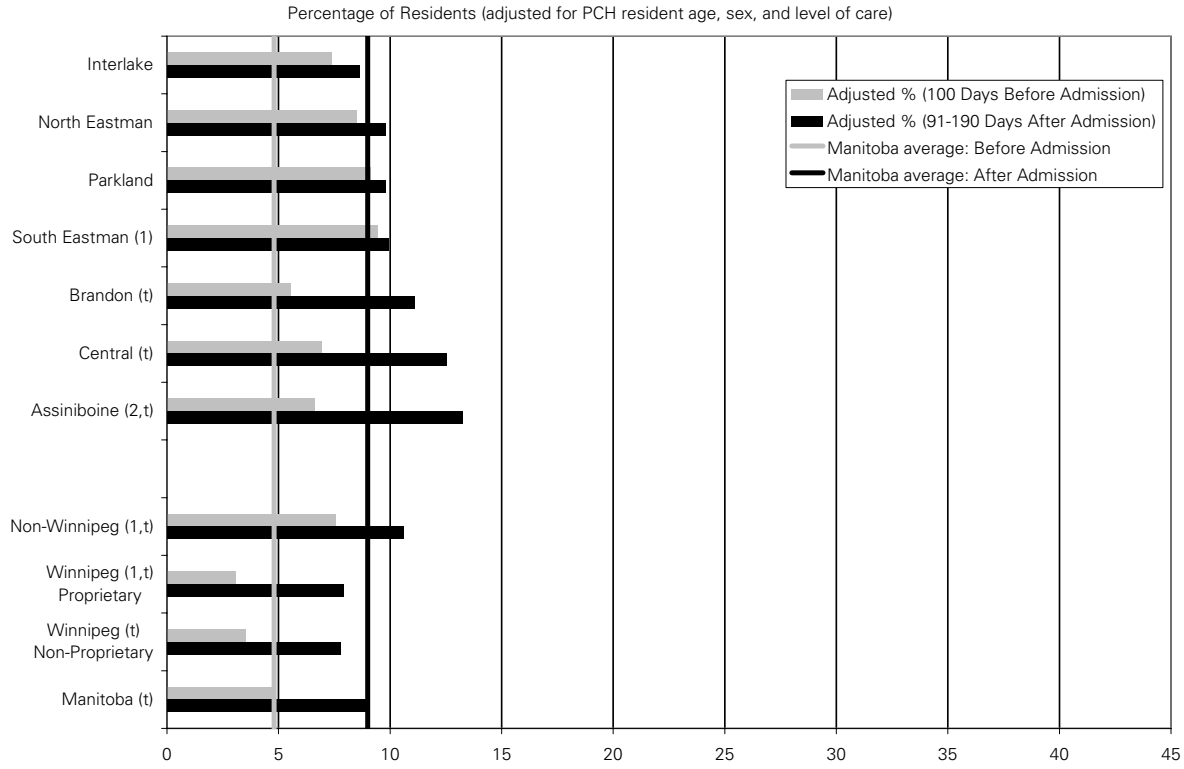
Polypharmacy and RHA-Level Data

In the 100-day period before they were admitted to a PCH, 4.8% of participants were dispensed at least nine different categories of medications (Figure 7.2). After adjusting for differences in resident age, sex and the level of care assigned on admission to a PCH, this proportion of residents was similar for most RHAs. However, compared to the Manitoba average, more residents met the criteria for polypharmacy in the South Eastman RHA (9.4% of residents) ($p<.01$). Conversely, fewer residents of proprietary PCHs in the WRHA were dispensed nine or more different categories of medications prior to being admitted to a PCH (3.1% of these residents) ($p<.01$).

In Manitoba 9.0% of residents met the criteria for polypharmacy shortly after they were admitted to a PCH, compared to 4.8% of residents who met this criteria 100 days before they were admitted to a PCH (an 88.9% increase in residents) (Figure 7.2). After adjusting for differences in resident age, sex and the level of care assigned on admission to a PCH, RHA-level changes in polypharmacy dispensing patterns were reported as follows:

- Increases in polypharmacy dispensing with admission to a PCH were most substantive for residents of proprietary PCHs in the WRHA (3.1% of residents were dispensed nine or more different categories of medications prior to being admitted to a PCH versus 7.9% of residents after this time, a 154.8% increase in residents—summarized as '3.1%, 7.9%, a 154.8% increase in residents'). Similar increases in polypharmacy dispensing were noted for non-proprietary PCHs in the WRHA (3.5%, 7.8%, a 121.7% increase in residents), and also for residents in the Brandon (5.6%, 11.1%, a 100% increase in residents), Assiniboine (6.6%, 13.2%, a 100.6% increase in residents) and Central RHAs (6.9%, 12.5%, an 81.2% increase in residents).
- Non-substantive increases in polypharmacy dispensing were reported for some RHAs (e.g., Interlake, Parkland, South Eastman, and North Eastman). Compared to PCH residents in other RHAs, residents in these RHAs were most likely to have been dispensed polypharmacy medications before they were admitted to a PCH.
- After being admitted to a PCH, the proportion of residents who met the criteria for polypharmacy was fairly consistent in all RHAs (Figure 7.2). As an exception, compared to the Manitoba average, more residents in the Assiniboine RHA were dispensed nine or more different classes of drugs during this time ($p<.01$).

Figure 7.2: Percent of Admitted Residents Who Were Dispensed Nine or More Different Drugs Before and After Being Admitted to a PCH, for Manitoba and by RHA, 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' In the period of time prior to being admmitted to a PCH, indicates that the percent of residents dispensed 9+ different drugs was statistically different than the Manitoba average.
'2' In the period of time after being admmitted to a PCH, indicates that the percent of residentsdispensed 9+ different drugs was statistically different than the Manitoba average.
't' indicates that the percent of residents dispensed 9+ different drugs increased substantially (by more than 20%) with admission to a PCH.

Source: Manitoba Centre for Health Policy, 2006

Polypharmacy and PCH-Level Data

PCH-level data focus on the time 91 to 190 days after residents were admitted to a PCH, and polypharmacy dispensing for PCHs during this time is summarized in Figure 7.3. To protect the anonymity of study participants, data for this drug-related QI were suppressed for 46 out of 89 PCHs (PCHs were excluded from this analysis when between one and five residents met the criterion for polypharmacy 91 to 190 days after they were admitted to the PCH). For the remaining 43 PCHs, the 10th and 90th percentiles were identified as facilities where 2.2% and 18.6% of residents met the criteria for polypharmacy respectively. Five PCHs ranked above the 90th percentile for this QI and nine PCHs ranked below the 10th percentile.[34] Data for these PCHs are summarized as follows:

- After adjusting for differences in resident age, sex and level of care on admission to a PCH, the proportion of residents who were

[34] As analyses were conducted on 43 PCHs for this drug-related QI, only four or five facilities should have been ranked below the 10th percentile. However, nine PCHs had no residents who met the criteria for polypharmacy. The 10th percentile threshold was therefore calculated as the average between these facilities and the PCH with the lowest 'non-zero' value. This strategy was used to ensure that a realistic 10th percentile threshold was established for this QI.

dispensed polypharmacy medications ranged from zero residents (several PCHs) to 22.6% of residents (ID 601, Assiniboine RHA).

- In each of the PCHs that ranked below the 10th percentile, no residents were dispensed nine or more different medications.
  - Three of these PCHs were located in the Assiniboine RHA (IDs 671, 698, 687).
  - Two of these PCHs were located in each of the Central (ID 503, 654) and Interlake RHAs (ID 603, 612).
  - One PCH was located in each of the North Eastman (ID 566) and South Eastman RHAs (ID 645).
- Five PCHs ranked above the 90th percentile for this drug-related QI (residents in these PCHs were most likely to meet the criteria for polypharmacy):
  - Two of these PCHs were located in the Assiniboine RHA (ID 601, 22.6% of residents met the criteria for polypharmacy; ID 682, 19.7% of residents).
  - One of these PCHs was located in each of the Brandon (ID 529, 18.6% of residents), South Eastman (ID 679, 18.6% of residents), and Central RHAs (ID 659, 19.3% of residents).

Changes in polypharmacy drug dispensing with admission to a PCH (i.e., 't' in Figure 7.1) are summarized in the following text, for PCHs that ranked above the 90th percentile in Figure 7.3.[35] Results for these PCHs are summarized as follows:

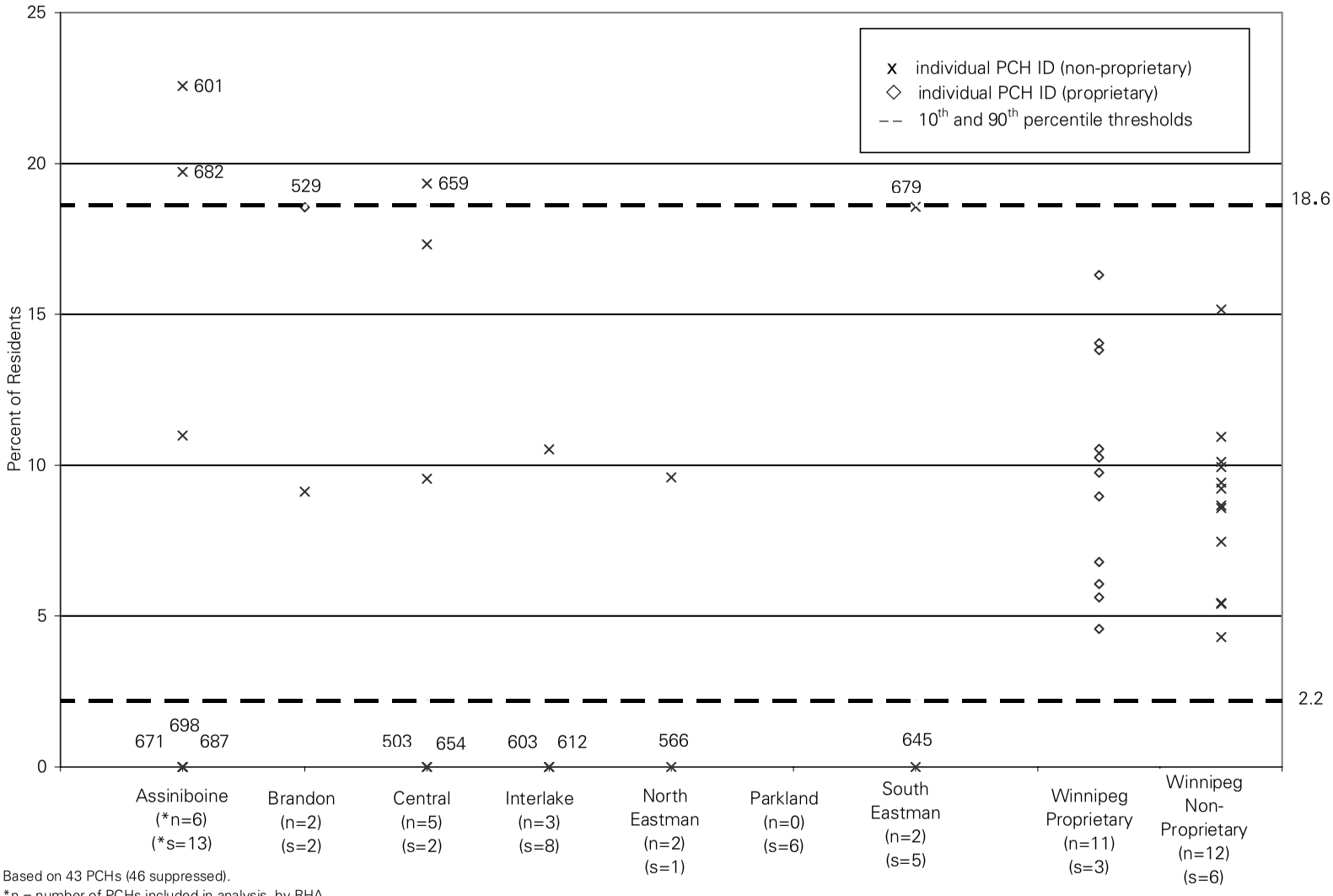
- These data were suppressed for three of the five PCHs that were ranked above the 90th percentile in Figure 7.3 (in each of these three PCHs, between one and five individuals met the criteria for polypharmacy before and shortly after they were admitted to a PCH).
- In PCH ID 601 (Assiniboine RHA), 14.4% of residents met the criteria for polypharmacy before they were admitted to this PCH compared to 22.6% of residents shortly after this time. In other words, the proportion of individuals who met the criteria for polypharmacy increased by 57.2%, after versus before they were admitted to this PCH. The results demonstrated for this PCH in Figure 7.3 can therefore be attributed to increasing trends in drug use with admission to a PCH.

[35] To access these results for other PCHs, refer to the section in this chapter titled "How to Interpret the Results of this Chapter', subsection 'Interpreting the Results Presented for Individuals PCHs in Manitoba'.

- Shortly after they were admitted to a PCH, residents in PCH ID 679 (South Eastman RHA) were among the most likely in Manitoba to meet the criteria for polypharmacy (Figure 7.3). However, trends in polypharmacy drug dispensing actually decreased as residents were admitted to this PCH; 21.0% of individuals met the criteria for polypharmacy before they were admitted to this PCH compared to 18.6% of these individuals shortly after this time. In other words, 11.5% fewer residents met the criteria for polypharmacy after versus before they were admitted to this PCH. The results for PCH ID 679 in Figure 7.3 can therefore be attributed partly to drug dispensing practices before residents were admitted to this PCH.

Figure 7.3: Percent of Admitted Residents Who Were Dispensed Nine or More Different Drugs 91-190 Days After Being Admitted to a PCH, by PCH, by RHA, from 1999/2000 – 2003/04

Percentage of Residents (adjusted for PCH resident age, sex, and level of care)



Based on 43 PCHs (46 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

7.3.2 PCH Residents Who Were Dispensed Benzodiazepines

An Introduction to Benzodiazepines

Several researchers have analyzed benzodiazepine use in older adults and PCH residents (Beers et al., 1992; Dhall et al., 2006; Dhalla et al., 2002; Tamblyn et al., 1994; Zimmerman et al., 1995). Cautions associated with these medications include an increased risk of falls and fractures as well as increased patient confusion, withdrawal from others and dependence on these medications (Mustard and Mayer 1997; Wagner et al., 2004). While some researchers have advocated that short-acting benzodiazepines are a safer alternative, several researchers have demonstrated the negative effects of benzodiazepines regardless of the medication half-life (Wagner et al., 2004).

Overall, 23.7% of residents who were included in the analysis of drug-related QIs (n=1,167 out of 4,930) were dispensed benzodiazepines shortly after they were admitted to a PCH. Of these residents, the majority received an intermediate-acting agent (Table 7.5), while a smaller proportion of these residents were dispensed a short- or a long-acting agent. Lorazepam was dispensed to the majority (54.7%) of these individuals while fewer residents were dispensed Zopiclone (24.1% of residents) and Temazepam (15.6% of residents). These data help to define the types of benzodiazepines that were dispensed to PCH residents during the five-year study period of this research.

Table 7.5: For PCH residents who were dispensed benzodiazepines 91-190 days after being admitted to a PCH, the percent who were dispensed short-, intermediate- and long-acting agents

Drug	Of residents who were dispensed benzodiazepines, the % who were dispensed different agents*	Half-life of Drug (hours)**
Short-acting		
Zopiclone	24.1	4 – 7
Triazolam	0.9	1.5 – 5
Intermediate-acting		
Lorazepam	54.7	10 – 20
Temazepam	15.6	10 – 20
Clonazepam	10.4	20 – 80
Alprazolam	4.0	12 – 15
Oxazepam	3.7	5 – 15
Bromazepam	0.6	8 – 30
Nitrazepam	0.04	16 – 55
Long-acting		
Diazepam	4.0	100
Chlordiazepoxide	0.5	100
Flurazepam	0.5	100

* Total percent is greater than 100%, as some individuals were dispensed more than one type of benzodiazepine medication.

** Defined as the amount of time it takes before half of the active elements of the drug are either eliminated or broken down by the body (Canadian Pharmacists Association, 2005).

Source: Canadian Pharmacists Association, 2005

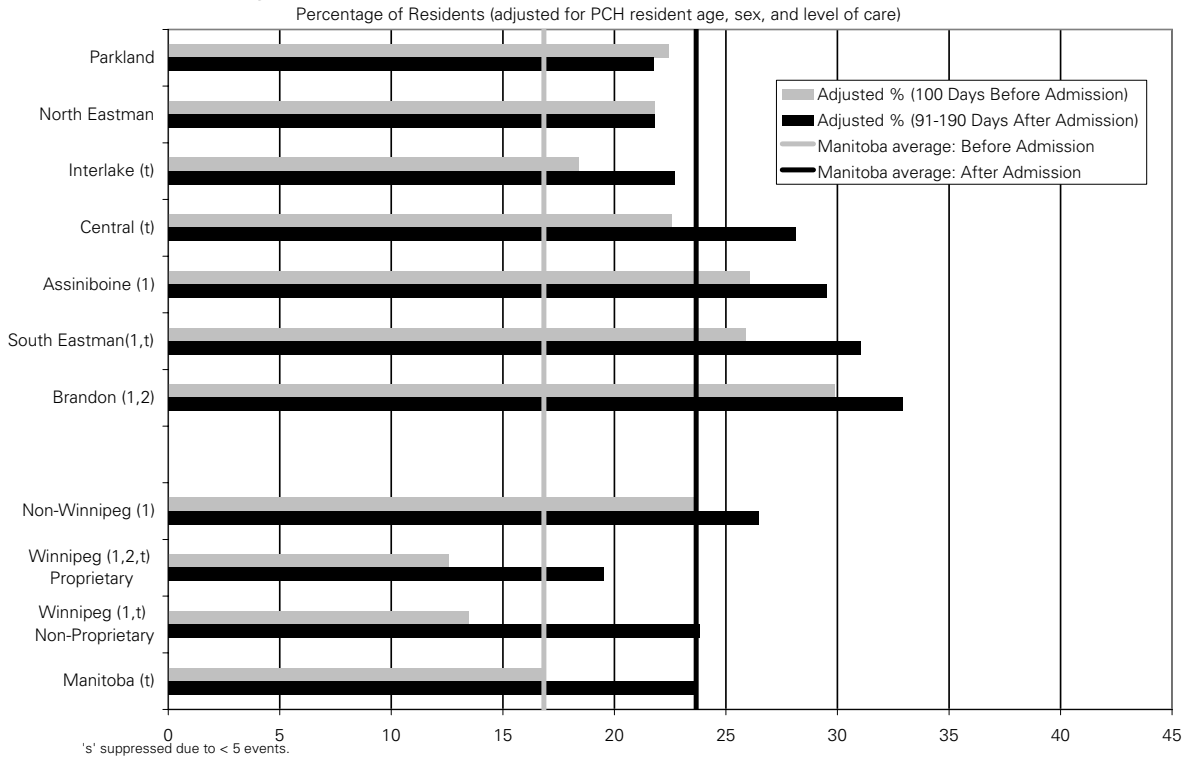
Benzodiazepine Dispensing and RHA-Level Data

Prior to being admitted to a PCH, 16.8% of study participants were dispensed benzodiazepines (Figure 7.4). While this proportion of individuals was similar for some RHAs, soon-to-be PCH residents in the Assiniboine, South Eastman and Brandon RHAs were more likely to have been dispensed benzodiazepines ($p<.01$). Conversely, soon-to-be PCH residents in the WRHA were less likely to have been dispensed benzodiazepines, and this result was demonstrated for residents who were admitted to both proprietary and non-proprietary facilities ($p<.01$).

In Manitoba, 23.7% of residents were dispensed benzodiazepines shortly after they were admitted to a PCH, compared to 16.8% of residents before this time (a 40.6% increase in residents) (Figure 7.4). After adjusting for differences in resident age, sex and the level of care assigned at the time of admission to a PCH, RHA-specific data are summarized as follows:

- Benzodiazepine dispensing increased most substantially for non-proprietary PCHs in the WRHA; 13.5% of residents in these PCHs were dispensed benzodiazepines prior to being admitted to a PCH versus 23.8% of residents after this date (a 77.0% increase in residents who were dispensed benzodiazepines—summarized as '13.5%, 23.8%, a 77.0% increase in residents'). Substantive increases in benzodiazepine dispensing were also recorded for proprietary PCHs in the WRHA (12.6%, 19.5%, a 55.4% increase in residents) and also for PCHs in the Interlake (18.4%, 22.7%, a 23.3% increase in residents), Central (22.6%, 28.1%, a 24.5% increase in residents), and South Eastman RHAs (25.9, 31.0, a 20.0% increase in residents).
- Despite the substantial increases in benzodiazepine dispensing reported for some RHAs, a similar proportion of residents in most RHAs were dispensed these medications shortly after they were admitted to a PCH (Figure 7.4). As an exception, compared to the Manitoba average, PCH residents in the Brandon RHA were more likely to have been dispensed benzodiazepines shortly after they were admitted to a PCH (refer to '2' in Figure 7.4) ($p<.01$). Benzodiazepines were dispensed to many of these residents before they were admitted to a PCH. Also, despite the substantive increase in benzodiazepine use for residents who were admitted to proprietary PCHs in the WRHA, these residents were still less likely (compared to the Manitoba average) to have been dispensed these medications shortly after being admitted to a PCH.

Figure 7.4: Percent of Admitted Residents Who Were Dispensed Benzodiazepines Before and After Being Admitted to a PCH, for Manitoba and by RHA, from 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' In the period of time prior to being admmitted to a PCH, indicates that the percent of residents dispensed benzodiazepines was statistically different than the Manitoba average.
'2' In the period of time after being admmitted to a PCH, indicates that the percent of residents dispensed benzodiazepines was statistically different than the Manitoba average.
't' indicates that the percent of residents dispensed benzodiazepines increased substantially (by more than 20%) with admission to a PCH.

Source: Manitoba Centre for Health Policy, 2006

Benzodiazepine Dispensing and PCH-Level Data

PCH-level data for benzodiazepines are shown in Figure 7.5. To protect the anonymity of study participants, data for this QI-drug were suppressed for 27 out of 89 PCHs (PCHs were excluded from this analysis when between one and five residents were dispensed benzodiazepines 91 to 190 days after they were admitted to the PCH). For the remaining 62 PCHs, the 10th and 90th percentiles were identified as facilities where 13.6% and 37.1 % of residents were dispensed benzodiazepines respectively. Six PCHs in Manitoba ranked above the 90th percentile for this QI-drug and six PCHs ranked below the 10th percentile. Data for these PCHs are summarized as follows:

- After adjusting for differences in PCH resident age, sex and level of care on admission to a PCH, the proportion of individuals who were dispensed benzodiazepines ranged from zero residents (ID 694, Assiniboine RHA) to 55.7% of residents (ID 613, Assiniboine RHA).
- Six PCHs ranked below the 10th percentile for this QI-drug (residents in these PCHs were least likely to have been dispensed benzodiazepines):
  - Four of these facilities were located in the WRHA. Three of these PCHs were proprietary facilities (ID 559, 11.9% of residents; ID 581, 12.7% of residents; ID 521, 10.7% of res-

idents), while one PCH was a non-proprietary facility (ID 617, 13.3% of residents).
    - One PCH was located in each of the Assiniboine (ID 694, no residents) and Interlake RHAs (ID 583, 10.4% of residents).
- Six PCHs ranked above the 90th percentile for benzodiazepine dispensing (residents in these PCHs were most likely to have been dispensed benzodiazepines):
    - Two of these PCHs were located in each of the Assiniboine (ID 682, 38.8% of residents; ID 613, 55.7% of residents) and Interlake RHAs (ID 606, 50.7% of residents; ID 556, 45.9% of residents).
    - One PCH was located in each of Parkland (ID 641, 38.1% of residents) and South Eastman RHAs (ID 679, 43.8% of residents).

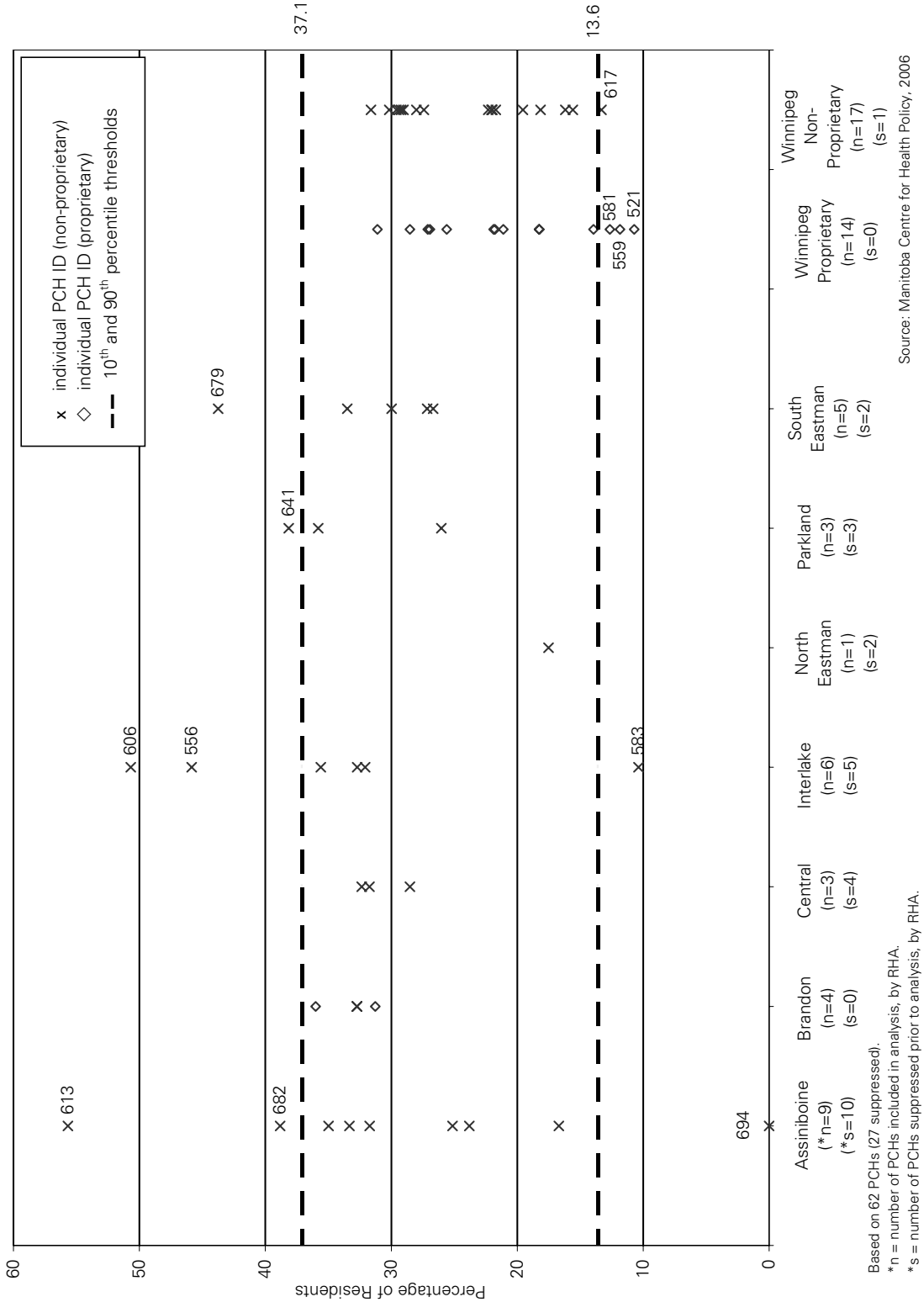
Changes in benzodiazepine drug dispensing with admission to a PCH (i.e., 't' in Figure 7.1) are summarized in the following text, for PCHs that ranked above the 90th percentile in Figure 7.5.[36] Results for these PCHs are summarized as follows:

- Increases in benzodiazepine dispensing were substantive for PCH ID 556 (Interlake RHA, 16.3% of residents were dispensed these medications before they were admitted to this PCH versus 45.9% of residents shortly after this time, a 181.1% increase in the proportion of residents who were dispensed benzodazepines—summarized as 16.3%, 45.9%, a 181.1% increase in residents), and were also substantive for ID 613 (Assiniboine RHA; 26.6%, 55.7%, a 109.3% increase in residents), ID 682 (Assiniboine RHA; 31.8%, 38.8%, a 22.0% increase in residents) and ID 679 (South Eastman RHA; 36.4%, 43.8%, a 20.3% increase in residents).The results demonstrated for these PCHs in Figure 7.5 can therefore be attributed to increasing trends in drug use with admission to a PCH.
- While residents in PCH ID 641 (Parkland RHA) were among the most likely in Manitoba to be dispensed benzodiazepines (Figure 7.5), trends in this drug dispensing actually decreased as residents were admitted to this PCH; 51.6% of individuals were dispensed benzodiazepines before they were admitted to this PCH compared to 38.1% of these individuals shortly after this time. In other words, 26.1% fewer residents were dispensed benzodiazepines shortly after versus before they were admitted to this PCH. The results for PCH ID 641 in Figure 7.5 can therefore be attributed partly to drug dispensing practices before residents were admitted to this PCH.

[36] To access these results for other PCHs, refer to the section in this chapter titled "How to Interpret the Results of this Chapter', subsection 'Interpreting the Results Presented for Individuals PCHs in Manitoba'.

Figure 7.5: Percent of Admitted Residents Who Were Dispensed Benzodiazepines 91-190 Days After Being Admitted to a PCH, by PCH, by RHA, from 1999/2000 – 2003/04

Percentage of Residents (adjusted for PCH resident age, sex, and level of care)



Based on 62 PCHs (27 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

7.3.3 PCH Residents Who Were Dispensed Antipsychotic Medications

An Introduction to Antipsychotic Drugs

The term 'behavioural and psychological symptoms of dementia' (BPSD) is used to describe the more common symptoms of dementia. These symptoms include verbal and physical aggression, psychosis, agitation, sleep disturbance and wandering. Conventional (typical) antipsychotics used to treat these symptoms have been demonstrated to be moderately effective only, with the potential for serious adverse effects such as Parkinsonism, cerebrovascular events, drowsiness and falls (Ballard and Margallo-Lana 2004; Bronskill et al., 2004; Lee et al., 2004).

Atypical antipsychotics have been adopted more recently to treat the symptoms of dementia, and in particular drugs such as risperidone and olanzapine are dispensed frequently. These medications, at least when dispensed in lower doses, have been shown by some researchers to be more efficacious than typical antipsychotics with an improved safety profile (De Deyn et al., 1999). However, the United States Food and Drug Administration has warned that risperidone may be associated with an increased risk of ischemic stroke (as cited in Lee et al., 2004), and a similar warning has been issued for olanzapine by the United Kingdom Committee on Safety of Medications (as cited in Lee et al., 2004). Further evidence is required before the use of atypical antipsychotics is approved for patients who have been diagnosed with dementia (Lee et al., 2004).

Overall, 30.2% of residents who were included in the analysis of the drug-related QIs (n=1,490 out of 4,930), were dispensed antipsychotics shortly after they were admitted to a PCH. The majority of these individuals received atypical drugs such as risperidone and olanzapine, and to a lesser extent quetapine (Table 7.6). Typical antipsychotics were dispensed much less frequently to PCH residents with the exception of haloperidol and loxapine. These data provide some perspective as to the type of antipsychotics that were dispensed to PCH residents once they were admitted to a PCH.

Table 7.6: For residents who were dispensed antipsychotics 91-190 days after being admitted to a PCH, the percent who were dispensed atypical and typical agents

Drug	Of residents who were dispensed antipsychotics, the % who were dispensed different atypical and typical agents*
Atypicals	
Risperidone	58.3
Olanzapine	23.2
Quetapine	9.7
Clozapine	0.3
Typicals and other neuroleptics	
Haloperidol	9.1
Loxapine	8.6
Trifluoperazine	2.1
Thioridazine	1.7
Lithium Carbonate	1.4
Methotrimeprazine	1.3
Chlorpromazine	1.2
Other typicals	2.7

* Total percent is greater than 100, as some individuals were dispensed more than one type of antipsychotic medication.

Source: Manitoba Centre for Health Policy, 2006

Antipsychotic Drug Dispensing and RHA-Level Data

For this QI-drug, comparisons between RHAs and PCHs have been standardized for differences in resident age, sex and level of care, and also for differences in the proportion of residents who were diagnosed with dementia.

Before they were admitted to a PCH, 16.5% of PCH residents in Manitoba were dispensed antipsychotics (Figure 7.6). This result was similar for most RHAs, although fewer residents were dispensed antipsychotics in the Brandon RHA at this time (9.2% of residents) ($p<.01$). Further, individuals in the North Eastman (32.0% of people) and Central RHAs (23.9% of people) were more likely to have been dispensed antipsychotic medications shortly before they were admitted to a PCH ($p<.01$).

In Manitoba, 30.2% of residents were dispensed antipsychotics shortly after they were admitted to a PCH, compared to 16.5% of these residents before this time (an 83.7% increase in residents) (Figure 7.6). After adjusting for differences in resident age, sex, level of care and a previous diagnosis of dementia, RHA-specific data are summarized as follows:

- Antipsychotic dispensing increased most substantially for residents in the Assiniboine RHA; 12.4% of residents in these PCHs were dispensed benzodiazepines prior to being admitted to a PCH versus 26.3% of residents after this date (a 112.9% increase in residents who were dispensed benzodiazepines—summarized as '12.4%, 26.3%, a 112.9% increase in residents'). Substantive increases in the

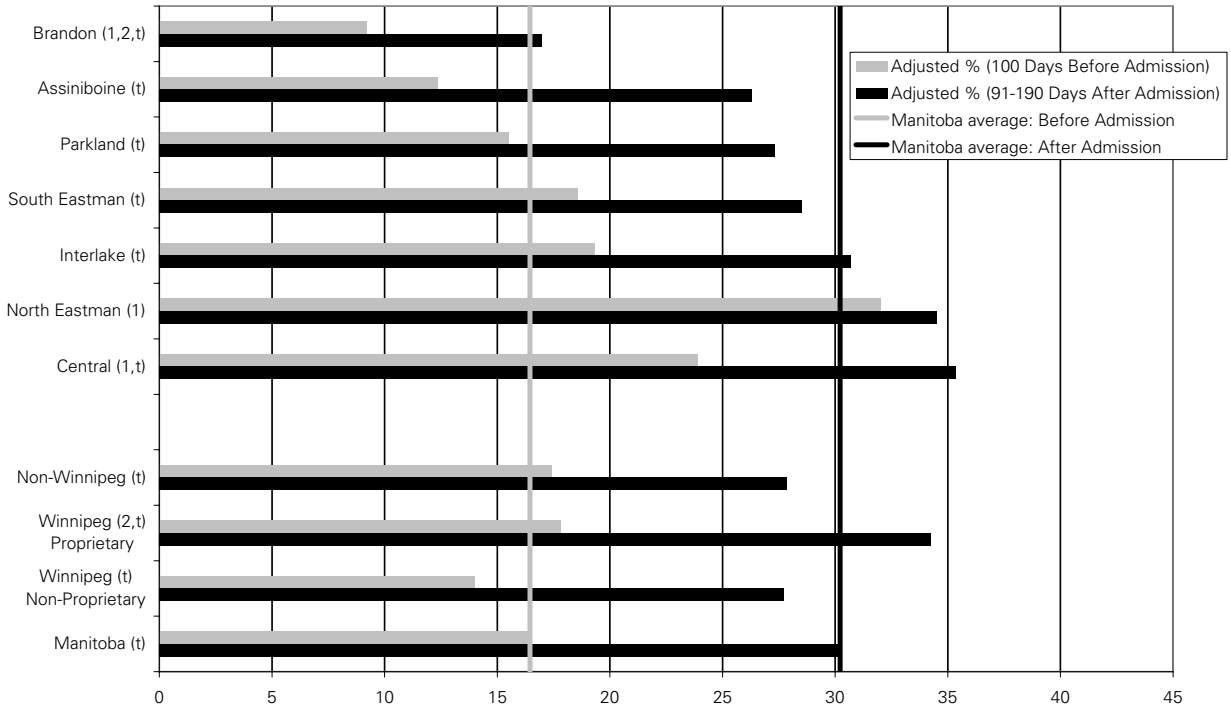
antipsychotic drug dispensing were also reported in each of the Brandon (9.2%, 17.0%, a 84.2% increase in residents) and Parkland RHAs (15.5%, 27.3%, a 76.1% increase in residents), as well as for proprietary PCHs (17.8%, 34.3%, a 92.1% increase in residents) and non-proprietary PCHs (14.0%, 27.7%, a 98.1% increase in residents) in the WRHA. As well, substantive increases in antipsychotic drug dispensing were reported in each of the South Eastman (18.6%, 28.5%, a 53.5% increase in residents), Interlake (19.3%, 30.7%, a 58.9% increase in residents) and Central (23.9%, 35.4%, a 48.0% increase in residents) RHAs.

- Increases in antipsychotic drug dispensing with admission to a PCH occurred least for residents in the North Eastman RHA (32.0%, 34.5%, a 7.8% increase in residents). Compared to the Manitoba average, residents in this RHA were more likely to have been dispensed antipsychotics before they were admitted to a PCH (see '1' in Figure 7.6).
- A similar proportion of residents in most RHAs were dispensed antipsychotics after they were admitted to an RHA (Figure 7.6). As exceptions, residents of proprietary PCHs in the WRHA were more likely to have been dispensed antipsychotics during this time (refer to '2' in Figure 7.6) ($p<.01$),[37] and residents in the Brandon RHA were less likely to have been dispensed these medications during this time ($p<.01$).

[37] A large proportion of PCH residents in the Central and North Eastman RHA were also dispensed antipsychotics during this time. These results were not statistically different from the Manitoba average, presumably because the results for these RHAs are based on a smaller sample of PCH residents.

Figure 7.6: Percent of Admitted Residents Who Were Dispensed Antipsychotics Before and After Being Admitted to a PCH, for Manitoba and by RHA, from 1999/2000 – 2003/04

Adjusted for resident age, sex, level of care, and the previous diagnosis of dementia



's' suppressed due to < 5 events.
'1' In the period of time prior to being admmitted to a PCH, indicates that the percent of residents dispensed antipsychotics was statistically different than the Manitoba average.
'2' In the period of time after being admmitted to a PCH, indicates that the percent of residents dispensed antipsychotics was statistically different than the Manitoba average.
't' indicates that the percent of residents dispensed antipsychotics increased substantially (by more than 20%) with admission to a PCH.

Source: Manitoba Centre for Health Policy, 2006

Antipsychotic Drug Dispensing and PCH-Level Data

PCH-level data for antipsychotics are described in Figure 7.7. To protect the anonymity of study participants, data for this QI-drug were suppressed for 28 out of 89 PCHs (PCHs were excluded from this analysis when between one and five residents were dispensed antipsychotics shortly after they were admitted to the PCH). For the remaining 61 PCHs, the 10th and 90th percentiles were identified as facilities where 21.3% and 40.2% of residents were dispensed antipsychotics respectively. Six PCHs in Manitoba ranked above the 90th percentile for this QI and six ranked below the 10th percentile. Data for these PCHs are summarized as follows:

- After adjusting for differences in PCH resident age, sex, level of care, and residents diagnosed with dementia, the proportion of individuals who were dispensed antipsychotics ranged from zero residents (several PCHs) to 45.5% of residents (ID 695, Assiniboine RHA).
- Six PCHs ranked below the 10th percentile for this QI (residents in these PCHs were least likely to have been dispensed antipsychotics):
  - Three of these PCHs were located in the Assiniboine RHA (IDs 618, 652, and 671). No residents were dispensed antipsychotics in each of these PCHs.
  - Two PCHs were non-proprietary facilities in the WRHA

(ID 642, 20.0% of residents; ID 607, 20.5% of residents).
    - One PCH was located in the Brandon RHA (ID 625, 15.3% of residents).
- Six PCHs also ranked above the 90th percentile for this QI (residents in these PCHs were most likely to have been dispensed antipsychotics):
    - One PCH was located in the Assiniboine RHA (ID 695, 45.5% of residents).
    - Three PCHs were proprietary facilities in the WRHA (ID 571, 44.3% of residents; ID 555, 41.6% of residents; ID 568, 40.7% of residents).
    - One PCH was located in each of the South Eastman (ID 576, 40.6% of residents) and Central RHAs (ID 659, 44.1% of residents).

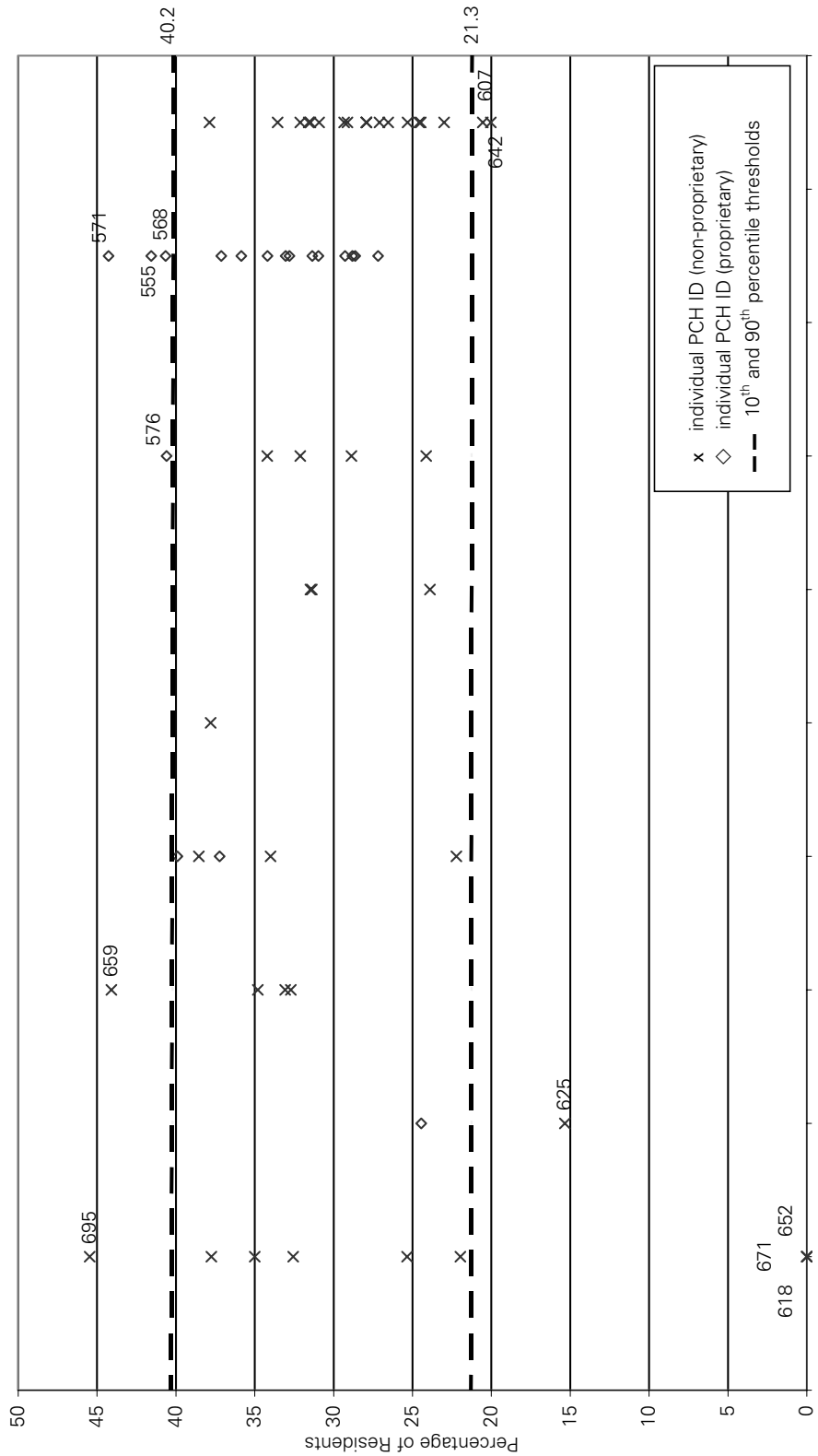
Changes in antipsychotic drug dispensing with admission to a PCH (i.e., 't' in Figure 7.1) are summarized in the following text, for PCHs that ranked above the 90th percentile in Figure 7.7.[38] Results for these PCHs are summarized as follows:

- Increases in antipsychotic drug dispensing were substantive for proprietary PCHs in the WRHA that ranked above the 90th percentile threshold in Figure 7.7 (ID 571; 21.0% of residents were dispensed antipsychotic medications before they were admitted to this PCH compared to 44.3% of residents shortly after this time; a 110.8% increase in the proportion of residents who were dispensed antipsychotics—summarized as '21.0%, 44.3%, a 110.8% increase in residents') (ID 568; 23.3%, 40.7%, a 74.8% increase in residents; ID 555; 25.3%, 41.6%, a 64.5% increase in residents). Increases were also substantive for ID 659 (Central RHA; 26.5%, 44.1%, a 66.5% increase in residents), and ID 576 (South Eastman RHA; 32.2%, 40.6%, a 26.2% increase in residents). The results for these PCHs in Figure 7.7 can therefore be attributed to increasing trends in drug use with admission to a PCH.

[38] To access these results for other PCHs, refer to the section in this chapter titled "How to Interpret the Results of this Chapter', subsection 'Interpreting the Results Presented for Individuals PCHs in Manitoba'.

Figure 7.7: Percent of Admitted Residents Who Were Dispensed Antipsychotics 91-190 Days After Being Admitted to a PCH, by RHA, from 1999/2000 – 2003/04

Percent of residents (adjusted for PCH resident age, sex, level of care, and diagnosis of dementia)



Based on 61 PCHs (28 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed prior to analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

7.3.4 PCH Residents Who Were Dispensed Beer's Criteria Medications

An Introduction to the Beer's Criteria

Expert review panels have identified and updated lists of select medications that should be avoided for use by older adults. These medications are thought to be ineffective and have poor side effects that include strong anticholinergic and sedating properties, or place older adults at an increased risk of drug addiction and falls. This list of higher risk medications is referred to as the Beer's Criteria (Beers et al., 1992; Beers 1997; Fick et al., 2003). These criteria have been used extensively by researchers to describe potentially inappropriate and higher risk drug dispensing to older adults (Curtis et al., 2004; Dhall et al., 2006; Dhalla et al., 2002; Fu et al., 2004; Gurwitz et al., 2003; Intrator et al., 2004; Zhan et al., 2005).

Investigators in the present research selected a subset of Beer's Criteria medications that are labelled as high risk independent of the prescription dose of the drug or of people's disease. These Beer's Criteria medications are provided in Table 7.7.

Table 7.7: List of Beer's Criteria medications that were included in this research

Medication Classes	Individual Drugs
Anti-inflammatory medications	Indomethacin
Analgesics	Meperidine
Barbiturates	Meprobamate, Amobarbital
Antiarrhythmic	Disopyramide
Anticholinergics and antihistamines	Chlorpheniramine, Hydroxyzine
Anticlotting	Dipyridamole, Ticlopidine
Antidepressant	Amitriptyline, Doxepin
Antihypertensive	Methyldopa
Sedatives	Chlordiazepoxide, Diazepam, Flurazepam, Nitrazepam, Clonazepam
Muscle relaxants	Methocarbamol, Cyclobenzaprine
Gastrointestinal antispasmodics	Hyoscyamine, Propantheline bromide

Source: Manitoba Centre for Health Policy, 2006

Overall, 10.5% of residents who were included in the analyses of the drug-related QIs (n= 516 out of 4,930), were dispensed Beer's Criteria medications shortly after they were admitted to a PCH. The majority of these residents were dispensed amitriptyline (an antidepressant) or clonazepam (a sedative), while a smaller proportion of these residents were dispensed hydroxyzine (an anticholinergic), diazepam (a sedative) and ticlopidine (an anticlotting medication) (Table 7.8).

Table 7.8: For PCH residents who were dispensed Beer's Criteria medications 91-190 days after their PCH admission date, the percent who were dispensed different categories of these drugs

Drug	Of residents who were dispensed antipsychotics, the % who were dispensed different atypical and typical agents*
Antidepressant	
Amitriptyline	33.7
Doxepin	6.0
Sedatives	
Clonazepam	21.9
Diazepam	8.4
Anticholinergics	
Hydroxyzine	14.3
Anticlotting	
Ticlopidine	8.0
Dipyridamole	2.7
Muscle relaxants	
Cyclobenzaprine	1.6
Methocarbamol	1.6
Anti-inflammatory	
Indomethacin	1.6
Other drug classes combined	
Other drugs combined	5.8

* Total percent is greater than 100, as some individuals were dispensed more than one Beer's Criteria drug.

Source: Manitoba Centre for Health Policy, 2006

Beer's Criteria Medications and RHA-Level Data

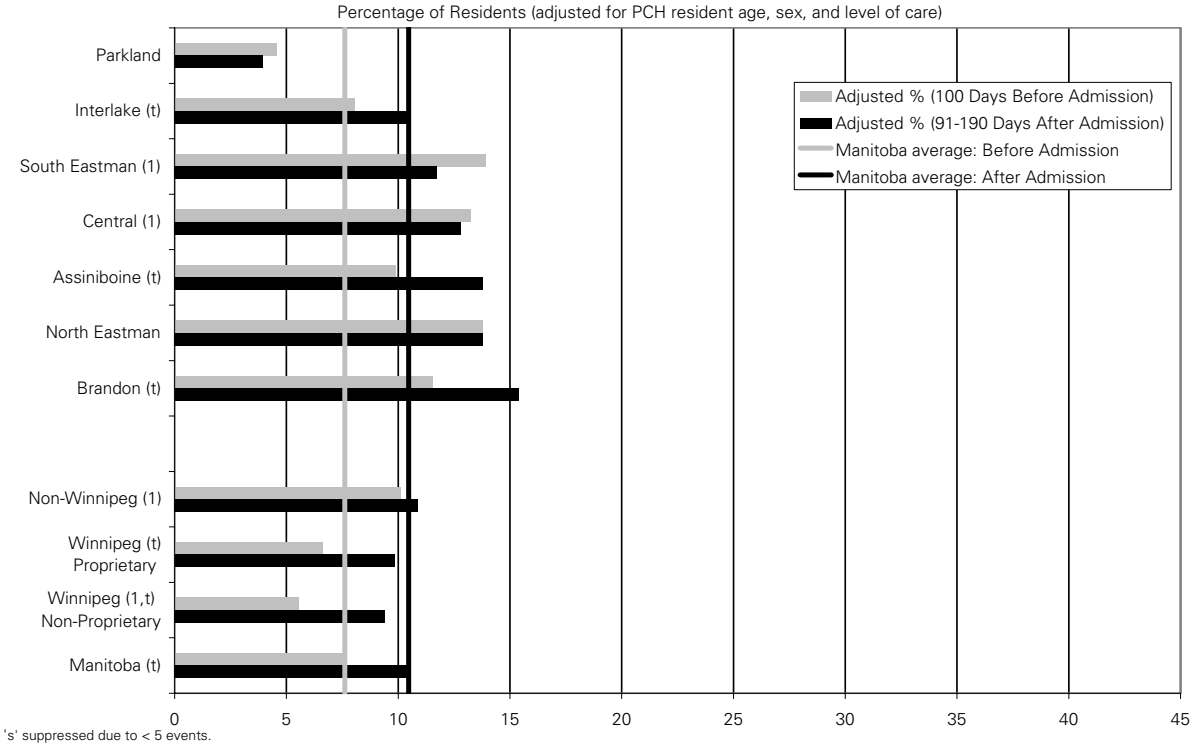
Trends in the dispensing of Beer's Criteria medications is provided in Figure 7.8, for individuals prior to and shortly after they were admitted to PCH. RHA-level data for these two time periods are summarized as follows:

- In Manitoba, 7.6% of individuals were dispensed at least one Beer's Criteria medication before they were admitted to a PCH. Similar results were reported for most RHAs after adjusting for differences in resident age, sex and level of care on admission to a PCH. As exceptions, individuals were more likely to have been dispensed these medications before they were admitted to a PCH in each of the South Eastman (13.9% of residents) and Central RHAs (13.3% of residents) ($p<.01$). Conversely, individual were less likely to have been dispensed Beer's Criteria medications before they were admitted to non-proprietary PCHs in the WRHA (5.6% of residents) ($p<.01$).
- In Manitoba, 10.5% of residents were dispensed Beer's criteria mediations after they were admitted to a PCH, compared to 7.6% of residents who were dispensed these medications before this time (a 37.6% increase in residents—summarized as '7.6%,

10.5%, a 37.6% increase in residents') (Figure 7.8). After adjusting for differences in resident age, sex and the level of care assigned on admission to a PCH, RHA-specific data are summarized as follows:

- The proportion of residents who were dispensed Beer's Criteria medications increased substantially with admission to a PCH, for individuals who were admitted to proprietary PCHs in the WRHA (6.6%, 9.8%, a 48.5% increase in residents) and also for individuals who were admitted to non-proprietary PCHs in the WRHA (5.6%, 9.4%, a 69.1% increase in residents). Similar results are demonstrated for residents who were admitted to PCHs in the Assiniboine (9.9%, 13.8%, a 39.5% increase in residents), Brandon (11.5%, 15.4%, a 33.3% increase in residents) and Interlake (8.1%, 10.6%, a 31.3% increase in residents) RHAs.
- For some RHAs, a similar or smaller proportion of residents were dispensed Beer's Criteria medications after versus before they were admitted to a PCH. These trends are reported in the Central (13.3%, 12.8%, a 3.4% decrease in residents), North Eastman (13.8%, 13.8%, no change in the proportion of residents dispensed Beer's Criteria medications), Parkland (4.6%, 3.9, a 14.2% decrease in residents) and South Eastman (13.9%, 11.7%, a 15.7% decrease in residents) RHAs. Compared to the Manitoba average, residents in some but not all of these RHAs were more likely to have been dispensed these medications before they were admitted to a PCH (see '1' in Figure 7.8).
- Despite these aforementioned trends in Beer's Criteria drug dispensing, a similar proportion of residents in each RHA were dispensed these higher risk medications after they were admitted to a PCH (refer to '2' in Figure 7.8).

Figure 7.8: Percent of Admitted Residents Who Were Dispensed Beer's Criteria Medications Before and After Being Admitted to a PCH, for Manitoba and by RHA, 1999/2000 – 2003/04



's' suppressed due to < 5 events.
'1' In the period of time prior to being admmitted to a PCH, indicates that the percent of residents dispensed Beer's Criteria medications was statistically different than the Manitoba average.
'2' In the period of time after being admmitted to a PCH, indicates that the percent of residents dispensed Beer's Criteria medications was statistically different than the Manitoba average.
't' indicates that the percent of residents dispensed Beer's Criteria medications increased substantially (by more than 20%) with admission to a PCH.

Source: Manitoba Centre for Health Policy, 2006

Beer's Criteria Medications and PCH-Level Data

PCH-level data for Beer's Criteria medications are described in Figure 7.9. To protect the anonymity of study participants, data for this QI-drug were suppressed for 42 out of 89 PCHs (PCHs were excluded from this analysis when between one and five residents were dispensed these drugs shortly after they were admitted to the PCH). For the remaining 47 PCHs, the 10th and 90th percentiles were identified as facilities where 2.9% and 17.2% of residents were dispensed these medications respectively. Four PCHs in Manitoba ranked above the 90th percentile for this QI and seven PCHs ranked below the 10th percentile. Data for these PCHs are summarized as follows:

- After adjusting for differences in PCH resident age, sex and level of care, the proportion of individuals who were dispensed Beer's Criteria medications ranged from zero residents (several PCHs) to 23.7% of residents (ID 529, Brandon RHA).
- For each PCH that ranked below the 10th percentile, no residents were dispensed Beer's Criteria medications.

  - Three of these PCHs were located in the Assiniboine RHA (ID 591, 687, 671).
  - One PCH was located in each of the Central (ID 689), Interlake (ID 656), Parkland RHA (ID 641) and South Eastman RHAs (ID 645).
- Four PCHs ranked above the 90th percentile for this QI (residents in these PCHs were most likely to have been dispensed Beer's Criteria medications):
  - One PCH was located in each of the Brandon (ID 529, 23.7% of residents), Central (ID 659, 23.6% of residents), Interlake (ID 663, 17.4% of residents) and Winnipeg (ID 551, a proprietary PCH, 17.6% of residents) RHAs.

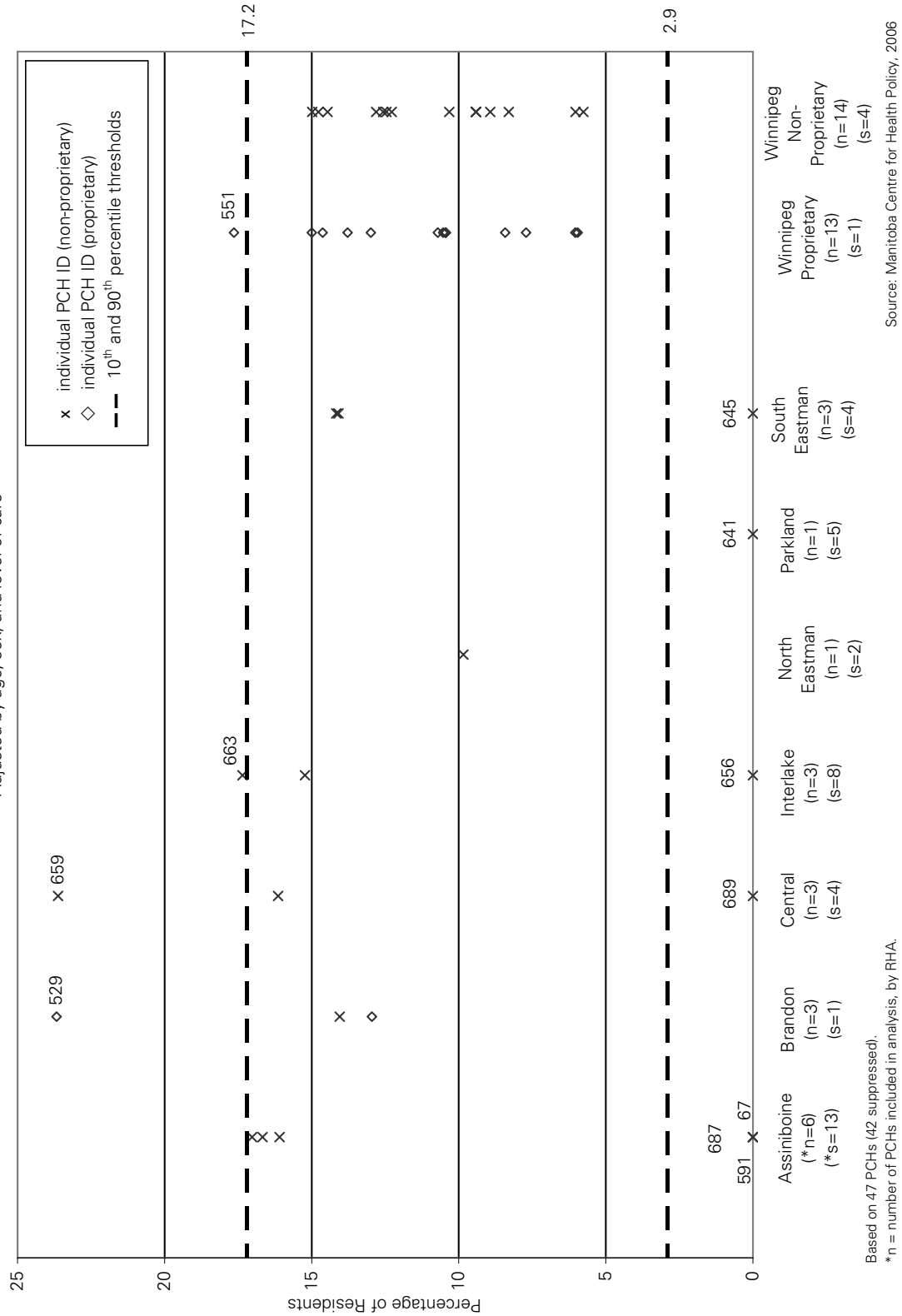
Changes in Beer's Criteria drug dispensing with admission to a PCH (i.e., 't' in Figure 7.1) are summarized in the following text, for PCHs that ranked above the 90th percentile in Figure 7.9.[39] Results for these PCHs are summarized as follows:

- Increases in dispensing of these medications were substantive for PCH ID 551 (a proprietary PCH in the WRHA; 10.9% of residents were dispensed Beer's Criteria medications before they were admitted to this PCH compared to 17.6% of residents shortly after this time; a 62.3% increase in the proportion of residents who were dispensed these medications—summarized as '10.9%, 17.6%, a 62.3% increase in residents'), as well as ID 529 (Brandon RHA; 18.0%, 23.7%, a 31.7% increase in residents). The results for these PCHs in Figure 7.9 can therefore be attributed to increasing trends in drug dispensing with admission to a PCH.
- While residents in PCH ID 663 (Interlake RHA) were among the most likely in Manitoba to be dispensed Beer's Criteria medications (Figure 7.9), trends in this drug dispensing increased 'non-substantially' as residents were admitted to this PCH; 14.9% of individuals were dispensed Beer's Criteria medications before they were admitted to this PCH compared to 17.4% of these individuals after this time. In other words, 16.6% more residents were dispensed Beer's Criteria medications after versus before they were admitted to this PCH. The results for PCH ID 663 in Figure 7.9 can therefore be attributed partly to drug dispensing patterns before residents were admitted to this PCH.

[39] To access these results for other PCHs, refer to the section in this chapter titled "How to Interpret the Results of this Chapter', subsection 'Interpreting the Results Presented for Individuals PCHs in Manitoba'.

Figure 7.9: Percent of Admitted Residents Who Were Dispensed Beer's Criteria Medications 91-190 Days After Being Admitted to a PCH, by PCH, by RHA, from 1999/2000 – 2003/04

Adjusted by age, sex, and level of care



Based on 47 PCHs (42 suppressed).
*n = number of PCHs included in analysis, by RHA.
*s = number of PCHs suppressed during analysis, by RHA.

Source: Manitoba Centre for Health Policy, 2006

CHAPTER 8: PCH FACILITY AND RESIDENT CHARACTERISTICS THAT INFLUENCED QI RATES

Previous chapters have identified variation in QIs between RHAs and PCHs. Using multivariate statistical analyses techniques, the purpose of this chapter is to define scenarios where diagnostic and drug-related QIs occurred more and less frequently during the five-year study period. These results can be used to identify when PCH residents were most at risk of experiencing a QI event like a hip fracture, or when they were most likely to have been dispensed certain higher risk medications.

8.1 How to Interpret the Results in This Chapter

8.1.1 How to Interpret the Results for the Diagnostic QIs

Highlights of the analysis strategy for the diagnostic QIs are as follows (Table 8.1):

- Several risk factors were used to explain variation in QI events throughout the province. These risk factors have been defined in Chapter 5 of this report and are summarized in Table 8.1. Two additional risk factors were developed specifically for analyses of the diagnostic QIs:
    - Diagnostic QIs were counted using ICD-9-CM codes, to reflect how frequently PCH residents had contact with the healthcare system for select reasons. Inter-PCH variation in QI rates may therefore be due to the quality of care provided or to differences in the volume of care that was reported in the administrative data (refer to Chapter 4, subsection titled 'Limitations of the Research' for a more complete description). Risk factors labelled 'hospital bias' (hospital contact bias) and 'physician bias' (physician contact bias) were developed to control for these latter potential biases; e.g., to identify PCHs where fewer ICD-9-CM codes (representing physician visits) were submitted to Manitoba Health for each resident, perhaps because more care was provided by nurses versus physicians, or because physicians were paid via contract and did not submit shadow billings to Manitoba Health.
    - The variables 'hospital bias' and 'physician bias' were created by summing, for each PCH, the number of hospital contacts and physician visits respectively, excluding those visits when diagnostic QIs were counted. These variables provide an indication of the overall volume of care reported in each PCH. For example, in the event that the risk of experiencing

a skin ulcer was less in PCHs where fewer physician visits were reported, this may be an indication that results were biased by inter-PCH differences in the volume of care reported.

- Based on discussions with decision-makers, QI events may be more likely to occur just after residents are admitted to a PCH or when they are closer to separation or death.[40] A variable was created to distinguish between events that occurred within 30 days of a resident's admission to a PCH or within 60 days of this person's death, versus events that occurred during all other periods in which the resident was living in a PCH. This risk factor has been labelled as 'QI timing'.

- Results of multivariate analyses for the diagnostic QIs are summarized using a relative risk (RR). This outcome compares the likelihood that a QI event would have occurred for a given group of people versus a reference group (denoted 'RG' in Table 8.1). For example, an RR of 1.9 for 'WRHA proprietary' in Table 8.1 means that on average, a given QI was 1.9 times more likely to have occurred in proprietary PCHs in the WRHA versus free-standing (non-proprietary) PCHs in Manitoba. The following information is key to interpreting these data, using PCH types as an example:
  - For the diagnostic QIs, free-standing (non-proprietary) PCHs were selected as the reference group, as QI events were reported less frequently in these versus other facility types (data not shown).
  - An RR value of 1.9 for 'WRHA proprietary' does not mean the QI event was 1.9 times more likely to occur in WRHA proprietary PCHs versus *all other facility types*. Rather, RR values for each facility type make comparisons to the reference group (in this case, non-proprietary free-standing PCHs in Manitoba). More specific information is provided in Appendix D, to make comparisons between each type of PCH.

[40] In this context, 'separation' from a PCH does not refer to transfers between PCHs but rather to separations from the long-term care system. During the study period, 94.5% of these latter separations were due to death of the PCH resident within two weeks. The phrase 'QI timing' in the remainder of this report is therefore defined with reference to an individual's PCH admission and death.

Table 8.1: A summary of the risk factors used to predict variation in diagnostic QIs

Risk Factor	Reference Group (RG)*	Interpretation of Results
PCH level characteristics		
WRHA proprietary	Free-standing †	Compared to the RG, the risk of experiencing a QI event was ↑,↓ for proprietary PCHs in the WRHA.
Non-Winnipeg proprietary	Free-standing	Compared to the RG, the risk of experiencing a QI event was ↑,↓ for proprietary PCHs located outside of the WRHA.
Juxtaposed	Free-standing	Compared to the RG, the risk of experiencing a QI event was ↑,↓ in juxtaposed (non-proprietary) PCHs.
Bed number	N/A	For every 1 bed ↑ in PCH, the risk of experiencing a QI event was ↑,↓ 'X' fold.
Nurse staff**	N/A	For every 1 hour ↑ in nursing hours worked / resident-day, the risk of experiencing a QI event was ↑,↓'X' fold.
Aide staff**	N/A	For every 1 hour ↑ in hours of care provided / resident-day, the risk of experiencing a QI event was ↑,↓'X' fold.
Hospital bias	N/A	For every additional hospital separation, the risk of experiencing a QI event ↑,↓ was 'X' fold.
Physician bias	N/A	For every additional ambulatory care physician visit, the risk of experiencing a QI event was ↑,↓ 'X' fold.
Resident level characteristics		
QI timing	All other times	Compared to all other times, the risk of experiencing a QI event was ↑,↓ within 30 days of a person's admission to a PCH or within 60 days of their death.
Age 75-84	0-74	Compared to people 0-74 years old, the risk of experiencing a QI event was ↑,↓ for PCH residents 75-84 years old.
Age 85+	0-74	Compared to people 0-74 years old, the risk of experiencing a QI event was ↑,↓ for PCH residents 85+ years old.
Male	Female	Compared to females, the risk of experiencing a QI event was ↑,↓ for males.
Level 3	Level of care 1,2	Compared to residents assigned a level of care of 1 or 2, the risk of experiencing a QI event was ↑,↓ for those who were assigned a level of care of 3.
Level 4	Level of care 1,2	Compared to residents assigned a level of care of 1 or 2, the risk of experiencing a QI event was ↑,↓ for those who were assigned a level of care of 4.
Married**	Married residents	Compared to married residents, the risk of experiencing a QI event was ↑,↓ for all other residents.
SES index**	N/A	For every 1 dollar increase in resident fees paid by the resident, the risk of experiencing a QI event ↑,↓ 'X' fold.
Dementia	Other PCH residents	Compared to other residents, the risk of experiencing a QI event was ↑,↓ for those who had been diagnosed with dementia.
Chronic disease	Other PCH residents	Compared to other residents, the risk of experiencing a QI event was ↑,↓ for those who had been diagnosed with two or more different categories of chronic diseases.

* RGs were selected where events were reported least frequently (e.g., free-standing PCHs), or where conceptually the risk should have been lowest (e.g., married individuals).

** Data are not available for all PCHs.

† Data provided from Manitoba Health characterized originally PCH ID 622 (Flin Flon PCH in the Nor-Man RHA, 30 beds) as a free-standing facility. At the completion of this report, we have learned that this PCH is actually juxtaposed to another healthcare facility. The data provided in Chapter 5 of this report have been corrected to reflect this change. Multivariate analyses were not re-assessed, and the small number of beds in this PCH are expected to influence these results minimally.

Source: Manitoba Centre for Health Policy, 2006

- Text is provided in Table 8.1 to help interpret the results from multivariate analyses. Three scenarios are defined based on different RR values:[41]
  - *RR values close to '1'* indicate that the risk of experiencing a diagnostic QI was not statistically different from the reference group (p<.01). These non-significant findings have been summarized using the acronym 'ns' in subsequent tables in this chapter.
  - *RR values greater than '1'* mean the risk of experiencing a diagnostic QI was significantly greater for a given group versus the reference group (e.g., the risk was greater for males versus the reference group of females) (p<.01).
  - *RR values less than '1'* mean the risk of experiencing a diagnostic QI was significantly less for a group versus the reference group (p<.01). This also means that the risk of experiencing the QI was greater for the reference group (e.g., see 'Male' in Table 8.1; a RR of less than '1' means that a select QI was less likely to occur for males, or more likely to occur for females).
- The concept of multivariate analysis is similar to that of standardization used in Chapters 6 and 7 of this report. During multivariate analyses, RR values are provided for each group of risk factors while taking into account the effect that all other variables have on the study outcome. For example, the RR value associated with 'WRHA proprietary' in Table 8.1 is an adjusted outcome, after controlling for the influence of facility size (denoted by 'bed number'), staffing hours provided, and all other facility and resident characteristics included in the model. However, other risk factors not included in Table 8.1 may help to account for these differences between types of PCHs. Examples of these additional risk factors not included in the present research are direct measures of resident functional and cognitive performance.
- For each diagnostic QI, multivariate analyses were conducted in nine sequential steps. The type of PCH ['WRHA proprietary', 'non-Winnipeg proprietary' and '(non-proprietary) juxtaposed', all compared to the reference group of (non-proprietary) free-standing

[41] These scenarios are developed based on standard statistical techniques which use 99% confidence levels (CLs) of the (average) RR values. Using participant sex and skin ulcers as an example (reference group=females), if the 99% CL of the RR value included the value of '1' (i.e., was 'close to 1'), researchers concluded that, on average, the risk of experiencing this QI was similar for males and females. Conversely, if the lower 99% CL of the RR value was greater than '1', researchers concluded that, on average, the risk of experiencing this QI was significantly greater for males than females (p<.01). Lastly, if the upper 99% CL of the RR value was less than '1', researchers concluded that, on average, the risk of experiencing this QI was less for males than females (p<.01).

PCHs in Manitoba][42] was entered as the first step in these analyses, and 'dementia' and 'chronic disease' were entered as the last step. RR values were re-calculated at the completion of each step of modelling. This process helps to define why different RR values are reported for select PCH-level risk factors. The results for these stepwise models are provided in Appendix D of this report, with a brief summary of findings. The present chapter focusses on the RR values reported during the final step of these analyses, once all risk factors were included in the model.

- Incomplete data were available for some of the risk factors provided in Table 8.1 (see risk factors 'nurse staff', 'aide staff', 'SES index', and 'marital status'). Strategies were developed to cope with these missing data, so that analyses could be conducted on the full sample of study participants. The results for these variables should be interpreted with some caution as actual data were not available for all study participants. Further details about these missing data are not provided in this report, but are available from the first author.

8.1.2 How to Interpret the Results for the Drug-Related QIs

Multivariate analyses strategies are identical for the diagnostic and drug-related QIs, with the following exceptions (Table 8.2):

- As a reminder, drug-related outcomes in this research focus on the sample of residents who were admitted to a PCH during the study period (n=4,930), after excluding individuals who resided in PCHs where drugs were supplied from a hospital-based pharmacy, those who resided in a hospital for more than 60 days prior to and shortly after they were admitted to a PCH, and those who died within 190 days of being admitted to a PCH (refer to Chapter 4 for an explanation of these exclusion criteria).
- Multivariate analyses for the drug-related QIs focus on drug dispensing patterns 91 to 190 days after individuals were admitted to a PCH. The variables 'QI timing', 'hospital bias', and 'physician bias' are not relevant to the drug-related QIs. Also, because of the smaller sample size, PCH facility size ('bed number'), marital status and resident SES were excluded as potential risk factors in the drug-related QIs.[43]

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[42] Conventionally, PCHs are defined as proprietary and non-proprietary, and these latter PCHs are defined further as free-standing and juxtaposed (i.e., there are no proprietary PCHs in Manitoba that are juxtaposed to a hospital). For the purposes of this chapter, 'WRHA proprietary' (n=14) and 'non-Winnipeg proprietary' (n=5) define proprietary PCHs in Manitoba. Alternatively, 'free-standing' and juxtaposed PCHs are assumed to be non-proprietary facilities in Manitoba. Sixty-four free-standing PCHs were included in these analyses, and 39 juxtaposed PCHs were included in these analyses.

[43] Initial analyses demonstrated that these latter risk factors had minimal influence on the drug-related QIs.

- These analyses were conducted on a subset of PCHs in Manitoba that received drugs from retailed pharmacies. The number of facili ties for different types of PCHs is as follows: i) proprietary PCHs in the WRHA, n=14 out of a possible 14 facilities (i.e., all proprietary PCHs in the WRHA received drugs from a retail pharmacy, and were therefore included in these analyses); ii) proprietary PCHs located in non-Winnipeg RHAs, n=5 out a out of a possible five facilities; iii) non-proprietary free-standing PCHs in Manitoba, n= 44 out of a possible 64 facilities, and; iv) non-proprietary juxtaposed PCHs in Manitoba, n=26 out of a possible 39 facilities.
- Outcomes for the drug-related QIs have been summarized using an odds ratio (OR), and a more complete description of an OR is provided in the Glossary of this report. Briefly, this ratio compares the odds that two different groups (e.g., males and females) were dispensed select medications. For each type of risk factor, terminology to interpret results using an odds ratio is provided in Table 8.2.
- Similar reference groups were used for all risk factors in the diagnostic and drug-related QIs. As an exception, juxtaposed (non-proprietary) PCHs were used as the reference group for the types of PCHs (denoted 'RG' in Table 8.2). Residents in this type of facility were most likely to have been dispensed each of benzodiazepines, polypharmacy and Beer's Criteria medications, and were least likely to have been dispensed antipsychotics. More detail about these dispensing patterns is provided in Appendix E of this report.
- One additional risk factor was developed specifically for the drug-related QIs. This variable assesses if residents were prescribed medications by one versus two or more physicians, in the period of time 91 to 190 days after they were admitted to a PCH ('prescriber' in Table 8.2). This risk factor was developed generically for all medications (not just the QI-drugs) that were dispensed to residents during this time.
- In this chapter, results for each OR have been adjusted to account for the affect of other risk factors that were included in modelling procedures. More detailed results for these analyses are provided in Appendix E of this report, emphasizing: i) the step-by-step development of these models, where risk factors were added sequentially during data analysis; and, ii) more detailed comparisons between select categories of risk factors, emphasizing differences in ORs between non-reference groups. This additional information in Appendix E helps to define scenarios where PCH residents were more likely to have been dispensed QI-drugs.

Table 8.2: Risk factors used to predict variation in drug-related QIs

Risk Factor	Reference Group (RG)*	Interpretation of Results
PCH level characteristics		
WRHA proprietary	Juxtaposed	Compared to the RG, the odds of being dispensed a higher risk drug were ↑,↓ for proprietary PCHs in the WRHA.
Non-Winnipeg proprietary	Juxtaposed	Compared to the RG, the odds of being dispensed a higher risk drug were ↑,↓ for proprietary PCHs located outside of the WRHA.
Free-standing**	Juxtaposed	Compared to the RG, the odds of being dispensed a high risk drug were ↑,↓ in free-standing (non-proprietary) PCHs in Manitoba.
Nurse staff*	N/A	For every 1 hour ↑ in weekly nursing hours worked/ resident-day, the odds of being dispensed a higher risk drug were ↑,↓ 'X' fold.
Aide staff*	N/A	For every 1 hour ↑ in weekly hours of care worked/resident-day, the odds of being dispensed a higher risk drug were ↑,↓ 'X' fold.
Resident level characteristics		
Age 75-84	0-74	Compared to 0-74, odds of being dispensed a higher risk drug were ↑,↓ for PCH residents 75-84 years old.
Age 85+	0-74	Compared to people 0-74 years old, the odds of being dispensed a higher risk drug were ↑,↓ for PCH residents 85+ years old.
Male	Female	Compared to females, the odds of being dispensed a higher risk drug were ↑,↓ for males.
Level 3	Level of care 1,2	Compared to residents assigned a level of care of 1 or 2, the odds of being dispensed a higher risk drug were ↑,↓ for those who were assigned a level of care of 3.
Level 4	Level of care 1,2	Compared to residents assigned a level of care of 1 or 2, the odds of being dispensed a higher risk drug were ↑,↓ for those who were assigned a level of care of 4.
Dementia	Other PCH residents	Compared to other residents, the odds of being dispensed a higher risk drug were ↑,↓ for residents who had been diagnosed with dementia.
Chronic disease	Other PCH residents	Compared to other residents, the odds of being dispensed a higher risk drug were ↑,↓ for residents who had been diagnosed with two or more different categories of chronic diseases.
Prescriber	Single prescriber	Compared to residents who were prescribed drugs by one physician, the odds of being dispensed a higher risk drug were ↑,↓ for residents with two or more prescribing physicians.

* Data are not available for all PCHs.

** Data provided from Manitoba Health characterized originally PCH ID 622 (Flin Flon PCH in the Nor-Man RHA, 30 beds) as a free-standing facility. At the completion of this report, we have learned that this PCH is actually juxtaposed to another healthcare facility. The data provided in Chapter 5 of this report have been corrected to reflect this change. Multivariate analyses were not re-assessed, and the small number of beds in this PCH are expected to influence these results minimally.

Source: Manitoba Centre for Health Policy, 2006

8.2 Highlights of the Results in This Chapter

Highlights of this chapter are provided separately for the diagnostic and drug-related QIs. The following trends in results are reported:

8.2.1 Diagnostic QIs

Diagnostic QI events were affected minimally by *PCH facility characteristics* such as facility size (number of beds), staffing-to-resident ratios, and indicators of accessibility to hospital and physician services (i.e., contact bias risk factors). However, events of these QIs were influenced by the type of PCH. Specifically, diagnostic QIs were reported more frequently in proprietary PCHs in the WRHA versus free-standing facilities in Manitoba. These results should not be attributed to other risk factors included in the modelling process, as these latter risk factors were 'corrected for' in all models (e.g., multivariate modelling accounts for the fact that significantly fewer residents in proprietary PCHs in the WRHA were assigned a level of care of 1 or 2—refer to Figure 5.7 in Chapter 5). Variables not included in this modelling process (e.g., direct measures of function and cognitive performance of residents, etc.), not yet available to Manitoba Health for analyses, may have influenced these results.

Diagnostic QI events were affected by several *PCH resident characteristics*. As a general rule, these events were more likely to occur:

- Shortly after residents were admitted to a PCH or when they were closer to death.
- To residents who were 75 years or older.
- To residents who had been diagnosed with dementia, or who had been diagnosed with two or more different categories of chronic diseases.

The influence of other resident characteristics varied for some diagnostic QIs. For example, events of hip fractures, non-hip fractures and accidental falls occurred more frequently for females and for residents who were assigned a lower level of care. These residents may be more mobile (and in the case of females, may have been more likely to have had fragile bones), resulting in an increased propensity to fall and/or fracture a bone. Conversely, events of skin ulcers were more likely to occur in males and individuals who were assigned a higher level of care. These individuals may have been sitting or laying in one position for longer periods of time, which would increase their risk of experiencing this latter type of QI.

8.2.2 Drug-Related QIs

Drug-related QIs were also affected minimally by *PCH facility characteristics*. For example, the volume of staffing care provided did not influence the odds that residents were dispensed higher risk medications, and a similar statement can be made for different types of PCHs. As one exception, the odds of being dispensed antipsychotics was greater for residents who resided in proprietary PCHs in the WRHA versus juxtaposed (non-proprietary) PCHs in Manitoba.

Drug-related QIs were affected by several *PCH resident characteristics*. For example, the odds of being dispensed higher risk drugs were less for individuals 85 years or older. This may mean that the types of drugs dispensed to people 85 years and older more are monitored more closely as compared to younger individuals. Alternatively, these younger PCH residents may be more sick, and may therefore be more likely to use higher risk medications.

The influence of remaining resident-level risk factors were somewhat drug-specific, although the following trends are noted:

- *Benzodiazepines as well as polypharmacy and Beer's Criteria medications.*
  - The odds of being dispensed these medications were greater for individuals who had been diagnosed with two or more different categories of chronic diseases. This may reflect instances when more drugs are required by certain individuals (i.e., polypharmacy). More close monitoring of benzodiazepines and Beer's Criteria medications may be warranted for residents with chronic comorbidities.
  - The odds of being dispensed these medications were less for residents who had been diagnosed with dementia. These results suggest that drug dispensing is monitored closely for individuals with this disease.
  - The odds of being dispensed these medications were greater for PCH residents who were prescribed drugs by more than one physician. These data provide some insight into the importance of maintaining a continuity of care for PCH residents.
- *Antipsychotic medications*. The influence of most risk factors was unique for antipsychotic versus other QI-drugs. For example:
  - As one would expect, the odds of being dispensed antipsychotics were greater for residents who had been diagnosed with dementia.
  - The presence of having two or more different categories of chronic diseases did not influence significantly the odds of being dispensed these medications, nor did the presence of having multiple physician prescribers.

- The odds of being dispensed antipsychotics were greater for individuals who were assigned a higher level of care, irrespective of if these residents were diagnosed with dementia.

8.3 Detailed Multivariate Results for the Diagnostic and Drug-Related QIs

8.3.1 Detailed Results for the Diagnostic QIs

The results from multivariate analyses are summarized in Table 8.3 for each of the diagnostic QIs. Results are provided separately for PCH facility and resident characteristics.

PCH Facility Characteristics

Compared to free-standing (non-proprietary) PCHs, diagnostic QIs occurred more frequently in proprietary PCHs in the WRHA, after controlling for all other risk factors in the model. For example, the risk of experiencing a skin ulcer was 1.9 times greater in proprietary PCH in the WRHA versus free-standing PCHs in Manitoba, and the risk of experiencing each of hip and non-hip fractures as well as accidental falls was between 1.3 and 1.4 times greater in proprietary PCHs in the WRHA. As one exception to this trend, the risk of experiencing an accidental fall was about the same in proprietary PCHs in the WRHA versus (non-proprietary) free-standing PCHs in Manitoba.

Remaining PCH characteristics influenced the results for diagnostic QIs minimally (Table 8.3). For example, after adjusting for the affect of all other variables, the risk of experiencing a diagnostic QI was about the same for different sizes of PCHs ('bed number'), and did not appear to be influenced by the volume of care provided by nurses or aides. As one exception, events of skin ulcers were less likely to occur in PCHs that provided more hours of care by aides (see 'aide staff' in Table 8.3). For every one additional hour of this care per resident-day, the risk of experiencing a skin ulcer decreased 0.7 fold .[44]

The variables 'hospital bias' and 'physician bias' were created to account for inter-PCH differences in access to or reported contact with the healthcare system. These variables were non-significant for the majority of the diagnostic QIs, meaning that differences in QI rates between PCHs was not related to differences in access to the healthcare system, or to how frequently physicians reported ICD-9-CM codes from ambulatory visits. As one exception, events of fluid and electrolyte imbalances were more likely to occur in PCHs

[44] Conversely, fewer hours of care by aides resulted in a greater risk of experiencing a skin ulcer.

where residents generally had more contact with hospital and physician services. A similar statement can be made for events of accidental falls and contact with hospital services. After controlling for these risk factors, RR values for other variables were unchanged.

Resident Characteristics

After controlling for all other variables, the risk of experiencing a diagnostic QI was much greater just after residents were admitted to a PCH or when they were closer to death ('QI timing' in Table 8.3). For example, the risk of fracturing a hip was 34.8 times greater during these time periods versus all other times that residents resided in a PCH, and the risk of experiencing a skin ulcer was 9.4 times greater during these times. These results may demonstrate the level of morbidity associated with experiencing some diagnostic QIs (i.e., individuals may be likely to die shortly after experiencing a hip fracture), while in other instances (i.e., accidental falls) these results may reflect the time required for residents to adapt to their new living environment. One of the recommendations of this research is to analyze further these results by separate time periods.

Diagnostic QIs were also more likely to occur for certain groups of PCH residents, and these individuals may benefit most from interventions to optimize care. Trends in these results are summarized as follows:

- Compared to individuals 0-74 years old, most diagnostic QIs occurred more frequently to residents 75 years or older. For example, events of hip fractures were 1.6 times more likely to have occurred to residents 75-84 years old, and events of fluid and electrolyte imbalances were 1.4 times more likely to have occurred to individuals 85+ years old.
- The influence of PCH resident sex was dependent on the diagnostic QI. Events of hip and non-hip fractures as well as accidental falls were reported more frequently for females (i.e., compared to females, events of these QIs were reported less frequently for males). These results may be due to differences in frailty between male and female PCH residents, with less frail individuals (females) being more mobile and therefore more susceptible to falls and fractures. As an alternate explanation, females are at a greater risk of developing osteoporosis and may therefore have been more susceptible to experiencing falls and fractures. Events of skin ulcers and respiratory infections were reported more frequently for males. These latter QIs may occur more often for individuals who are more frail or who have limited mobility.

Table 8.3: A summary of the results of multivariate regression analyses, to determine how PCH facility and resident risk factors influenced events of diagnostic QIs

	Hip Fractures	Non-Hip Fractures	Accidental Falls	Skin Ulcers	Respiratory Infections	Fluid & Electrolyte Imbalances
PCH factors						
WRHA proprietary	1.4	1.3	ns	1.9	1.4	1.6
Juxtaposed	ns	ns	ns	ns	ns	ns
Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns
Bed number	**	**	**	ns	ns	ns
Nurse staff*	ns	ns	ns	ns	ns	ns
Aide staff*	ns	ns	ns	0.7	ns	ns
Hospital bias	ns	ns	2.0	ns	ns	2.9
Physician bias	**	ns	**	ns	ns	1.02
Resident factors						
QI timing	34.8	17.5	22.5	9.4	6.6	14.2
Age 75-84	1.6	ns	1.3	1.1	1.2	1.3
Age 85+	1.6	1.3	1.3	1.4	1.3	1.4
Males	0.7	0.6	0.8	1.1	1.3	ns
Level 3	0.8	0.9	0.9	1.1	ns	ns
Level 4	0.4	0.5	0.4	1.5	ns	ns
Married	ns	ns	ns	ns	0.9	ns
Resident SES	ns	ns	ns	ns	ns	ns
Dementia	1.5	1.2	1.3	ns	0.9	ns
Chronic disease	1.3	1.4	1.4	1.5	1.4	1.7

ns Denotes not significant.

* Results should be interpreted with some caution, as data were not available for all PCHs in Manitoba.

** Excluded for multivariate analyses when diagnostic QIs were reported less frequently, or because the risk factor was not relevant to the QI (i.e., physician bias and accidental falls resulting in a hospitalization).

Source: Manitoba Centre for Health Policy, 2006

- Diagnostic QI events were between 1.3 and 1.7 times more likely to have occurred for residents who had been diagnosed with two or more different categories of chronic diseases, indicating that the risk of experiencing these events was greater for individuals in poorer health.
- Similar results are reported for hip and non-hip fractures as well as accidental falls, for residents who had been diagnosed with dementia. Alternatively, events of respiratory infections were less likely to occur for residents who had been diagnosed with dementia.

The level of care assigned to PCH residents is based primarily on their ability to perform daily functional tasks such as dressing, feeding and being mobile. Residents assigned a level of care of 3 or 4 generally require more assistance to complete these types of activities.

RR values for levels of care depended on the type of diagnostic QI. Results are summarized as follows:

- *Events of hip and non-hip fractures as well as accidental falls*. Events of these QIs occurred more frequently for residents who were assigned a lower level of care. For example, compared to residents who were assigned a level of care of 1 or 2, non-hip fractures were 0.9 fold and 0.5 fold as likely to occur for residents who were assigned a level of care of 3 and 4 respectively. Residents who are assigned a lower level of care are usually more mobile; these residents may be more susceptible to falls and fractures.
- *Events of skin ulcers*. Compared to individuals who were assigned a level of care of 1 or 2, individuals who were assigned a level of care of 3 or 4 were more likely to experience events of skin ulcers. These individuals may spend more time in a stationary position (e.g., in a bed, chair or wheelchair), and therefore may be more susceptible to skin ulcers.
- *Events of respiratory infections as well as fluid and electrolyte imbalances*. The risk of experiencing these diagnostic QIs was similar for residents who were assigned different levels of care.

8.3.2 Detailed Results for the Drug-Related QIs

The results from multivariate analyses are summarized in Table 8.4 for each of the drug-related QIs. Results are summarized separately for PCH facility and resident characteristics.

PCH Facility Characteristics

Drug dispensing was influenced minimally by PCH-level risk factors. In most cases, the odds of being dispensed a QI-drug were similar for residents who resided in different types of PCHs, and was not influenced by the volume of nursing or aide hours worked in PCHs. As an exception, the odds of being dispensed antipsychotic medications were 1.7 times greater for residents who resided in proprietary PCHs in the WRHA versus juxtaposed (non-proprietary) PCHs in Manitoba.

Resident Characteristics

The majority of resident-level characteristics influenced the odds that participants were dispensed QI-medications. Trends in results are provided for these risk factors.

Resident Age and Sex

As a general rule, the odds of being dispensed QI-drugs were greater for younger PCH residents (or less for older PCH residents). One explanation for these results is that younger PCH residents have more illnesses and

therefore were more likely to have been dispensed these medications. Alternatively, drug dispensing patterns may be monitored more closely for older PCH residents.

For most QI-drugs, the odds of being dispensed higher risk medications were similar for males and females. As one exception, the odds of being dispensed benzodiazepines were less for males versus females. Previously in this chapter, it was hypothesized that female PCH residents were more mobile than males. This same hypothesis may help to explain differences in benzodiazepine dispensing patterns, with the odds of being dispensed benzodiazepines greater for more mobile (female) PCH residents.

Resident Level of Care

Resident level of care had minimal influence on the dispensing patterns of QI-drugs. As one exception, the odds of being dispensed antipsychotic medications were greater for residents who were assigned a level of care of 3 versus less frail people (i.e., those who were assigned a level of care of 1 or 2). PCH residents are typically assigned higher levels of care based on functional or behavioural challenges. The odds of being dispensed antipsychotic medications may have been greater for PCH residents assigned a level of care of 3, based on these latter challenges. While similar results were demonstrated for residents who were assigned a level of care of 4, RR values were not statistically significant, presumably as analyses for the drug-related QIs were based on a smaller sample of PCH residents.

The reverse trend was noted for Beer's Criteria medications; the odds of being dispensed these medications were less for residents who were assigned a level of care of 3, versus those who were assigned a level of care of 1 or 2. The majority of Beer's Criteria medications dispensed to residents were either antidepressants or sedatives (i.e., long-acting benzodiazepines) (refer to Table 7.8 in Chapter 7). As PCH residents assigned a level of care of 3 are generally less mobile, one interpretation of this result is that the odds of being dispensed these medications were greater for more mobile individuals. Similar results were demonstrated for individuals who were assigned a level of care of 4, however these latter results were not statistically significant.

Residents Diagnosed with Dementia and Two or More Different Categories of Chronic Diseases

The odds of being dispensed antipsychotics were 2.9 times greater for residents who had been diagnosed with dementia. Conversely, the odds of being dispensed each of the remaining QI-drugs were less for residents with dementia. This may imply that the use of some higher risk medications is monitored closely for residents with dementia.

A different pattern of results is demonstrated for residents who were diagnosed with two or more different categories of chronic diseases (see 'chronic

disease' in Table 8.4). The odds of being dispensed polypharmacy, Beer's Criteria or benzodiazepine medications were greater for residents who were diagnosed with two or more different categories of chronic diseases. While individuals with comorbid chronic diseases may require more medication (i.e., polypharmacy), the dispensing patterns of benzodiazepines and Beer's Criteria medications may need to be monitored more closely for these individuals. Lastly, this trend in results was not demonstrated for antipsychotic medications, and the odds of being dispensed antipsychotics were roughly equal for residents with and without different two or more different categories of chronic diseases.

Residents Dispensed Medications by Two or More Physicians

The odds of being dispensed most higher risk medications were greater for residents whose drugs were prescribed by two or more versus one physician (see "prescriber' in Table 8.4). For example, the odds that residents were dispensed nine or more medications (polypharmacy) were 1.8 times greater when these drugs were prescribed by more than one physician. This trend in results was not reported for antipsychotic medications. These latter medications are generally used for more specific diseases, and having multiple physicians prescribe medications in this latter scenario may not increase their odds of use.

Table 8.4: A summary of the results of multivariate regression analyses, to determine how PCH facility and resident risk factors influenced the dispensing of QI-drugs

	Polypharmacy	Beer's Criteria	Benzodiazepines	Antipsychotics
PCH factors				
WRHA proprietary	ns	ns	ns	1.7
Free-standing	ns	ns	ns	ns
Non-Winnipeg proprietary	ns	ns	ns	ns
Nurse staff	ns	ns	ns	ns
Aide staff	ns	ns	ns	ns
Resident factors				
Age 75-84	ns	0.6	0.8	ns
Age 85+	0.6	0.5	0.7	0.4
Males	ns	ns	0.8	ns
Level 3	ns	0.8	ns	1.3
Level 4	ns	ns	ns	ns
Dementia	0.6	0.8	0.8	2.9
Chronic disease	4.3	1.5	1.3	ns
Prescriber	1.8	1.6	1.6	ns

ns Denotes not significant.

Source: Manitoba Centre for Health Policy, 2006

CHAPTER 9: KEY MESSAGES AND RECOMMENDATIONS

Specific results of this research are highlighted in three key messages. Eight recommendations are also made to influence policy, to suggest follow-up research activities and to improve the quality of long-term care administrative data in Manitoba.

9.1 Key Messages

1. PCH utilization patterns have changed dramatically in the recent past, and PCH residents are now typically much older, frailer and have greater healthcare needs.

The findings of this research should be interpreted in the general context of these recent and projected PCH utilization patterns. With a continued focus on community-based healthcare, it is likely that these changing utilization patterns will continue in the future. While not the focus of this research, several policy-related questions emerge from these projected trends:

- What are the characteristics of people who are most suited for care in a PCH?
- If community-based care is being considered as an alternative to PCHs, who are these programs intended for? What resource implications do these strategies have for home care in Manitoba?
- As PCH utilization patterns have changed substantially, are the levels of care used to define PCH residents still appropriate to help plan for the provision of care?

As increasingly frail PCH residents have diverse and extensive healthcare needs, providing quality care to these residents will also present new challenges. Establishing baseline indicators of this care provision will help to ensure that appropriate standards of quality care are maintained.

2. *There was substantial variation across PCHs in diagnostic and drug-related QIs.*

Data from six diagnostic and four drug-related QIs have been used to assess the quality of care provided in PCHs in Manitoba. These QIs are not intended to identify definitively PCHs that excel or that provide poor quality of care, but rather are intended as information triggers. Relative thresholds (i.e., the 10th and 90th percentile of ranked PCHs) have been used to identify facilities where QIs were reported least and most frequently. Pending follow-up activities by decision-makers, successful quality of care strategies may be emulated from these former PCHs, while remedial activi-

ties may be required in the latter. Particular attention may be warranted for PCHs that ranked above or below these thresholds for multiple QIs, demonstrating potential trends in successful or problematic quality of care provision. Decision-makers and healthcare providers should consider using these data as baseline measures of the quality of care provided in PCHs. Study outcomes should be re-assessed regularly, to determine the effectiveness of planned interventions designed to optimize the quality of care provision in PCHs.

3. *Diagnostic and drug-related QIs were influenced mostly by resident-level versus facility-level characteristics.*

This research does not suggest ways to improve the quality of care in PCHs. However, based on the results of multivariate data analyses, this research has demonstrated that diagnostic and drug-related QIs were more likely to occur in certain scenarios for PCH residents. These results help to target interventions designed to optimize the quality of care provision in PCHs.

- Factors such as resident age and sex, as well as the level of care and the presence of chronic comorbidities, are all important considerations when designing strategies to improve quality of care. The influence of some of these risk factors varied for different QIs. For example, while individuals assigned a higher level of care were more likely to experience skin ulcers, individuals assigned a lower level of care were more likely to fall accidentally, or to experience a hip or other type of fracture.
- Residents were much more likely to have experienced diagnostic QIs immediately after they were admitted to a PCH or when they were closer to death, compared to all other time periods when they were living in a PCH. These data suggest that diagnostic QIs may be more likely to occur at certain times when an individual is residing in a PCH.
- Residents were much more likely to have been dispensed higher risk drugs if two or more physicians were prescribing these medications. These results demonstrate the importance of ensuring continuity care in PCHs.
- After controlling for a variety of PCH- and resident-level risk factors, variables such as PCH facility size and staffing-to-resident ratios did not influence consistently the likelihood that QIs occurred. However, most diagnostic QIs were more likely to have occurred in proprietary PCHs in the WRHA (versus non-proprietary free-stand ing facilities in Manitoba). Antipsychotic medications were also dis pensed to more residents in proprietary PCHs in the WRHA versus most other types of PCHs in Manitoba. While similar results for proprietary PCHs have been reported by other researchers using data

from North America (Hillmer et al., 2005; McGregor et al., 2005), and also from Manitoba (Shapiro and Tate, 1995; Zimmerman et al., 2002), additional data are required to assess these latter findings further. Data that provide more facility-level information (e.g., more accurate data on the type and volume of staffing provided) and more resident-level information (e.g., direct measures of function and cognitive performance, indicators of informal supports and SES), may help to explain these unique results for proprietary PCHs in the WRHA. In addition, PCH-level data (Chapters 6 and 7 of this report) demonstrate that these results may be attributed to a select number of proprietary PCHs in WRHA, where rates of QIs were at times reported more frequently (i.e., above the 90th percentile threshold) in the province.

- In this research, it is important to keep in mind that diagnostic QIs were counted using ICD-9-CM codes. Inter-PCH variation in these QIs can therefore be attributed to actual differences in quality of care, or to extraneous factors such as different physician remuneration strategies in PCHs (i.e., fee-for-service physicians are required to submit ICD-9-CM codes for payment, while salaried physicians may not necessarily do so). Variables were created in this research to account for this potential source of bias. Based on findings from multivariate analyses, these 'contact bias' risk factors influenced study results minimally. *These findings are key to this research, and demonstrate that the majority of inter-PCH variation in the rates of diagnostic QIs can be attributed to potential differences in quality of care, versus extraneous factors such as access to hospitals or differences in physician reporting strategies.* It is important to keep in mind that this conclusion is based on average multivariate results; Appendix C of this report identifies *some* PCHs where lower rates of diagnostic QIs may be attributed to missing data.

9.2 Study Recommendations

Eight recommendations are provided to influence policy, to suggest follow-up research activities and to improve the quality of long-term care administrative data in Manitoba.

9.2.1 Policy Recommendations

1. While this research does not define acceptable rates of QIs for PCHs, it does define facilities where QIs were reported less and more frequently in the province. Decision-makers and healthcare providers can use this information to compare how frequently events were reported for PCHs in the province, and to target facilities where problems with quality care may be most evident (i.e., targeting PCHs that ranked above the 90th percentile for a given QI).

Examples of how to improve this quality of care may be 'borrowed' from PCHs where QIs were reported least frequently. Problems with quality care are most likely to exist in PCHs that ranked above the 90th percentile for multiple QIs. Follow-up is recommended for these facilities.

2. This research does not suggest ways to optimize the quality of care provided in PCHs, however results demonstrate scenarios where QIs may be more likely to occur. Decision-makers and healthcare providers can use these data to understand periods of time when residents are more at risk of experiencing a QI, and if certain groups of PCH residents are especially at risk. These data can be used to target more explicitly quality of care interventions in PCHs.

9.2.2 Data Recommendations

3. To understand better the results provided for some PCHs, direct measures of resident function and cognitive performance are required. Some of these data are gathered currently when individuals are panelled for admission to a PCH, however these data are available in hard copy only. These data are also available electronically in Minimum Data Sets (MDS) in the WRHA for home care clients when they are admitted to a PCH, and also for residents of non-proprietary PCHs in the WRHA. At present, MDS data are not collected in other RHAs in Manitoba. MDS data for the WRHA are presently not available to Manitoba Health for analyses.

   MDS data also contain additional QIs for PCHs. These data may be used to assess, for example, how often physical restraints are used, and the prevalence of frequent bladder or bowel incontinence without a toileting plan. These additional QIs will help to define further the quality of care provided in PCHs in Manitoba.

4. Data for the drug-related QIs are limited to some extent in this research, as the drugs supplied to PCHs from hospital-based pharmacies are not available to Manitoba Health for analyses. Inclusion of hospital-based pharmacy data would permit drug-related research to be conducted on more PCHs in Manitoba; 33 of the 122 eligible PCHs were excluded from the drug-based analyses in this research, as these facilities received drugs from hospital-based pharmacies.

   The present research provides data on the proportion of people who were dispensed QI-drugs before and shortly after they were admitted to a PCH. Often residents were hospitalized during these time periods. As the drugs dispensed during hospitalization are unavailable to

Manitoba Health for analyses, these patterns of drug use may be biased in some instances. While steps were taken to minimize this potential source of error in the current research (i.e., by excluding from the analyses residents who resided in a hospital for more than 60 days, either before or shortly after they were admitted to a PCH), access to data from hospital-based pharmacies would help to understand more fully how drug dispensing patterns change as residents are admitted to a PCH.

5. This research has used nursing and aide staffing data to help explain inter-PCH variation in QI rates. These results should be interpreted with some caution, as nursing and aide data are not available for all PCHs during the study period. Further, data for additional types of PCH staff (e.g., recreational services, occupational therapy, pastoral care, etc.) are reported jointly in the administrative data (i.e., the hours of care provided for these staff are often combined into a category of 'other' in the administrative data). As workload issues are becoming more prominent in PCHs, it is imperative to understand how the amount of care provided by different types of staff influences QI rates. The majority of these data are already provided in the administrative data, but need to reported using a more consistent and standardized format.

9.2.3 Recommendations for Future Research

6. MDS data are currently available for residents in non-proprietary PCHs in the WRHA, and these data provide valuable information about resident function and cognitive performance. These data should be linked to the administrative data in Manitoba to help understand variance in QI rates between different types of PCHs, and also to define further how resident characteristics influence these rates. QIs in the MDS and administrative data may be combined to assess more completely the quality of care that is provided in PCHs.

7. This research has provided an initial assessment of drug utilization patterns in Manitoba PCHs, documenting the dramatic increase in drug use as residents are admitted to a PCH. Follow-up research should be conducted to define scenarios where this increase in drug use is particularly dramatic. This may include assessing changes in drug use as residents are admitted to a PCH from a community-based versus a hospital-based environment, or if these changes in drug use are more dramatic for residents with certain characteristics.

8. This research has demonstrated that the risk of experiencing a diagnostic QI was greater for residents just after they were admitted to a

PCH or when they were closer to death. These results may demonstrate the level of morbidity associated with experiencing some diagnostic QIs (e.g., PCH residents who experience a hip fracture may die shortly thereafter). For other QIs (e.g., accidental falls), these results may reflect the period of time required for residents to adapt to their new living environment. Future research should assess the differences in risk of experiencing QIs between these two times, to understand further when PCH residents are most likely to experience different adverse events.

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GLOSSARY

Acronyms used in this report:

ACG	Adjusted Clinical Group
ADG	Ambulatory Diagnostic Group
ATC	Anatomical Therapeutic Chemical
BPSD	Behavioural and Psychological Symptoms of Dementia
CL	Confidence Limit
DPIN	Drug Programs Information Network
ID	Identification Number
MCHP	Manitoba Centre for Health Policy
MDS	Minimum Data Sets
MIS	Management Information System
OR	Odds Ratio
OTC	Over-the-Counter
PCH	Personal Care Home
QI	Quality Indicator
RHA	Regional Health Authority
RAI	Resident Assessment Instrument
RR	Relative Risk
SES	Socioeconomic Status
TFR	Total Fertility Rate
WRHA	Winnipeg Regional Health Authority

Administrative Data/Databases

Data collected, usually by the government, for some administrative purpose (e.g., keeping track of the population eligible for certain benefits, paying doctors or hospitals), but not primarily for research or surveillance purposes.

Accidental Falls

One of the six **diagnostic quality indicators** (**QIs**) reported in this research. Events of accidental falls were counted using the **ICD-9-CM** 'E' codes 880 through 888 in the hospital abstract data only. An ICD-9-CM 'E' code represents environmental causes, circumstances, and conditions that result in an injury.

Adjusted Clinical Groups (ACGs) and Ambulatory Diagnostic Groups (ADGs)

The ACG is a population/patient case mix adjustment system developed by researchers at Johns Hopkins University School of Hygiene and Public Health in Baltimore, Maryland, U.S.A. The ACG system measures health status by grouping ICD-9-CM medical diagnoses codes into 32 different Ambulatory Diagnostic Groups (ADGs) based on five clinical and expected utilization criteria: 1) duration of the condition (acute, recurrent, or chronic); 2) severity of the condition (e.g., minor and stable versus major and

unstable); 3) diagnostic certainty (symptoms focussing on diagnostic evaluation versus documented disease focussing on treatment services); 4) etiology of the condition (infectious, injury, or other); and 5) specialty care involvement (medical, surgical, obstetric, hematology, etc.).

For the purposes of this research, select groups of ADGs were used to denote **personal care home** (**PCH**) residents with two or more categories of **chronic diseases**. Residents were assigned as having comorbid chronic diseases if they were assigned to two or more of the distinct ADG groupings in Glossary Table 1. These data were reviewed one year prior to the PCH admission date for residents who were admitted to a PCH between April 1, 1999 and March 31, 2004, and five years prior to April 1, 1999 for all other residents.

Glossary Table 1: ADGs used to denote participants with multiple categories of chronic diseases

ADG Grouping	Chronic Disease Groups
ADG group 5	Allergies
ADG group 6	Asthma
ADG group 10	Chronic Medical: Stable
ADG group 11	Chronic Medical: Unstable
ADG group 12	Chronic Specialty: Stable-Orthopedic
ADG group 13	Chronic Specialty: Stable-Ear, Nose, Throat
ADG group 14	Chronic Specialty: Stable-Eye
ADG group 16	Chronic Speciality: Unstable-Orthopedic
ADG group 17	Chronic Speciality: Unstable-Ear, Nose, Throat
ADG group 18	Chronic Speciality: Unstable-Eye
ADG group 24	Psychosocial: Persistent/Recurrent, Stable
ADG group 25	Psychosocial: Persistent/Recurrent, Unstable
ADG group 32	Malignancy

Source: Manitoba Centre for Health Policy, 2006

Adjusted Rates

See **Standardization**.

Ambulatory Diagnostic Groups (ADGs)

See **Adjusted Clinical Groups** (**ACGs**) **and Ambulatory Diagnostic Groups** (**ADGs**).

Ambulatory Care Physician Visits

Any contact between a patient and physician at one of the following locations: physician's office, outpatient or emergency department, clinics, **personal care home** (**PCH**), the patient's home, or northern/remote nursing stations.

Anatomical, Therapeutic and Chemical (ATC) Drug Classification System

The ATC system for classifying drugs is used widely in European countries. ATC classifications are available online, and are updated and published once a year by the World Health Organization Collaborating Centre for Drug Statistics Methodology (http://www.whocc.no/atcddd/). The ATC system is becoming used more commonly in Canada, and is currently managed by Health Canada (http://www.hc-sc.gc.ca/hpfb-dgpsa/tpd-dpt/index_drugs_dpd_e.html).

In the ATC classification system, drugs are divided into different groups according to the organ or system on which they act and their chemical, pharmacological and therapeutic properties. Drugs are classified into groups at five different levels.

- **1st Level** - At the broadest level, drugs are divided into one of 14 anatomical groups as outlined in Glossary Table 2. The first level of the code is based on a letter (e.g., "B" for Blood and blood forming organs):

Glossary Table 2: Anatomical groups used to denote the first level of the ATC drug classification system

Level	Main Group
A	Alimentary tract and metabolism
B	Blood and blood forming organs
C	Cardiovascular system
D	Dermatologicals
G	Genito urinary system and sex hormones
H	Systemic hormonal preparations
J	Antiinfectives for systemic use
L	Antineoplastic and immunomodulating agents
M	Musculoskeletal system
N	Nervious system
P	Antiparasitic products
R	Respiratory system
S	Sensory organs
V	Various

Source: Manitoba Centre for Health Policy, 2006

- **2nd Level** - A pharmacological or therapeutic subgroup (e.g., 'B03' for antianemic preparations).
- **3rd Level** - A chemical or therapeutic or pharmacological subgroup (e.g., "B03A" for iron preparations).
- **4th Level** - A chemical or therapeutic or pharmacological subgroup. This is the level used to count the "number of different drugs" as it is the level which aggregates drugs just above their descriptive chemical substance (e.g., 'B03AA' for iron, bivalent, oral preparations). A

count of an individual's drugs at the fourth level of the ATC gives the researcher a categorical option with which to stratify and then describe pharmaceutical users.

- **5th Level** - The subgroup for the chemical substance (e.g., 'B03AA07' for ferrous sulphate).

In the ATC system, all drug identification numbers with the generic name 'ferrous sulphate' would be assigned the code B03A A07. In other words, an ATC code has five levels that are described by seven digits.

Antipsychotic Medications

Medications used to counteract or diminish the symptoms of psychotic conditions (i.e., hallucinations, paranoia, etc.). These medications are also referred to as neuroleptics. Typical neuroleptics define more traditional or 'older' antipsychotic medications, while atypical neuroleptics define newer antipsychotics. For a list of antipsychotic drugs studied, see Table 7.6 in this report.

Beer's Criteria

A list of drugs, compiled and updated by expert review panels, that should be avoided for use by older adults, as they are generally thought to be ineffective or to place older adults at an unnecessary high risk of experiencing adverse events. These medications typically have strong anticholinergic and sedating properties, or place older adults at an increased risk of drug addiction and falls. See Table 7.7 for a list of Beer's Criteria drugs used in this research.

Benzodiazepines

Benzodiazepines belong to the group of medicines called central nervous system depressants (e.g., tranquilizers and sleeping pills). They are used to slow down the nervous system and are identified typically by the **Anatomical Therapeutic Chemical** (**ATC**) drug classification code: N05B. Benzodiazepines are typically classified as having short, intermediate or a long-acting half-life, to reflect how long these medications remain active in the body. See Table 7.5 for a list of benzodiazepines used by **personal care home** (**PCH**) residents during the five-year study period.

Confidence Limit (CL)

An interval, calculated from data, which contains a population parameter, such as the population median or mean, with specified probability. For example, a 99% confidence limit (written a 99% CL) would have a 99% probability of containing the true population value.

Chronic Disease

Diseases which have one or more of the following characteristics: they are permanent, leave residual disability, are caused by nonreversible pathological alteration, require special training of the patient for rehabilitation, or may be expected to require a long period of supervision, observation, or care. For examples of chronic disease categories used in this study, see **Adjusted Clinical Groups (ACGs) and Ambulatory Diagnostic Groups (ADGs)**.

Contact Bias

A risk factor created specifically for this research by summing, for each **personal care home (PCH)**, the total number of **ambulatory care physician visits** or hospital contacts made by PCH residents, excluding contacts used to count the **diagnostic quality indicators (QIs)**. This measure was utilized during multivariate analyses of the diagnostic QIs, to control for differences in access to the healthcare system between PCHs (in the case of hospital contact bias), and to also control for differences in physician reporting strategies in the case of ambulatory care visits (i.e., some salaried physicians may not have submitted shadow billings to Manitoba Health, to reflect the care provided to PCH residents).

Data Suppression

As per policies at the Manitoba Centre for Health Policy (MCHP), RHA- and PCH-level data were suppressed when between one and five events of **quality indicators (QIs)** were reported during the five-year study period. RHA- and PCH-level data were not suppressed when zero events of QIs were reported during this time. This process of suppressing data is conducted to protect the anonymity of study participants.

Dementia

Dementia is a term used to define the loss of cognitive function of the brain. This usually affects decision-making and problem solving, memory and verbal communications, and in some instances also results in behaviour changes (National Institute of Neurological Disorders and Stroke, 2006).

For the purposes of this research, a previous diagnosis of dementia was determined using the following **ICD-9-CM** codes: 290 (organic psychotic conditions), 291 (alcoholic psychosis), 292 (drug psychosis) 294 (other organic psychotic conditions), 331 (cerebral degenerations), or 797 (senility) in either hospital abstracts or physician claims. These data were reviewed five years prior to the **personal care home (PCH)** admission date for residents who were admitted to a PCH between April 1, 1999 and March 31, 2004, and five years prior to April 1, 1999 for all other residents.

Diagnostic Quality Indicators (QIs)

Diagnostic QIs were assessed by counting how frequently select **ICD-9-CM** diagnostic codes appeared in the administrative healthcare data during an **ambulatory care physician visit** and/or a hospital admission. Diagnostic QIs assessed in this research include: **hip fractures**, **non-hip fractures**, **accidental falls**, **skin ulcers**, **respiratory infections**, and **fluid and electrolyte imbalances**. See also **Quality Indicators** (**QIs**).

Dispensed Medications

The act of providing a patient with a supply of medications, usually by a pharmacist. To be differentiated from medications that are prescribed by physicians. Drug information available at the Manitoba Centre for Health Policy (MCHP) assesses medications dispensed by community or retail pharmacists. See also **Drug Programs Information Network** (**DPIN**).

Drug Programs Information Network (DPIN)

An electronic, on-line, point-of-sale drug dispensing database. It links all community pharmacies (but not hospital-based pharmacies) and captures information about all Manitoba residents, including most prescriptions dispensed to status Indians. DPIN contains information such as unique patient identification, age, birthdate, sex, medication history, **over-the-counter** (**OTC**) medication history, patient postal code, new drugs prescribed, date dispensed, and unique pharmacy identification number. DPIN is maintained by the Government of Manitoba's Ministry of Health.

Fluid and Electrolyte Imbalances

One of the six **diagnostic quality indicators** (**QIs**) reported in this research. Events of fluid and electrolyte imbalances were counted using the **ICD-9-CM** code 276 in both the medical claims and hospital abstract data. Events of this QI include disorders of fluid, electrolyte and acid-base balance. Examples include hyperosmosality and hyposmolality, acidosis and alkalosis, volume depletion and overload, as well as hyperpotassemia and hypopotassemia.

Free-Standing Personal Care Home (PCH)

A PCH that is not **juxtaposed** to another healthcare facility.

Half-Life of Drugs

Defined by the Canadian Pharmacists Association as the amount of time it takes before half of the active elements of the drug are either eliminated or broken down by the body.

Hip Fracture
A break or rupture in the cortex of the femur bone (typically the top part where it connects to the pelvis). The most common types are: femoral neck fractures, intertrochanteric fractures and subtrochanteric fractures.

Hip fractures were reported as one of the six **diagnostic quality indicators (QIs)** in this research, by counting the **ICD-9-CM** codes 820 (fracture of the neck of the femur) and 821 (fracture of other and unspecified parts of the femur) in both the medical claims data and the hospital abstract data. These diagnostic codes were counted only if select tariff codes (0865, 0868, 0870, 0872, 0874, denoting a reduction of the hip or a prosthetic replacement) were also reported within a two-week period of the hip fracture diagnostic claim.

ICD-9-CM
The 9th version of the ICD (International Classification of Disease) coding system (with Clinical Modifications), developed by the World Health Organization (WHO) that is used to classify diseases, health conditions, and procedures.

Juxtaposed Personal Care Home (PCH)
A PCH located on the same campus as, but not necessarily physically linked to, another healthcare facility, that may share one or more services (e.g., staff, supplies, equipment and/or physical plant).

Logistic Regression
The standard method of data analysis concerned with describing the relationship between a response variable and one or more explanatory variables, where the response variable follows a binomial (categorical) distribution.

Length of Stay
The number of days of care counted from the admission date to the separation date for residents within a healthcare facility. In this research, length of stay was accessed only for PCH residents with a separation date recorded during the study period.

Level of Care
As a part of the panelling process for admission to a **personal care home (PCH)**, all residents are assigned a level of care based on their level of dependence in the areas of bathing and dressing, assistance with meals (feeding), ambulation/mobility/transfers, elimination, professional intervention (treatment/medication) and behaviour management/support supervision. In each of these areas, individuals are scored as being 'independent', or requir-

ing 'minimal', 'partial' or 'maximal' dependence. Individuals can also be assigned a score of 'chronic care indicator' in each of these areas, which usually means that professional expertise is required to complete the task.

Levels of care are assigned to individuals using the following criteria:

- **Level of care 1**: Individuals who are scored as 'independent' or 'minimal dependence' in each of the six areas of care.
- **Level of care 3**: Individuals who are scored as: a) 'maximal dependence' in two or three areas of care, and as 'independent' or 'minimal dependence' in all other areas of care; or, b) 'maximal dependence' in the area of behaviour management/support supervision, and 'partial dependence' in at least two other areas of care.
- **Level of care 4**: Individuals who are scored as 'maximal dependence' in four or more areas of care.
- **Level of care 2**: Individuals who are scored as any other combination of 'minimal', 'partial' and 'maximal' dependence, in all areas of care.

Individuals that are assigned a score of 'chronic care indicator' in any of the six areas of care may be considered for placement into a chronic care facility in Manitoba, such as Deer Lodge or Riverview in the WRHA.

Hours of nursing care in a PCH have been estimated for residents assigned these different levels of care. Residents assigned a level of care of 1 are estimated to require 0.5 hours of care in a 24-hour period. Residents assigned a level of care of 2 are estimated to require 2.0 hours of care in a 24-hour period, while those assigned a level of care of 3 or 4 are estimated to require at least 3.5 hours of nursing care during this time.

Management Information System (MIS)

A standard classification system for financial and statistical records in Canadian healthcare facilities designed to simplify the process of comparison across facilities, regions and provinces. It was developed by the Canadian Institute for Health Information.

Minimum Data Set (MDS)

See **Resident Assessment Instrument (RAI)**.

Multivariable Analysis

A term used to define various statistical analysis techniques, whereby several independent or explanatory variables are used to predict a single study outcome. The effect of each independent variable on the study outcome is provided uniquely from the influence of all other independent variables.

Non-Hip Fractures

Refers to all bone fractures except **hip fractures**.

Non-hip fractures were reported as one of six **diagnostic quality indicators** (**QIs**) in this research by counting the ICD-9-CM codes 800 through 829 using both the medical claims data and the hospital abstract data, and excluding hip fractures. The majority of non-hip fractures reported in this research were specific to the upper limbs (34.6% of events) and neck or trunk (29.6%). Further, 23.6% of non-hip fractures were specific to the upper or lower leg, while 2.7% of events involved the skull and 9.6% of events involved multiple fracture sites.

Non-Proprietary Personal Care Home (PCH)

Describes a type of PCH that is operated on a non-profit basis. These PCHs are either **free-standing** or **juxtaposed** to another healthcare facility.

Odds

The ratio of the probability of an event to that of nonoccurrence. For example, if 60 males experienced a hip fracture and 40 did not, the odds of experiencing a hip fracture in males is 60:40 or 1.5 (Last, 1995).

Odds Ratio (OR)

The outcome provided from several statistical techniques including **logistic regression** is defined as the ratio of two **odds**. Using the following example (Last, 1995):

	Males	Females
QI present	a	b
QI absent	c	d

The OR of males to females is: $a/c \div b/d$ or ad/bc

An OR is similar to a **relative risk** (**RR**) when the occurrence of an event is very rare.

Over-the-Counter (OTC) Medications

Medications legally available without a physician prescription. In this research, OTC medications were excluded when assessing the proportion of individuals who met the criteria for **polypharmacy** (i.e., were dispensed nine or more different categories of medications in a 100-day period), prior to and shortly after they were admitted to a **personal care home** (**PCH**). This is because OTC medications may not be registered in the **Drug Programs Information Network** (**DPIN**) databases before residents are admitted to a PCH, but are more likely to be registered in this database after this time. Examples of OTC medications excluded from these analyses include aceta-

minophen, Tylenol, aspirin, multivitamins, and select stool softeners. A more complete list of these OTC medications is available from the first author of this report.

Outcome Quality Indicators (QIs)
Indicators of quality care that reflect the health status of individuals. See also **Quality Indicators (QIs)**.

Personal Care Home (PCH)
Personal care homes (PCHs) are residential facilities for predominantly older persons with a **chronic disease** or disability. In Manitoba, PCHs can be **proprietary** (for profit) or **non-proprietary** (not-for-profit). PCHs are referred to often as nursing homes in other provinces in Canada.

Polypharmacy
In this research, polypharmacy was defined as the proportion of **personal care home (PCH)** residents who were dispensed nine or more different categories of medications in a 100-day period.

Population Health Research Data Repository (Repository)
A comprehensive database developed to describe and explain patterns of healthcare and profiles of health and illness. It is located at the Manitoba Centre for Health Policy (MCHP). The database contains anonymized encounter-based records of an individual's interactions with the healthcare system, including physicians, hospitals, nursing homes, home care, and pharmaceutical prescriptions. The Repository also includes data from other agencies, for example, Statistics Canada data at the level of enumeration area. Subsets of the data are used in specific approved research projects.

Prescribed Medications
Medications that are prescribed by a physician. To be differentiated from medications that are dispensed by a pharmacist.

Process Quality Indicators (QIs)
Indicators that reflect the standards of care provided by healthcare staff without necessarily taking into account the health needs of the individual. See also **Quality Indicators (QIs)**.

Proprietary Personal Care Home (PCH)
Describes a type of **personal care home (PCH)** that is operated on a for profit basis. In Manitoba, all proprietary PCHs are free-standing facilities.

Quality Indicators (QIs)

Markers that have been developed to reflect the presence or absence of potential shortcomings in the provision of healthcare. These indicators are not intended to identify definitive problems in the quality of healthcare provision, but rather are intended to serve as triggers for decision-makers and healthcare providers to conduct further investigations.

Quality Indicator (QI) Timing

A variable used specifically in this research, to differentiate between **diagnostic QIs** that occurred within 30 days of admission to a **personal care home** (**PCH**) or 60 days from the time that a person was separated from long-term care in Manitoba (in the vast majority of instances because of death), versus those that occurred in all other time periods. This variable was created specifically for use during multivariate analyses of the diagnostic QIs, based on decision-makers' recommendation that QI events likely happen more often to residents just after they are admitted to a PCH or when they are closer to death. See also **Quality Indicators** (**QIs**)

Relative Risk (RR)

Relative risk (RR) is the ratio of two risk estimates. Using the following example (Last, 1995):

	Males	Females
QI present	a	b
QI absent	c	d

The RR for males to females is: $a / a + c \div b / b + d$

Regional Health Authority (RHA)

In Manitoba there are 11 established RHAs as governance structures: South Eastman, Brandon, Winnipeg, Central, Assiniboine, Parkland, North Eastman, Interlake, Burntwood, Norman and Churchill. Winnipeg was originally divided into two authorities: the Winnipeg Community and Long Term Care Authority and the Winnipeg Hospital Authority, which amalgamated in February 2000 into WRHA. In addition, in 2002, the Assiniboine RHA was established via the merger of the Marquette and South Westman RHAs. Each RHA has the responsibility for providing for the delivery and administration of health services in a specified geographic area.

For the purposes of this research, no data have been provided for the Churchill and Burntwood RHAs. Neither of these RHAs contain **personal care homes** (**PCHs**) that are registered and funded entirely by Manitoba

Health (two PCHs in Burntwood are funded partially by the Federal Government; these PCHs were excluded from this research as only data for

some residents are available to Manitoba Health for analyses). In addition, no PCHs from the Nor-Man RHA have been included in the drug analyses, as PCHs in this RHA received drugs from hospital-based pharmacies. Drug data from hospital-based pharmacies are not available to Manitoba Health for analyses.

Residential Charges

Effective 1993, individuals are required to pay a daily residential fee once they are admitted into a **personal care home** (**PCH**), or once they are panelled (accepted) for admission into a PCH, and are waiting for placement in a hospital. This fee is calculated according to the individual's net income and the income of his or her spouse if applicable. Residents who have a net income below a minimum level, have dependents in the community, and are not eligible for select pensions or other forms of financial assistance may also have the residential fee reduced or waived.

Resident Assessment Instrument (RAI)

An assessment tool designed by the Centre for Health Systems Research and Analysis at the University of Wisconsin to improve the quality of clinical needs assessments and care planning for **personal care home** (**PCH**) residents. This instrument has been mandated for use by PCHs in the United States, and is also being utilized currently by select provinces in Canada, and also by **non-proprietary PCHs** in the WRHA in Manitoba. **MDS** data are a component of the RAI designed to report function and cognitive performance, indicators of social supports, and other resident characteristics.

Respiratory Infections

One of the six **diagnostic quality indicators** (**QIs**) reported in this research. Events of respiratory infections were counted using the **ICD-9-CM** codes 480 through 487 in both the medical claims and hospital abstract data. These ICD-9-CM codes are used to diagnose various strains of viral and bacterial pneumonia (480, 481, 482, 483), as well as pneumonia derived from various strains of infectious diseases (484, 485, 486) and cases of influenza (487).

Skin Ulcers

One of the **six diagnostic quality indicators** (**QIs**) reported in this research. Events of skin ulcers were counted using the **ICD-9-CM** code 707 in both the medical claims and hospital abstract data. This definition includes events of decubitus ulcers and other skin ulcers related to poor nutrition and neurodegenerative diseases.

Socioeconomic Status (SES)

Characteristics of economic, social and physical environments in which individuals live and work, as well as demographic and genetic characteristics. In

this research, daily residential fees paid by study participants were used as an indicator of SES.

Standardization

The process of adjusting outcomes to account for their differences in confounding characteristics. In this research, **quality indicator** (**QI**) rates were adjusted in each **personal care home** (**PCH**) as if all residents in Manitoba had the same age and sex distribution of residents, and also had the same proportion of residents assigned to each **level of care**. This process removes any differences in QI rates between PCHs that are attributed to these characteristics. For the **diagnostic QIs**, level of care was assessed at the time the QI was recorded; resident age was assessed at the time of admission to a PCH, or as of April 1, 1999 for residents who were admitted to a PCH prior to this date. For the drug-related QIs, level of care and resident age were assessed at the time of admission to a PCH.

Structural Quality Indicators (QIs)

Indicators that define if a healthcare facility has proper standards in place to facilitate the appropriate delivery of healthcare. Examples of structural QIs include having staff with appropriate training and credentials, ensuring that facility space and equipment meet predetermined standards, and having appropriate policies and procedures in place so that staff can provide appropriate and consistent standards of healthcare. See also **Quality Indicators** (**QIs**).

Total Fertility Rate (TFR)

The number of children who would be born to an average woman who experiences each of the age-specific fertility rates of a population in a given year, as she progresses through her reproductive lifetime.

Appendix A: Name and Identification Number (ID) of the PCHs Included in the Analyses of the Diagnostic QIs

Table A.1: Name and identification number (ID) of the PCHs included in the analyses of the diagnostic QIs

ASSINIBOINE RHA

PCH ID	PCH Name
550	ERICKSON PERSONAL CARE HOME
554	WILLOWVIEW HOME
584	HARTNEY COMMUNITY HEALTH CENTRE
591	ELKWOOD MANOR PERSONAL CARE HOME
601	BAYSIDE PERSONAL CARE HOME INC
602	BALDUR MANOR INC
608	BIRTLE PERSONAL CARE HOME INC.
610	EVERGREEN PLACE
613	BRENDELWIN LODGE
616	CARBERRY PERSONAL CARE HOME
618	DELWYNDA COURT PERSONAL CARE HOME INC
621	EASTVIEW LODGE
648	MINNEDOSA PERSONAL CARE HOME
650	MORLEY HOUSE OF SHOAL LAKE INC
652	MELITA AND AREA PERSONAL CARE HOME INC.
664	RUSSELL PERSONAL CARE HOME
671	RIVERDALE PERSONAL CARE HOME INC
677	HAMIOTA DISTRICT HEALTH CENTRE INC.
678	SANDY LAKE MEDICAL N. H. INC.
681	THE SHERWOOD LODGE
682	SOURIS DISTRICT PERSONAL CARE HOME INC
687	TIGER HILLS MANOR INC
692	ROSSBURN PERSONAL CARE HOME INC
694	WAWANESA PERSONAL CARE HOME INC
695	WESTMAN NURSING HOME INC
696	WESTVIEW LODGE
698	GLENBORO PERSONAL CARE HOME INC

BRANDON RHA

PCH ID	PCH Name
501	RIDEAU PARK PERSONAL CARE HOME INC
529	C P L VALLEYVIEW
557	HILLCREST PLACE INC
599	DINSDALE PERSONAL CARE HOME
625	FAIRVIEW HOME INC

CENTRAL RHA

PCH ID	PCH Name
503	PEMBINA-MANITOU HEALTH CENTRE
592	DOUGLAS CAMPBELL LODGE
600	ALTONA AND DISTRICT PERSONAL CARE HOME
611	BOYNE LODGE
624	EMERSON PERSONAL CARE HOME
629	FOYER NOTRE DAME
640	LIONS PRAIRIE MANOR
654	ROCK LAKE PERSONAL CARE HOME
659	PRAIRIE VIEW LODGE
661	RED RIVER VALLEY LODGE
672	SALEM HOME,INC.
674	ST CLAUDE PAVILION
686	TABOR SENIOR CITIZENS HOME INC
689	THIRD CROSSING MANOR INC
691	MACGREGOR PERSONAL CARE HOME INC.

INTERLAKE RHA

PCH ID	PCH Name
556	FISHER PERSONAL CARE HOME
583	RED RIVER PLACE
593	TUDOR HOUSE
603	BETEL HOME FOUNDATION
604	ASHERN PERSONAL CARE HOME
605	BETEL HOME FOUNDATION
606	ERIKSDALE PERSONAL CARE HOME
612	LUNDAR PERSONAL CARE HOME
631	GOODWIN LODGE INC.
656	PIONEER HEALTH SERVICES INC
663	ROSEWOOD LODGE INC

NOR-MAN RHA

PCH ID	PCH Name
622	FLIN FLON PERSONAL CARE CORPORATION
653	NORTHERN LIGHTS MANOR
670	ST PAULS RESIDENCE

NORTH EASTMAN RHA

PCH ID	PCH Name
504	KIN-PLACE PERSONAL CARE HOME
566	LAC DU BONNET PERSONAL CARE HOME
597	SUNNYWOOD MANOR P.C.H. INCORPORATED
598	WHITEMOUTH PERSONAL CARE HOME INC.
620	EASTGATE LODGE

PARKLAND RHA

PCH ID	PCH Name
552	GILBERT PLAINS HEALTH CENTRE INC.
589	BENITO HEALTH CENTRE - P.C.H.
614	DAUPHIN PERSONAL CARE HOME INC.
633	THE GRANDVIEW PERSONAL CARE HOME INC
638	DR GENDREAU MEMORIAL HOME
641	MCCREARY ALONSA PERSONAL CARE HOME INC.
666	CROCUS COURT PERSONAL CARE HOME
669	ST PAULS HOME
683	SWAN RIVER LODGE (1991) INC
684	SWAN RIVER VALLEY PERSONAL CARE HOME
697	WINNIPEGOSIS/MOSSEY RIVER P.C.H. INC

SOUTH EASTMAN RHA

PCH ID	PCH Name
576	ST ADOLPHE NURSING HOME
609	BETHESDA PERSONAL CARE HOME
645	REOPS JOLYS PERSONAL CARE HOME
646	MENNO HOME FOR THE AGED
662	REST HAVEN NURSING HOME
679	VITA & DISTRICT PERSONAL CARE HOME
693	VILLA YOUVILLE INC

WINNIPEG PROPRIETARY RHA

PCH ID	PCH Name
508	BEACON HILL LODGE
521	C P L POSEIDON CARE CENTRE
525	C P L PARKVIEW PLACE
537	FORT GARRY CARE CENTRE
551	GOLDEN DOOR GERIATRIC CENTRE
555	HERITAGE LODGE PERSONAL CARE HOME INC.
559	CHARLESWOOD CARE CENTRE
564	KILDONAN PERSONAL CARE CENTRE
568	MAPLES PERSONAL CARE HOME
571	OAKVIEW PLACE
574	RIVER EAST PERSONAL CARE HOME LTD
581	ST NORBERT NURSING HOMES LTD
594	TUXEDO VILLA NURSING HOME
595	VISTA PARK LODGE

WINNIPEG NON-PROPRIETARY RHA

PCH ID	PCH Name
506	CALVARY PLACE PERSONAL CARE HOME
509	MISERICORDIA PLACE
573	CONCORDIA PLACE
587	RIVERVIEW HEALTH CENTRE
596	WEST PARK MANOR PERSONAL CARE HOME
607	BETHANIA MENNONITE P C HOME INC
615	THE SAUL AND CLARIBEL SIMKIN CENTRE
617	CONVALESCENT HOME OF WINNIPEG
619	DONWOOD MANOR PERSONAL CARE HOME INC
626	FOYER VALADE INC
628	FRED DOUGLAS LODGE
632	GOLDEN WEST CENTENNIAL LODGE
635	HOLY FAMILY NURSING HOME
636	PEMBINA MENNONITE PERSONAL CARE HOME
639	LIONS PERSONAL CARE CENTRE
642	MEADOWOOD MANOR
643	LUTHER HOME
649	THE MIDDLECHURCH HOME OF WINNIPEG
657	PARK MANOR PERSONAL CARE HOME
667	ST JOSEPHS RESIDENCE INC.
680	THE SHARON HOME INC
685	GOLDEN LINKS PCH
688	CENTRE TACHE CENTRE
699	DEER LODGE CENTRE PC

Appendix B: Name and ID of the PCHs Included in the Analyses of the Drug-Related QIs

Table B.1: Name and identification number (ID) of the PCHs included in the analyses of the drug-related QIs

ASSINIBOINE RHA

PCH ID	PCH Name
554	WILLOWVIEW HOME
591	ELKWOOD MANOR PERSONAL CARE HOME
601	BAYSIDE PERSONAL CARE HOME INC
602	BALDUR MANOR INC
610	EVERGREEN PLACE
613	BRENDELWIN LODGE
618	DELWYNDA COURT PERSONAL CARE HOME INC
650	MORLEY HOUSE OF SHOAL LAKE INC
652	MELITA AND AREA PERSONAL CARE HOME INC.
664	RUSSELL PERSONAL CARE HOME
671	RIVERDALE PERSONAL CARE HOME INC
678	SANDY LAKE MEDICAL N. H. INC.
681	THE SHERWOOD LODGE
682	SOURIS DISTRICT PERSONAL CARE HOME INC
687	TIGER HILLS MANOR INC
694	WAWANESA PERSONAL CARE HOME INC
695	WESTMAN NURSING HOME INC
696	WESTVIEW LODGE
698	GLENBORO PERSONAL CARE HOME INC

BRANDON RHA

PCH ID	PCH Name
529	C P L VALLEYVIEW
557	HILLCREST PLACE INC
599	DINSDALE PERSONAL CARE HOME
625	FAIRVIEW HOME INC

CENTRAL RHA

PCH ID	PCH Name
503	PEMBINA-MANITOU HEALTH CENTRE
629	FOYER NOTRE DAME
654	ROCK LAKE PERSONAL CARE HOME
659	PRAIRIE VIEW LODGE
672	SALEM HOME,INC.
674	ST CLAUDE PAVILION
689	THIRD CROSSING MANOR INC

INTERLAKE RHA

PCH ID	PCH Name
556	FISHER PERSONAL CARE HOME
583	RED RIVER PLACE
593	TUDOR HOUSE
603	BETEL HOME FOUNDATION
604	ASHERN PERSONAL CARE HOME
605	BETEL HOME FOUNDATION
606	ERIKSDALE PERSONAL CARE HOME
612	LUNDAR PERSONAL CARE HOME
631	GOODWIN LODGE INC.
656	PIONEER HEALTH SERVICES INC
663	ROSEWOOD LODGE INC

NORTH EASTMAN RHA

PCH ID	PCH Name
566	LAC DU BONNET PERSONAL CARE HOME
598	WHITEMOUTH PERSONAL CARE HOME INC.
620	EASTGATE LODGE

PARKLAND RHA

PCH ID	PCH Name
552	GILBERT PLAINS HEALTH CENTRE INC.
633	THE GRANDVIEW PERSONAL CARE HOME INC
641	MCCREARY ALONSA PERSONAL CARE HOME INC.
666	CROCUS COURT PERSONAL CARE HOME
669	ST PAULS HOME
697	WINNIPEGOSIS/MOSSEY RIVER P.C.H. INC

SOUTH EASTMAN RHA

PCH ID	PCH Name
576	ST ADOLPHE NURSING HOME
609	BETHESDA PERSONAL CARE HOME
645	REOPS JOLYS PERSONAL CARE HOME
646	MENNO HOME FOR THE AGED
662	REST HAVEN NURSING HOME
679	VITA & DISTRICT PERSONAL CARE HOME
693	VILLA YOUVILLE INC

WINNIPEG PROPRIETARY RHA

PCH ID	PCH Name
508	BEACON HILL LODGE
521	C P L POSEIDON CARE CENTRE
525	C P L PARKVIEW PLACE
537	FORT GARRY CARE CENTRE
551	GOLDEN DOOR GERIATRIC CENTRE
555	HERITAGE LODGE PERSONAL CARE HOME INC.
559	CHARLESWOOD CARE CENTRE
564	KILDONAN PERSONAL CARE CENTRE
568	MAPLES PERSONAL CARE HOME
571	OAKVIEW PLACE
574	RIVER EAST PERSONAL CARE HOME LTD
581	ST NORBERT NURSING HOMES LTD
594	TUXEDO VILLA NURSING HOME
595	VISTA PARK LODGE

WINNIPEG NON-PROPRIETARY RHA

PCH ID	PCH Name
596	WEST PARK MANOR PERSONAL CARE HOME
607	BETHANIA MENNONITE P C HOME INC
617	CONVALESCENT HOME OF WINNIPEG
619	DONWOOD MANOR PERSONAL CARE HOME INC
626	FOYER VALADE INC
628	FRED DOUGLAS LODGE
632	GOLDEN WEST CENTENNIAL LODGE
635	HOLY FAMILY NURSING HOME
636	PEMBINA MENNONITE PERSONAL CARE HOME
639	LIONS PERSONAL CARE CENTRE
642	MEADOWOOD MANOR
643	LUTHER HOME
649	THE MIDDLECHURCH HOME OF WINNIPEG
657	PARK MANOR PERSONAL CARE HOME
667	ST JOSEPHS RESIDENCE INC.
680	THE SHARON HOME INC
685	GOLDEN LINKS PCH
688	CENTRE TACHE CENTRE

APPENDIX C: FOLLOW-UP ANALYSES OF PHYSICIAN VISIT RATES REPORTED IN THE MEDICAL CLAIMS DATA AT MANITOBA HEALTH

Caution may be required when interpreting the results for some PCHs in Table 6.2. Events of diagnostic QIs were counted using the hospital abstract and medical claims data. Given the potential source of bias associated with these latter data (see Chapter 4, subsection titled 'Limitations of the Research'), follow-up analyses were conducted to assess physician visit rates in these PCHs. The results of these follow-up analyses are provided in Appendix Table C.1, and highlights of these data are summarized as follows:

- On average for all PCHs (n=122), medical claims data were provided for 90.7% of residents at least once per year during the five-year study period, at an average physician visit rate of 10.8 times per resident per year. This means that PCH residents were visited by a physician on average 10.8 times per year, according to the medical claims data.
- Table 6.2 highlights PCHs where QI events were consistently reported less frequently in the province. While residents in these PCHs may have been healthier and therefore required physician visits less frequently, it is also possible that physicians in these PCHs did not submit medical claims data to reflect the care they provided. For example, physicians providing care in PCH ID 669 (in the Parkland RHA), submitted medical claims for 48.9% of the residents in this facility, and according to the medical claims data, residents in this PCH were visited by a physician on average 1.4 times per year. Similar results are reported for PCH IDs 698, 593, and 503.[45] Overall, the physician visit rates for these PCHs are lower than the average values reported for all PCHs in the province. The results for these specific PCHs in Table 6.2 may be due to a combination of exceptional PCH resident health and a lack of medical claims data. It is not possible to discern between these two potential explanations for these specific PCHs in Table 6.2.
- It is important to note that this potential limitation does not apply to all of the PCHs highlighted in Table 6.2 (i.e., those ranked below the 10th percentile threshold). For the majority of these facilities, medical claims data were available for at least 90% of PCH residents, and residents in each PCH were visited by a physician at least four times per year (Appendix Table C.1). The results in Table 6.2 for these latter PCHs are more likely to be attributed to exceptional strategies of quality care provision.

[45] These PCH's are identified in Table 6.2 because they ranked below the 10th percentile for at least two diagnostic QIs. Physician visit rates are lower than the Manitoba average for several other PCHs in Table C.1, however these PCH's were not ranked below the 10th percentile in Table 6.2. In fact, two PCH's in Table 6.3 (ID 537, 504; where QI events are reported most frequently in Manitoba) had physician visit rates below the provinical average in Table C.1.

Table C.1: Ambulatory care physician visit rates per PCH in the five-year study period

PCH ID	% of Residents With 1+ Physician Visit / Year	Average # of Physician Visits / Resident / Year	Median # of Physician Visits / Resident / Year	Minimum # of Physician Visits / Resident / Year	Maximum # of Physician Visits / Resident / Year
Average values for all PCHs	**90.0**	**10.3**	**9.4**	**0.0**	**36.6**
ASSINIBOINE RHA					
PCH ID					
554	89.4	5.8	5	0	34
601	86.4	4.9	3	0	29
610	97.6	12.3	11	0	35
613	97.8	35.9	44	0	60
616	89.2	6.0	5	0	31
618	93.8	39.1	46.5	0	61
621	71.0	5.8	2	0	37
648	98.8	10.3	9	0	28
652	87.9	4.6	4	0	43
664	95.6	27.2	27	0	57
671	67.2	2.7	1	0	22
677	97.6	14.0	13	0	39
678	94.2	10.5	9	0	36
681	97.3	9.8	9	0	31
687	99.2	10.6	12	0	20
692	75.0	3.5	2	0	22
694	99.2	18.8	18	1	46
695	93.4	6.5	6	0	26
696	98.3	12.0	11	0	38
602**	97.0	8.8	8	0	23
550*	93.4	7.9	6	0	30
584*	98.0	9.0	8	0	35
591*	73.2	4.8	4	0	17
608*	92.6	4.3	4	0	15
650*	98.1	12.7	12	0	67
682**	95.6	10.1	9	0	36
698*	26.6	0.5	0	0	5

Table C.1 continued

PCH ID	% of Residents With 1+ Physician Visit / Year	Average # of Physician Visits / Resident / Year	Median # of Physician Visits / Resident / Year	Minimum # of Physician Visits / Resident / Year	Maximum # of Physician Visits / Resident / Year
BRANDON RHA					
PCH ID					
501	70.3	3.1	2	0	29
529	95.8	12.6	12	0	46
557	97.4	13.0	11	0	38
599	97.6	20.0	15	0	52
625	98.0	13.3	12	0	57
CENTRAL RHA					
PCH ID					
592	94.9	6.8	6	0	31
600	96.9	11.4	11	0	29
611	86.6	5.0	4	0	29
624	97.0	7.4	6	0	27
629	81.7	3.1	2	0	16
640	95.5	7.4	6	0	44
654	91.4	6.6	5	0	33
659	95.6	5.8	5	0	25
661	90.6	6.0	6	0	15
672	98.0	16.6	16	0	47
674	87.4	4.3	3	0	20
686	98.2	8.8	8	0	33
689	93.8	7.5	6	0	30
691	86.4	4.2	3	0	21
503*	40.5	0.8	0	0	5

Table C.1 continued

PCH ID	% of Residents With 1+ Physician Visit / Year	Average # of Physician Visits / Resident / Year	Median # of Physician Visits / Resident / Year	Minimum # of Physician Visits / Resident / Year	Maximum # of Physician Visits / Resident / Year
INTERLAKE RHA					
PCH ID					
556	78.2	3.4	3	0	15
583	96.7	7.4	7	0	27
603	98.0	13.5	11	0	46
604	94.0	11.0	9	0	40
605	96.3	7.2	6	0	31
612	94.5	4.4	4	0	15
631	100.0	13.0	12	1	43
656	90.9	5.9	5	0	23
663	95.3	9.2	8	0	31
606**	97.1	16.7	15	0	54
593*	47.7	1.7	0	0	28
622	66.7	2.6	2	0	16
653	70.5	3.5	3	0	16
670	89.9	16.7	8.5	0	59
NORTH EASTMAN RHA					
PCH ID					
597	88.9	5.3	5	0	15
598	85.0	17.8	10	0	56
620	90.7	5.9	4	0	44
504**	40.6	1.5	0	0	17
566*	97.8	31.8	40	0	57
NOR-MAN					
PCH ID					
622	66.7	2.6	2	0	16
653	70.5	3.5	3	0	16
670	89.9	16.7	8.5	0	59

Table C.1 continued

PCH ID	% of Residents With 1+ Physician Visit / Year	Average # of Physician Visits / Resident / Year	Median # of Physician Visits / Resident / Year	Minimum # of Physician Visits / Resident / Year	Maximum # of Physician Visits / Resident / Year
PARKLAND RHA					
PCH ID					
552	98.4	10.3	9	0	39
589	77.5	2.8	2	0	12
614	88.4	6.2	4	0	38
633	97.9	10.3	9	0	35
638	97.5	10.4	10	0	39
641	56.3	3.8	1	0	27
666	94.1	8.8	7	0	48
684	85.5	3.8	3	0	23
697	98.4	22.0	25	0	39
669*	48.9	1.4	1	0	14
683*	92.6	5.0	4	0	29
SOUTH EASTMAN					
PCH ID					
609	98.7	10.2	9	0	38
646	95.2	11.2	11.5	0	30
662	94.9	7.6	6	0	39
679	91.9	10.8	8	0	43
693	99.3	14.2	14	0	44
576**	84.2	15.6	14	0	54
645*	89.9	5.9	5	0	19

Table C.1 continued

PCH ID	% of Residents With 1+ Physician Visit / Year	Average # of Physician Visits / Resident / Year	Median # of Physician Visits / Resident / Year	Minimum # of Physician Visits / Resident / Year	Maximum # of Physician Visits / Resident / Year
WRHA (PROPRIETARY PCHS)					
PCH ID					
525	95.8	11.2	10	0	69
551	96.4	10.0	10	0	30
555	97.4	15.5	15	0	48
564	98.8	13.1	12	0	40
568	96.2	9.6	9	0	52
571	96.7	14.7	14	0	52
581	97.9	16.3	15	0	53
594	97.5	16.4	16	0	66
595	95.7	11.8	10	0	47
508**	97.1	11.2	10	0	46
521**	96.1	14.3	13	0	48
537**	85.1	6.6	5	0	40
574**	98.3	15.3	14	0	48
559**	96.7	16.0	15	0	49

Table C.1 continued

PCH ID	% of Residents With 1+ Physician Visit / Year	Average # of Physician Visits / Resident / Year	Median # of Physician Visits / Resident / Year	Minimum # of Physician Visits / Resident / Year	Maximum # of Physician Visits / Resident / Year
WRHA (NON-PROPRIETARY PCHS)					
PCH ID					
506	96.8	12.5	11	0	46
509	94.6	14.4	12	0	62
573	97.2	21.5	18	0	54
587	95.4	10.8	10	0	50
596	98.1	13.1	12	0	54
607	98.1	11.6	11	0	38
615	97.7	9.8	9	0	40
617	97.0	17.4	17	0	56
619	98.6	10.9	10	0	29
626	98.2	12.7	11	0	45
628	95.1	11.2	10	0	63
632	99.2	13.5	12	0	45
635	98.0	17.6	18	0	52
639	95.9	14.7	12	0	58
642	98.5	12.1	12	0	39
643	93.5	6.2	5	0	31
649	98.9	17.3	16	0	54
667	98.1	20.8	20	0	54
680	96.3	10.2	10	0	56
685	99.3	16.7	15	0	48
688	98.1	13.3	12	0	55
699	77.6	6.3	3	0	44
636**	97.7	24.4	25	0	53
657*	97.1	9.7	10	0	33

* PCH ranked below the 10th percentile for two or more diagnostic QIs in Table 6.2.

** PCH ranked above the 90th percentile for two or more diagnostic QIs in Table 6.3.

APPENDIX D: ADDITIONAL MULTIVARIATE MODELLING PROCEDURES AND RESULTS FOR THE DIAGNOSTIC QIS

D.1 Additional Methodologies

During multivariate analyses for each diagnostic QI, risk factors were actually entered in nine sequential steps (Appendix Table D.1). Highlights of this strategy are as follows:

- A variable representing PCH type was entered first into the model as Step 1. The results at this step of data analysis provide a response to the question *'Compared to free-standing (non-proprietary) PCHs in Manitoba, were QIs more or less likely to occur in any of the proprietary PCHs in the WRHA ('WRHA proprietary'), proprietary PCHs in non-Winnipeg RHAs ('non-Winnipeg proprietary'), or (non-proprietary) juxtaposed PCHs in Manitoba ('juxtaposed')?'.*
- During Step 2 of data analyses, 'PCH type' risk factors were re-analyzed simultaneous with PCH size ('bed number' in Appendix Table D.1). At the end of this second step of data analysis, relative risk (RR) values associated with 'PCH type' and 'bed number' were independent of each other. Changes in significance in 'PCH type' between these steps helps to explain why RR values differed for types of PCHs. For example, if the RR for 'WRHA proprietary' was significant in Step 1 but not in Step 2, this would mean that the original risk associated with these PCHs was related to the size of these facilities.
- Modelling procedures were continued until all variables were entered into the analyses. RR values provided at the conclusion of Step 9 represent the risk associated with each variable independent of all others included in the model. For example, the RR values associated with 'PCH type' after Step 9 should be considered to be independ ent of all other PCH and resident characteristics listed in Appendix Table D.1. RR values at Step 9 are provided in Table 8.2 of this report for each of the diagnostic QIs.

Table D.1: Modelling steps used to predict variation in diagnostic QIs

Model Step	Variables Entered During Each Step
PCH facility characteristics	
1	PCH type (WRHA proprietary, non-Winnipeg proprietary, non-proprietary juxtaposed, non-proprietary free-standing)
2	Bed number
3	Nurse staff; aide staff
4	Hospital bias; physician bias
Resident level characteristics	
5	QI timing
6	Resident age; resident sex
7	Level of care
8	Marital status; SES
9	Dementia; chronic disease

In addition to comparing results between modelling steps, RR values and 99% CLs of these values were created for select risk factors at Step 9 of data analyses. An explanation of this additional strategy is provided:

- RR values compare the risk that an event occurred in one group versus a reference group. This outcome is easier to interpret for dichotomous (two category) variables. For example, a RR of 1.5 for 'males' indicates that an event was more likely to occur for males or conversely, was less likely to occur for females. This interpretation is not as straight forward for variables with more than two categories (i.e., PCH type, resident age and assigned level of care), as RR values do not make comparisons between non-reference groups. These latter comparisons are important to determine scenarios in which QI events were most likely to occur.
- To make these latter comparisons, RR values and 99% CLs were provided for select risk factors at Step 9 of data analyses. Non-reference group categories were reported as being significantly different from each other ($p<.01$) if the RR values were outside of the 99% CLs of other category groups. For example, the risk of experiencing a QI event was be reported to be different in 'WRHA proprietary' and 'juxtaposed' PCHs, if the RR value for *each* type of PCH was beyond of the 99% CLs of the other type of PCH. An example is provided in text to further explain this procedure.

D.2 Additional Results

D.2.1 Changes in Relative Risk (RR) Values Between Analyses Steps

The results for the stepwise multivariate models are provided in Appendix Tables D.3 through D.8. The following statements summarize these results, focussing on the extent that RR values remained consistent between each step of model development:

- *All risk factors except 'PCH type'*. For each diagnostic QI, RR values for these variables remained quite consistent between modelling steps. Using non-hip fractures as an example (Appendix Table D.5), the RR values for participant age (RR approximately 1.3 for residents 75-84 years; RR approximately 1.4 for residents 85+ years) remained fairly consistent for Steps 6 through 9 of the model, even after other risk factors (level of care, marital and SES, and the presence of dementia and chronic diseases) were included in the model. As a second example, the affect of 'aide staff' was consistent for skin ulcers (commencing Step 3 in Appendix Table D.3) after considering the health and demographic characteristics of PCH residents. This means that the influence of 'aide staff' reported in Step 3 was not because certain residents were older or more frail (for example) and therefore required more staff to provide care.
- *PCH type.* Statistically significant results were reported only for proprietary PCHs in the WRHA; changes in RR values at each modelling step focusses on these facilities. Different scenarios are reported depending on the diagnostic QI.
  - *Skin ulcers, respiratory infections, and fluid and electrolyte imbalances:* For these diagnostic QIs, the results reported for proprietary PCHs in the WRHA were consistent at each step of modelling. This consistency of results emphasizes the findings reported in Chapter 8, where the results reported for 'PCH type' were independent of all remaining facility and resident risk factors.
  - *Hip and non-hip fractures, as well as accidental falls.* For non-hip fractures (Appendix Table D.5), RR values associated with 'WRHA proprietary' became consistently significant after level of care was entered into the model (Step 7). The following statements help to explain this result:
    a) Individuals assigned a level of care of 1 or 2 were more likely to have experienced these diagnostic QIs (see results for level of care in Appendix Table D.5).
    b) Fewer residents in proprietary PCHs were assigned these lower levels of care (Figure 5.7 in Chapter 5).
    c) Rates of events of this QI were adjusted in WRHA proprietary PCHs, to account for each of these results provided in 'a' and 'b'. In other words, the 'real' rate at which non-hip fractures were reported in WRHA proprietary PCHs is in part because more frail residents resided in these facilities. Rates of this QI would have been much greater in these versus (non-proprietary) free-standing PCHs, if the distribution of level of care was the same in both types of facilities.

- A similar explanation for 'WRHA proprietary' is provided for accidental falls (Appendix Table D.6) and hip fractures (Appendix Table D.4), with the exception that:
  a) The RR associated with accidental falls became non-significant in Step 9 ($p<.01$), to account for the larger proportion of residents in WRHA proprietary PCHs who were diagnosed with dementia and/or chronic comorbidities (Appendix Table D.6; Figures 5.8 and 5.9 in Chapter 5).
  b) The RR value associated with hip fractures became significant in Step 5 ($p<.01$), once the variable QI timing was entered into the model (Appendix Table D.4).

D.2.2 Making Additional Comparisons Between Categories of Select Risk Factors

Strategies were used to compare the risk of QI events between non-reference groups, for risk factors with three or more categories. (e.g., for the risk factors PCH type, resident age, and resident level of care). The results from these follow-up analyses help to clarify scenarios in which QI events were most likely to occur.

- *PCH type*. Crude counts of QI events are reported in Appendix Table D.2, as a proportion of the number of beds in each type of PCH. These crude data help clarify the following trends in results, for different diagnostic QIs:
  - *Skin ulcers*: Events of skin ulcers were more likely to have occurred in proprietary PCHs in the WRHA as compared to all other types of PCHs in Manitoba, and this QI was reported at a similar rate for these remaining types of facilities (i.e., for proprietary PCHs located outside of the WRHA, as well as free-standing and juxtaposed PCHs in Manitoba) (Appendix Table D.3). This is because the RR value for 'WRHA proprietary' falls outside of the 99% CLs for these other types of PCHs. *In addition*, the RR value for each of 'juxtaposed' and 'non-Winnipeg proprietary' falls outside of the 99% CLs for 'WRHA proprietary'. This result is also demonstrated looking at the crude data provided in Appendix Table D.2 (i.e., skin ulcers were reported in an equivalent of 66% of beds in proprietary PCHs in the WRHA during the five-year study period, versus at most 31% of beds in all other types of PCHs).
  - *Hip fractures, non-hip fractures, and respiratory infections*. Events of these QIs were more likely to occur in proprietary PCHs in the WRHA as compared to free-standing and juxtaposed facilities in Manitoba. Events of these QIs were

reported at a similar rate for proprietary PCHs within and outside of the WRHA (Appendix Tables D.4, D.5, and D.7).

* *Accidental falls*. Events of this QI were reported at a similar rate for all types of PCHs (Appendix Table D.6).
* *Fluid and electrolyte imbalances*. Events of this QI were more likely to occur in proprietary PCHs in the WRHA as compared to non-proprietary free-standing PCHs in Manitoba. Events of this QI occurred at an intermediate rate in non-proprietary juxtaposed PCHs in Manitoba, and also in proprietary PCHs located in non-Winnipeg RHAs (Appendix Table D.8).

Table D.2: Crude counts of diagnostic QI events, expressed as a proportion of the number of beds per PCH type

PCH Type	Diagnostic QI					
	Hip Fractures	Non-Hip Fractures	Accidental Falls	Skin Ulcers	Respiratory Infections	Fluid & Electrolyte Imbalances
Free-standing	12.2	21.4	22.6	29.4*	73.8	23.0
Juxtaposed	11.1	18.4	22.0	27.4	77.3	33.2
Non-Winnipeg proprietary	15.8	22.2	23.6	30.8	82.8	38.4
Winnipeg proprietary	15.5	30.9	23.4	66.0	110.6	47.9

* In free-standing PCHs, events of skin ulcers were reported in an equivalent of 29.4% of PCH beds in the five-year study period.

- *PCH resident age*. Events of all diagnostic QIs were generally reported at a similar rate for individuals 75 years or older. As one exception, events of skin ulcers were more likely to occur in residents 85+ years old as compared to those 75-84 years old (Appendix Table D.3).
- *PCH resident level of care*. For those QIs where level of care was statistically significant (Appendix Tables D.3 through D.6), the affect of level of care was incremental. For example, events of skin ulcers were more likely to occur to people assigned a level of care of 4 versus a level of care of 3 (Appendix Table D.3). Conversely, events of hip and non-hip fractures as well as accidental falls were less likely to occur to people assigned a level of care of 4 versus a level of care of 3 (Appendix Tables D.4 through D.6). These results are consistent with information provided in Chapter 8 of this report.

Table D.3: Results of multivariate statistical modelling, to determine how PCH facility and resident risk factors influenced events of skin ulcers

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	RR	Step 9 99% Lower CL	99% Upper CL
PCH Factors												
Step 1	WRHA proprietary	2.4	2.3	2.2	2.1	2.0	2.0	1.9	1.9	1.9	1.29	2.67
	Juxtaposed	ns	ns	ns	ns	ns	ns	ns	ns	ns (0.9)*	0.66	1.26
	Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns	ns	ns	ns (0.7)*	0.32	1.71
Step 2	Bed number		ns	ns	ns	ns	ns	ns	ns	ns	-	-
Step 3	Nurse staff			ns	ns	ns	ns	ns	ns	ns	-	-
	Aide staff			0.7	0.7	0.7	0.7	0.7	0.7	0.7	-	-
Step 4	Hospital bias				ns	ns	ns	ns	ns	ns	-	-
	Physician bias				ns	ns	ns	ns	ns	ns	-	-
Resident Factors												
Step 5	QI timing					10.6	10.2	9.9	9.9	9.4	-	-
Step 6	Age 75-84						ns	ns	ns	ns (1.1)*	0.99	1.31
	Age 85+						1.4	1.4	1.4	1.4	1.21	1.59
	Males						1.1	1.1	1.1	1.1	-	-
Step 7	Level 3							ns	ns	1.1	1.01	1.27
	Level 4							1.5	1.5	1.5	1.37	1.74
Step 8	Marital status								ns	ns	-	-
	Resident SES								ns	ns	-	-
Step 9	Dementia									ns	-	-
	Chronic disease									1.5	-	-

* Non-significant (ns), however RR value is provided.

Table D.4: Results of multivariate statistical modelling, to determine how PCH facility and resident risk factors influenced events of hip fractures

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	RR	Step 9 99% Lower CL	99% Upper CL
PCH Factors												
Step 1	WRHA proprietary	ns	ns	ns	ns	1.3	1.3	1.5	1.4	1.4	1.10	1.68
	Juxtaposed	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.0)*	0.72	1.25
	Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.7)*	0.96	3.12
Step 2	Bed number		**	**	**	**	**	**	**	**	-	-
Step 3	Nurse staff			ns	ns	ns	ns	ns	ns	ns	-	-
	Aide staff			ns	ns	ns	ns	ns	ns	ns	-	-
Step 4	Hospital bias				ns	ns	ns	ns	ns	ns	-	-
	Physician bias				**	**	**	**	**	**	-	-
Resident Factors												
Step 5	QI timing					45.3	42.9	37.6	37.7	34.8	-	-
Step 6	Age 75-84						1.8	1.7	1.7	1.6	1.19	2.09
	Age 85+						1.9	1.7	1.7	1.6	1.22	2.13
	Males						0.8	0.7	0.8	0.7	-	-
Step 7	Level 3							0.8	0.8	0.8	0.71	0.98
	Level 4							0.4	0.4	0.4	0.28	0.45
Step 8	Marital status								ns	ns	-	-
	Resident SES								ns	ns	-	-
Step 9	Dementia									1.5	-	-
	Chronic disease									1.3	-	-

* Non-significant (ns), however RR value is provided.

** Due to fewer events of this QI, risk factors 'bed number' and 'physician bias' were excluded from multivariate analyses.

Table D.5: Results of multivariate statistical modelling, to determine how PCH facility and resident risk factors influenced events of non-hip fractures

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	RR	Step 9 99% Lower CL	99% Upper CL
PCH Factors												
Step 1	WRHA proprietary	1.4	ns	ns	ns	ns	ns	1.4	1.4	1.3	1.03	1.65
	Juxtaposed	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.0)*	0.80	1.29
	Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.4)*	0.77	2.55
Step 2	Bed number	**	**	**	**	**	**	**	**	**	-	-
Step 3	Nurse staff			ns	ns	ns	ns	ns	ns	ns	-	-
	Aide staff			ns	ns	ns	ns	ns	ns	ns	-	-
Step 4	Hospital bias				ns	ns	ns	ns	ns	ns	-	-
	Physician bias				ns	ns	ns	ns	ns	ns	-	-
Resident Factors												
Step 5	QI timing					20.6	19.4	18.0	18.0	17.5	-	-
Step 6	Age 75-84						1.3	1.2	1.2	ns (1.2)*	0.97	1.43
	Age 85+						1.4	1.3	1.3	1.3	1.06	1.54
	Males						0.6	0.6	0.6	0.6	-	-
Step 7	Level 3							0.9	0.9	0.9	0.77	0.99
	Level 4							0.5	0.5	0.5	0.43	0.59
Step 8	Marital status								ns	ns	-	-
	Resident SES								ns	ns	-	-
Step 9	Dementia									1.2	-	-
	Chronic disease									1.4	-	-

* Non-significant (ns), however RR value is provided.

** Due to fewer events of this QI, risk factors 'bed number' was excluded from multivariate analyses.

Table D.6: Results of multivariate statistical modelling, to determine how PCH facility and resident risk factors influenced events of accidental falls

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	RR	Step 9 99% Lower CL	99% Upper CL
PCH Factors												
Step 1	WRHA proprietary	ns	ns	ns	ns	ns	ns	1.2	1.2	ns (1.2)*	0.98	1.38
	Juxtaposed	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.0)*	0.81	1.21
	Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.6)*	0.98	2.53
Step 2	Bed number		**	**	**	**	**	**	**	**	-	-
Step 3	Nurse staff			ns	ns	ns	ns	ns	ns	ns	-	-
	Aide staff			ns	ns	ns	ns	ns	ns	ns	-	-
Step 4	Hospital bias				2.7	ns	ns	ns	ns	2.0	-	-
	Physician bias				**	**	**	**	**	**	-	-
Resident Factors												
Step 5	QI timing					29.7	27.1	24.2	24.2	22.5	-	-
Step 6	Age 75-84						1.5	1.4	1.4	1.3	1.08	1.63
	Age 85+						1.5	1.4	1.4	1.3	1.10	1.65
	Males						0.8	0.8	0.8	0.8	-	-
Step 7	Level 3							0.9	0.9	0.9	0.75	0.97
	Level 4							0.4	0.4	0.4	0.32	0.47
Step 8	Marital status								ns	ns	-	-
	Resident SES								ns	ns	-	-
Step 9	Dementia									1.3	-	-
	Chronic disease									1.4	-	-

* Non-significant (ns), however RR value is provided.

** Due to fewer events of this QI, risk factors 'bed number' was excluded from multivariate analyses. 'physician bias' was also excluded as events for this QI were based on hospital abstract data only.

Table D.7: Results of multivariate statistical modelling, to determine how PCH facility and resident risk factors influenced events of respiratory infections

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	RR	Step 9 99% Lower CL	99% Upper CL
PCH Factors												
Step 1	WRHA proprietary	1.5	1.4	1.5	1.4	1.4	1.4	1.4	1.4	1.4	1.04	1.79
	Juxtaposed	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.0)*	0.78	1.21
	Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.2)*	0.68	2.12
Step 2	Bed number		ns	ns	ns	ns	ns	ns	ns	ns	-	-
Step 3	Nurse staff			ns	ns	ns	ns	ns	ns	ns	-	-
	Aide staff			ns	ns	ns	ns	ns	ns	ns	-	-
Step 4	Hospital bias				2.6	ns	ns	ns	ns	ns	-	-
	Physician bias				ns	ns	ns	ns	ns	ns	-	-
Resident Factors												
Step 5	QI timing					7.2	6.9	6.9	6.9	6.6	-	-
Step 6	Age 75-84						1.1	1.1	1.1	1.2	1.06	1.27
	Age 85+						1.3	1.3	1.3	1.3	1.20	1.44
	Males						1.3	1.3	1.3	1.3	-	-
Step 7	Level 3							ns	ns	ns (1.1)*	0.99	1.15
	Level 4							ns	ns	ns (1.1)*	0.99	1.15
Step 8	Marital status								0.9	0.9	-	-
	Resident SES								ns	ns	-	-
Step 9	Dementia									0.9	-	-
	Chronic disease									1.4	-	-

* Non-significant (ns), however RR value is provided.

Table D.8: Results of multivariate statistical modelling, to determine how PCH facility and resident risk factors influenced events of fluid and electrolyte imbalances

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	RR	Step 9 99% Lower CL	99% Upper CL
PCH Factors												
Step 1	WRHA proprietary	2.2	2.0	2.0	1.9	1.7	1.7	1.7	1.7	1.6	1.14	2.23
	Juxtaposed	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.3)*	0.98	1.79
	Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns	ns	ns	ns (1.3)*	0.59	2.80
Step 2	Bed number		ns	ns	ns	ns	ns	ns	ns	ns	-	-
Step 3	Nurse staff			ns	ns	ns	ns	ns	ns	ns	-	-
	Aide staff			ns	ns	ns	ns	ns	ns	ns	-	-
Step 4	Hospital bias				4.1	3.0	3.0	3.0	3.0	2.9	-	-
	Physician bias				1.02	1.02	1.02	1.02	1.02	1.02	-	-
Resident Factors												
Step 5	QI timing					14.9	14.9	14.9	14.9	14.2	-	-
Step 6	Age 75-84						1.3	1.3	1.3	1.3	1.10	1.50
	Age 85+						1.4	1.4	1.4	1.4	1.18	1.61
	Males						ns	ns	ns	ns	-	-
Step 7	Level 3							ns	ns	ns (1.1)*	0.95	1.20
	Level 4							ns	ns	ns (1.0)*	0.88	1.14
Step 8	Marital status								ns	ns	-	-
	Resident SES								ns	ns	-	-
Step 9	Dementia									ns	-	-
	Chronic disease									1.7	-	-

* Non-significant (ns), however RR value is provided.

APPENDIX E: ADDITIONAL MULTIVARIATE MODELLING PROCEDURES AND RESULTS FOR THE DRUG-RELATED QIS

E.1 Additional Methodologies

Additional multivariate analyses strategies used in this appendix are similar to those used for the diagnostic QIs (see Appendix D). Highlights of these strategies for the drug-related QIs are as follows:

- Risk factors were entered into each model in seven sequential steps, beginning with 'PCH type' and ending with 'provider' (see Table E.1). This strategy was used to help explain any differences in results for PCH-level risk factors. Odds ratios (OR) values provided at the conclusion of Step 7 represent the odds of being dispensed higher risk medications independent of all other risk factors in the model. OR values at Step 7 are provided in Table 8.4 of this report for each of the drug-related QIs.
- OR values and 99% CLs of these values were created at Step 7 of data analyses, for the risk factors 'PCH type', 'resident age', and 'level of care'. A strategy to interpret these CLs is provided in Appendix C of this report; these additional analyses more completely define scenarios where PCH residents were most likely to have been dispensed higher risk medications.
- The proportion of residents who were dispensed QI-drugs is provided in Table E.2 (crude values). Residents in juxtaposed PCHs were most likely to have been dispensed each of benzodiazepines as well as polypharmacy and Beer's Criteria medications, while fewer residents in this type of PCH were dispensed antipsychotics. This information explains why juxtaposed PCHs were used as the reference group during multivariate analyses, and additional reference to this table is provided in later text in this appendix.

Table E.1: Modelling steps used to predict variation in drug-related QIs

Model Step	Variables Entered During Each Step
PCH facility characteristics	
1	PCH type (WRHA proprietary, non-Winnipeg proprietary, non-proprietary juxtaposed, non-proprietary free-standing)
2	Nurse staff; aide staff
Resident level characteristics	
3	Resident sex
4	Resident age
5	Assigned level of care
6	Dementia; chronic disease
7	Provider

Table E.2: Proportion of residents who were dispensed QI-drugs, 91-190 days after being admitted to a PCH, by PCH type

PCH Type	Drug-Related QI			
	Polypharmacy	Beer's Criteria	Benzodiazepines	Antipsychotics
Free-standing	8.9	1.4	25.8	26.4
Juxtaposed	13.2	12.4	27.6	24.1
Non-Winnipeg proprietary	8.7	10.8	19.5	32.0
Winnipeg proprietary	7.8	9.9	19.6	38.1

E.2 Additional Results

E.2.1 Changes in Odds Ratio (OR) Values Between Analyses Steps

The results for the stepwise multivariate models are provided in Tables E.3 through E.6. The following statements summarize these results, focussing on the extent that OR values remained consistent between modelling steps:

- *All risk factors from Steps 1 through 6 of analyses.* For each drug-related QI, OR values remained quite consistent between modelling Steps 1 through 6. Using polypharmacy medications as an example (Table E.3), the odds that residents were dispensed nine or more drugs were less in proprietary PCHs in the WRHA versus jux taposed PCHs in Manitoba, in each of Steps 1 through 6 ($p<.01$). A similar statement can be made for polypharmacy medication (Table E.3) and benzodiazepines (Table E.5), sepcific to proprietary PCHs located in non-Winnipeg RHAs.
- *Step 7 of data analyses.* The influence of having multiple physicians prescribe medications was added during Step 7 of modelling, for each of the drug-related QIs. In most instances, the addition of this risk factor eradicated any statistical differences between PCH types. This means that at least some of the differences between PCH types in Steps 1 through 6 were related to the influence of having multiple physicians prescribe drugs. The following information is provided as an additional explanation:
  - For all QI-drugs except antipsychotics, the odds of being dispensed a higher risk medication were greater for residents with more than one prescribing physician (see Step 7 in Tables E.3 through E.5);
  - The proportion of residents with more than one physician prescriber varied by PCH type. For example, 52.9% of residents in non-proprietary juxtaposed PCHs were prescribed medications by more than one physician, versus a smaller proportion of residents in other PCH types (23.1% of residents in non-proprietary free-standing PCHs had more than one physician prescriber, versus 8.9% of residents in propri-

etary PCHs in the WRHA and 23.3% of residents in proprietary PCHs in non-Winnipeg RHAs).

- Adjusting the effect of 'PCH type' for these differences in multiple physician prescribers removed any significant variation between PCH type. In other words, these drug dispensing patterns would have been similar in different types of PCHs, if the same proportion of residents in all facilities were prescribed drugs by more than one physician. These results help to understand strategies to help reduce higher risk drug dispensing for PCH residents, for all QI-drugs except antipsychotics.

E.2.2 Making Additional Comparisons Between Categories of Select Risk Factors

For Step 7 of data analyses, ORs and 99% CLs of ORs were created for select risk factors (PCH type, resident age, and resident level of care). Data for these CLs are summarized as follows:[46]

- *PCH type*. The odds that residents were dispensed each of polypharmacy and Beer's Criteria medications as well as benzodiazepines were similar in all types of PCHs (Tables E.3 through E.5). However, the odds that residents were dispensed antipsychotics were statistically greater ($p<.01$) in proprietary PCHs in the WRHA versus (non-proprietary) juxtaposed and free-standing facilities in Manitoba (Table E.6).
- *PCH resident age*. Comparisons between age categories were made for each QI-drug. The odds of being dispensed polypharmacy medications (Table E.3) and antipsychotics (Table E.6) were less for individuals 85+ versus 0-84 years old ($p<.01$). The odds of being dispensed benzodiazepines (Table E.5) and Beer's Criteria medications (Table E.4) were less for individuals 75+ versus those 0-74 years old.
- *Assigned level of care*. Comparisons between levels of care were also made for each QI-drug. This risk factor did not influence significantly the study outcomes for polypharmacy medications (Table E.3) and benzodiazepines (Table E.5).

[46] An explanation of how to interpret these data is provided in Appendix D of this report.

The odds of being dispensed antipsychotics (Table E.6) and Beer's Criteria medications (Table E.4) were similar for residents who were assigned a level of care of 3 or 4. However, compared to less frail individuals (those assigned a level of care of 1 or 2), significant differences were only reported for individuals assigned in level of care of 3 (i.e., compared to residents who were assigned a level of care of 1 or 2, those assigned a level of care of 3 were more likely to have been dispensed antipsychotics. Conversely, individuals assigned a level of care of 3 were less likely to have been dispensed Beer's Criteria medications). A smaller number of individuals were assigned a level of care of 4 in these analyses, which may account for the lack of significant findings for this latter group of study participants.

Table E.3: Results of multivariate statistical modelling, to determine how PCH and resident–level risk factors influenced the odds of dispensing polypharmacy medications

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	OR	Step 7 99% Lower CL	99% Upper CL
PCH Factors										
Step 1	WRHA proprietary	0.6	0.6	0.6	0.6	0.6	0.5	ns (0.65)*	0.38	1.10
	Free-standing	0.7	ns	ns	ns	ns	0.6	ns (0.73)*	0.46	1.16
	Non-Winnipeg proprietary	ns	0.4	0.4	0.3	0.3	ns	ns (0.44)*	0.14	1.35
Step 2	Nurse staff		ns	ns	ns	ns	ns	ns	-	-
	Aide staff		ns	ns	ns	ns	ns	ns	-	-
Resident Factors										
Step 3	Males			ns	ns	ns	ns	ns	-	-
Step 4	Age 75-84				ns	ns	ns	ns (0.88)*	0.60	1.31
	Age 85+				0.5	0.5	0.5	0.5	0.38	0.85
Step 5	Level 3					ns	ns	ns (0.89)*	0.66	1.19
	Level 4					ns	ns	ns (0.62)*	0.32	1.20
Step 6	Dementia						0.6	0.6	-	-
	Chronic disease						4.4	4.3	-	-
Step 7	Prescriber							1.8	-	-

* Non-significant (ns), however OR value is provided.

Table E.4: Results of multivariate statistical modelling, to determine how PCH and resident-level risk factors influenced the odds of dispensing Beer's Criteria medications

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	OR	Step 7 99% Lower CL	99% Upper CL
PCH Factors										
Step 1	WRHA proprietary	ns	ns	ns	ns	ns	ns	ns (0.94)*	0.58	1.52
	Free-standing	ns	ns	ns	ns	ns	ns	ns (0.94)*	0.61	1.44
	Non-Winnipeg proprietary	ns	ns	ns	ns	ns	ns	ns (0.52)*	0.20	1.38
Step 2	Nurse staff		ns	ns	ns	ns	ns	ns	-	-
	Aide staff		ns	ns	ns	ns	ns	ns	-	-
Resident Factors										
Step 3	Males			ns	ns	ns	ns	ns	-	-
Step 4	Age 75-84				0.6	0.6	0.6	0.6	0.42	0.85
	Age 85+				0.5	0.5	0.5	0.5	0.35	0.71
Step 5	Level 3					0.7	0.8	0.8	0.58	1.00
	Level 4					ns	ns	ns (0.82)*	0.49	1.38
Step 6	Dementia						0.7	0.7	-	-
	Chronic disease						1.6	1.5	-	-
Step 7	Prescriber							1.6	-	-

* Non-significant (ns), however OR value is provided.

Table E.5: Results of multivariate statistical modelling, to determine how PCH and resident-level risk factors influenced the odds of dispensing benzodiazepines

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	OR	Step 7 99% Lower CL	99% Upper CL
PCH Factors										
Step 1	WRHA proprietary	ns	ns	ns	ns	ns	ns	ns (0.8)*	0.51	1.35
	Free-standing	ns	ns	ns	ns	ns	ns	ns (1.1)*	0.71	1.59
	Non-Winnipeg proprietary	ns	0.3	0.3	0.3	0.3	0.3	ns (0.4)*	0.15	1.02
Step 2	Nurse staff		ns	ns	ns	ns	ns	ns	-	-
	Aide staff		ns	ns	ns	ns	ns	ns	-	-
Resident Factors										
Step 3	Males			ns	0.8	0.8	0.8	0.8	-	-
Step 4	Age 75-84				0.7	0.7	0.8	0.8	0.57	1.00
	Age 85+				0.7	0.7	0.7	0.7	0.51	0.89
Step 5	Level 3					ns	ns	ns (1.0)*	0.79	1.18
	Level 4					ns	ns	ns (1.2)*	0.81	1.71
Step 6	Dementia						0.8	0.8	-	-
	Chronic disease						1.3	1.3	-	-
Step 7	Prescriber							1.6	-	-

* Non-significant (ns), however OR value is provided.

Table E.6: Results of multivariate statistical modelling, to determine how PCH and resident-level risk factors influenced the odds of dispensing antipsychotics

		Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	OR	Step 7 99% Lower CL	99% Upper CL
PCH Factors										
Step 1	WRHA proprietary	1.9	2.1	2.2	2.0	1.9	1.6	1.7	1.15	2.48
	Free-standing	ns	ns	ns	ns	ns	ns	ns (1.1)*	0.75	1.51
	Non-Winnipeg proprietary	ns	2.1	2.1	ns	ns	ns	ns (1.6)*	0.81	3.14
Step 2	Nurse staff		ns	ns	ns	ns	ns	ns	-	-
	Aide staff		ns	ns	ns	ns	ns	ns	-	-
Resident Factors										
Step 3	Males			ns	ns	ns	ns	ns	-	-
Step 4	Age 75-84				ns	ns	ns	ns (0.8)*	0.63	1.05
	Age 85+				0.4	0.5	0.4	0.4	0.33	0.55
Step 5	Level 3					1.4	1.3	1.3	1.09	1.57
	Level 4					1.5	ns	ns (1.4)*	0.97	1.91
Step 6	Dementia						2.9	2.9	-	-
	Chronic disease						ns	ns	-	-
Step 7	Prescriber							ns	-	-

* Non-significant (ns), however OR value is provided.

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