

VARIATIONS IN RESOURCE USE AND COSTS OF HOSPITAL CARE IN MANITOBA



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The Manitoba Centre for Health Policy (MCHP) is located within the Department of Community Health Sciences, Max Rady College of Medicine, Rady Faculty of Health Sciences, 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 Manitoba Population 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, enables 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, Seniors and Active Living. 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, Europe, and Australia.

We thank the Health Research Ethics Board at the University of Manitoba 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, Seniors and Active Living.



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ACRONYMS

CIHI	Canadian Institute for Health Information
CMG	Case Mix Groups
CWC	Cost per Weighted Case
DAD	Hospital Discharge Abstract Database
ELOS	Expected Length of Stay
GDP	Gross Domestic Product
ICD	International Classification of Diseases
LOS	Length of Stay
MCHP	Manitoba Centre for Health Policy
MIS	Management Information Systems
RHA	Regional Health Authority
RIW	Resource Intensity Weight
TWC	Total Weighted Case

EXECUTIVE SUMMARY

Hospital expenditures make up the largest share (more than 40%) of healthcare expenditures in Manitoba. Hospital spending in Manitoba is increasing: in 2016, per-capita hospital expenditures are estimated to have increased by 3.0% compared with 1.7% in Saskatchewan and 1.4% in Ontario [1]. To inform potential changes in funding allocation, it is important to first understand current drivers of healthcare spending, and hospital expenditures in particular. This information can provide insight into whether alternative funding mechanisms, such as activity-based funding, are likely to result in decreased spending without sacrificing quality of care.

Previous research at the Manitoba Centre for Health Policy has highlighted interesting anomalies with respect to variations in hospital expenditures over time [2]. Resource intensity weights (RIWs) provide a relative measure of the resources (relative costs) required to treat an average patient; they reflect the different diagnostic, procedural, and demographic characteristics of the patient. Previous research found that hospital rankings, in terms of their average RIWs, fluctuated significantly between years [2]. This research project aimed to identify the drivers of these fluctuations as well as drivers of hospital costs.

Our study had three research objectives:

- **Objective 1:** Describe the patient population seen at each hospital over the study period.
- **Objective 2:** Identify factors driving observed hospital-level variation in average RIWs over time [3].
- **Objective 3:** Identify and describe major drivers in the variation in hospital expenses over time – specifically, drivers of direct costs associated with inpatient care.

Our study included data from all hospitals in Manitoba operating primarily as acute care facilities¹ from 2008/09 to 2012/13:

- Tertiary Hospitals - provide medical care requiring highly specialized skills, technology, and support services;
- Urban Community Hospitals - community hospitals in Winnipeg and Brandon;
- Major Rural Hospitals - hospitals located in larger rural centres such as Steinbach and Thompson;
- Intermediate Rural Hospitals - hospitals located in intermediate-sized rural centres; and
- Small Rural Hospitals - small hospitals situated in rural areas.

Temporal Trends in Patient Characteristics and Hospitalizations

We first looked at changes in patient characteristics and hospitalization characteristics. Both may be significant drivers of hospital resource use and costs. For example, longer lengths of stay could be one potential driver of hospital costs; the proportion of inpatient versus outpatient cases is another potential driver. The total number of hospital cases has steadily increased over time. When we examined this in more detail, we found a relative shift from the inpatient to outpatient care setting. In addition, there has been much attention given to the cost implications associated with providing healthcare to an aging population. Thus, we also examined whether the age distribution among hospital patients is changing to determine whether increases in the proportion of patients age 70+ were associated with increased costs. We explored changes in patient socioeconomic status and region of residence. The percentage of hospital cases age 70+ did not change over the study period. It was interesting to note that, although patients from low-income neighbourhoods made up the largest percentage of hospitalizations, we found an overall decline in the percentage of patients from low-income neighbourhoods being admitted to hospital.

¹ See Method 6 in the Hospital Types concept for details about the hospital types used (<http://mchp-appserv.cpe.umanitoba.ca/viewConcept.php?conceptID=1309>).

Trends in Resource Use – Measured by Resource Intensity Weights

On average, RIWs increased during the study period. When we looked at this by hospital type, we saw increases in average RIW among Tertiary, Major Rural, Intermediate Rural, and Small Rural Hospitals. We tested a variety of patient-level and hospital-level factors to identify significant drivers of changes in RIW over time. None of these factors were significantly associated with changes in RIWs over time. This was surprising, since we had anticipated that both hospital characteristics and patient characteristics would be significant drivers of hospital-level resource intensity over time.

We next turned to identifying drivers of direct costs associated with inpatient care using the Management Information Systems (MIS) data: total expenditures, inpatient expenditures, and outpatient expenditures. The data necessary for accurately determining the cost per weighted case (CWC) were missing in many cases. When activity data were missing, and expenses existed in a functional centre, we used the Canadian Institute for Health Information's Cost of a Standard Hospital Stay methodology to impute workloads in order to ensure consistency within the MIS data [4;5].

- After adjusting for inflation, we found that inpatient hospital costs increased among Intermediate Rural and Small Rural Hospitals and that outpatient costs increased among Tertiary Care and Urban Community Hospitals. This could reflect the general shift of less-acute patients from the inpatient to outpatient setting; this would mean that there would be a shift towards higher acuity inpatients, and that inpatients would require more resources.
- The average CWC was reasonably consistent over time, except for hospitals in the Northern Health Region where there was variability over time.
- Nursing costs were the largest driver of total expenditures for inpatient care. Excluding nursing costs from the calculation of the CWC for hospitals removed some (but not all) of the variation between northern hospitals and those in the rest of the province. Since workload data were inconsistently recorded in the MIS data, we were unable to explore whether variations in nursing compensation were due to differences in wages, hours worked, number of staff, staff mix, or relative use of overtime.

Conclusions

Hospital expenditures in Manitoba comprise over 40% of all provincial healthcare spending. Moreover, hospital expenditures have been increasing over the past several years. Across Canada, several initiatives are being tested to identify strategies to reduce hospital spending and increase efficiency. These systems rely on comprehensive and robust management information systems. Substantial work has been put into the provincial management information system database over the past several years. These data have been used to inform local, on-the-ground decision making. However, if we are to tackle hospital spending systematically from a provincial level, we need a complete picture of how resources are being used. Currently, important pieces of information – such as workloads for some departments and expenditures for others – are missing. In order to make informed decisions about how to best manage hospitals, we must have access to the requisite data; i.e., complete data on both workload units and expenditures in MIS. Once those elements are in place, we can begin to understand what is driving hospital expenditures in our province.

CHAPTER 1: INTRODUCTION

In 2014, Canada's total health expenditure was estimated at \$215 billion, or 11.1% of the country's Gross Domestic Product (GDP) [1]. As a percentage of GDP, health expenditures have declined since their peak in 2010. The question arises, who pays for healthcare? Seventy percent of health expenditures are financed using public dollars: 65% from provincial funds and the remaining 5% from other public sources including federal funds, municipal funds, and social security. Hospital expenditures comprise the largest share (29.5%) of Canadian healthcare spending [1]. In Manitoba in 2014, health expenditures amounted to \$5.9 billion, or 38.7% of total provincial government expenditures [6]. Hospital expenditures accounted for 40.5% (\$2.4 billion) of these dollars [7].

Hospital spending in Manitoba is increasing: in 2016, per-capita hospital expenditures are estimated to have increased by 3.0% compared with 5.2% in the Yukon Territory, 3.2% in Newfoundland, 1.7% in Saskatchewan, and 1.4% in Ontario [1;6;7]. Given this pattern of increasing expenditures across Canada, hospitals have become the focus of several efficiency initiatives [8]. One such initiative is a move towards activity-based funding where funds are allocated based on patient volume and the type of services a hospital provides [8;9]. There are several challenges to implementing activity-based funding in Canada, including geography, our single-payer model, the impacts moving to activity-based funding will have on other parts of the healthcare sector, and substantial infrastructure costs to implement information management systems to collect patient-level cost data, among other key pieces of information [10]. Many Canadian provinces also lack the data systems necessary to fully implement this type of activity-based funding system [11]. Moreover, an evaluation of activity-based funding in Canada showed mixed results: a small increase in volume of surgical inpatient cases, a small decrease in volume of inpatient medical cases, and no changes in efficiency or quality measures [12].

In order to inform potential changes in funding allocation, it is important to first understand current drivers of healthcare spending, and hospital costs in particular. This information can provide insight into whether alternative funding mechanisms, such as activity-based funding, are likely to result in decreased spending without sacrificing quality of care. For example, one of the drivers of hospital expenditures identified in the literature is changing population demographics. Activity-based funding, which allocates funds based on both volume and type of care, may be a viable cost containment strategy.

In addition to informing future funding models, previous research at the Manitoba Centre for Health Policy (MCHP) highlighted interesting anomalies with respect to variations in hospital expenditures over time. Specifically, the research found that hospital rankings, in terms of their average resource intensity weights (a relative measure of the resources required to care for a patient), fluctuated over time [2]. The present research project aimed to identify both the factors driving these fluctuations in average resource intensity over time, and the drivers of hospital expenditures.

Our study had three research objectives:

- **Objective 1:** Describe the patient population at each facility over the study period.
- **Objective 2:** Identify factors driving observed hospital-level variation in average resource intensity weights over time.
- **Objective 3:** Identify and describe major drivers in the variation in hospital costs over time.

Chapter 2 presents the methods we used to address these three research objectives. In Chapter 3, we present descriptive results of the hospital cases seen over the study period. Chapter 4 summarizes the results of the longitudinal models used to identify drivers of resource use over time. In Chapter 5, we describe characteristics of the MIS data – including missing data patterns – and variations in hospital expenditures over time. Finally, our conclusions based on these findings are presented in Chapter 6.

CHAPTER 2: METHODS

Introduction

This chapter outlines the methods for this deliverable, including the data sources and detailed analytic methods we used.

Data Sources

Data for this study came from the Manitoba Population Research Data Repository (Repository) held at MCHP from fiscal years 2008 to 2012². The Repository houses individual-level administrative data from a variety of sources spanning several domains, including health. All records in the Repository are de-identified, meaning that all names and addresses are removed, and Personal Health Information Numbers (along with other identifiers) are scrambled to protect confidentiality. All results are reported using aggregated values; values based on five or fewer individuals or events – excluding true zeros – are suppressed.

Three datasets were used for this study:

1. The Hospital Discharge Abstract Database (DAD)
2. The Manitoba Health Insurance Registry (Registry)
3. The MIS Database

The first two research objectives for this study focused on individuals discharged from Manitoba hospitals. Data for these two objectives came from the DAD and the Registry. The DAD comprises administrative records for virtually every case that is discharged from an acute care hospital in Manitoba, including information on each patient's demographic characteristics, and diagnostic and procedural data. The DAD was used to construct profiles of these cases and to obtain case weights reflecting the relative intensity of care provided to each case. The Registry is a population-based data file that includes all Manitoba residents who are registered with Manitoba's universal health insurance program. The Registry provided information on individuals' postal code of residence and their age and sex. Detailed descriptions of these databases can be found on MCHP's Repository Data List (webpage: http://umanitoba.ca/faculties/health_sciences/medicine/units/chs/departmental_units/mchp/resources/repository/datalist.html).

The third research objective focused on identifying drivers of variations in hospital expenditures. Data from the MIS database were used to achieve this aim. Broadly, there are two types of data captured in MIS:

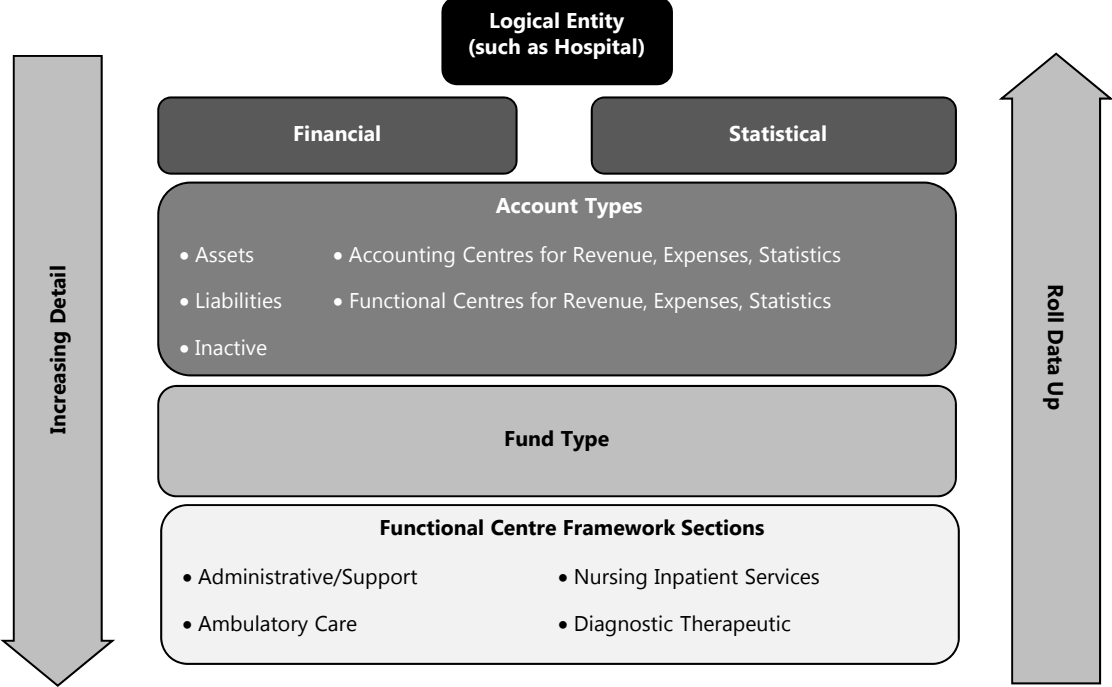
1. Financial data, which include information on expenses, revenues, and assets;
2. Activity data, which include information on workload units, staff activity, and patient-related activity, volume of services, and caseloads.

The MIS database is organized in a hierarchical framework so that the information it contains – both activity data and financial data – can be rolled up to higher summary levels or disaggregated to provide greater detail (Figure 2.1). For example, financial data can be rolled up to the hospital-level to provide a summary of total hospital expenses, revenues, and assets. Expenses, revenues, and activity pertaining to services provided by subdivisions in a hospital are recorded in functional centre account types. Other account types also exist, such as assets and liabilities. However, since we were focused on service provision, we only used functional centre account types in our analyses. The fund type identifies the primary funding source for the account type, which in this case was the operating fund.

2 April 1, 2008 to March 31, 2009 and April 1, 2012 to March 31, 2013

The functional centre identifies where the service was provided. They are sometimes referred to as the department or team in which staff members work. They form the foundation of much of the reporting of financial and activity data within a hospital. The Manitoba MIS account numbers are mapped to the national MIS Standards Chart of Account; this facilitates comparison across facilities and jurisdictions. Functional centres can be broken down even further into more specific service centres.

Figure 2.1: Organizational Structure of MIS data



Standardizing Inputs and Costs: 2008/09 to 2012/13

This study examined variations in hospital inputs (e.g. hospital case weights) and costs (i.e., hospital costs and hospital case weights) between hospitals and over time. In order to make fair comparisons of the cost of providing care to people treated in different acute care hospitals, we needed to ensure that our resource measures were comparable. Case Mix Groups+ (CMG+) files, available from the Canadian Institute for Health Information (CIHI), assign standardized measures of resource use to case discharge files. We used the CMG+ 2013 file, which was the most appropriate for the five years in our study period (2008/09 - 2012/13).

Measures

The literature is divided on whether the aging Canadian population is a major driver of increasing resource use and hospital cost over time – some suggest that the aging population and changing demographics are major drivers in the variation in hospital expenditures and resource use, while others contest this assertion [7].

Hospital Type

We began by classifying acute care hospitals into the five types developed by Fransoo et al. 2013 [13], as shown in Table 2.1:

- Tertiary Hospitals - provide medical care requiring highly specialized skills, technology, and support services;
- Urban Community Hospitals - urban hospitals in Winnipeg and Brandon;
- Major Rural Hospitals - hospitals located in larger rural centres such as Steinbach and Thompson;
- Intermediate Rural Hospitals - hospitals located in intermediate-sized rural centres;
- Small Rural Hospitals - hospitals situated in small rural areas

A sixth hospital type, Transitional Care, was excluded from this report. Hospitals of this type primarily provide long-term care (as opposed to acute care), and have very few admissions in a year. Results for this hospital type are available from the authors upon request.

For details on how these hospital types were developed, please see the MCHP Concept Dictionary: <http://mchp-appserv.cpe.umanitoba.ca/viewConcept.php?conceptID=1309>. We excluded federally funded facilities: nursing stations, chronic rehabilitation facilities, medical centres in Hodgson, Norway House, and Gypsumville, and Shilo Military Hospital.

Table 2.1: Hospital Type and Number of Cases for Manitoba Hospitals by Regional Health Authority (RHA), 2012/13

RHA	Hospital Name	Hospital Type	Total Number of Cases
Southern Health-Santé Sud	Bethesda Hospital (Steinbach)	Major Rural	5,030
	Boundary Trails Health Centre (Winkler/Morden)	Major Rural	7,292
	Portage District General Hospital	Major Rural	4,865
	Altona Community Memorial Health Centre	Intermediate Rural	488
	Carman Memorial Hospital	Intermediate Rural	1,271
	Ste. Anne Hospital	Intermediate Rural	627
	Desalaberry District Health Centre (St. Pierre-Jolys)	Small Rural	196
	Lorne Memorial Hospital (Swan Lake)	Small Rural	404
	Morris General Hospital	Small Rural	269
	Notre Dame Hospital	Small Rural	235
	Rock Lake Health District Hospital (Crystal City)	Small Rural	343
Vita and District Health Centre	Small Rural	96	
Winnipeg RHA	Health Sciences Centre	Tertiary	52,639
	St. Boniface General Hospital	Tertiary	40,255
	Concordia Hospital	Urban Community	10,340
	Grace General Hospital	Urban Community	12,652
	Seven Oaks General Hospital	Urban Community	11,817
	Victoria General Hospital	Urban Community	15,281
	Churchill Health Centre	Small Rural	449
Prairie Mountain Health	Brandon Regional Health Centre	Urban Community	19,634
	Dauphin Regional Health Centre	Major Rural	5,869
	Swan River Valley Hospital	Major Rural	1,506
	Hamiota District Health Centre	Intermediate Rural	272
	Minnedosa Health Centre	Intermediate Rural	1,446
	Neepawa District Memorial Hospital	Intermediate Rural	1,457
	Russell District Hospital	Intermediate Rural	740
	Souris Health Centre	Intermediate Rural	847
	Ste. Rose General Hospital	Intermediate Rural	1,061
	Tri-Lake Health Centre (Killarney)	Intermediate Rural	385
	Virden Health Centre	Intermediate Rural	547
	Boissevain Health Centre	Small Rural	192
	Carberry Plains District Health Centre	Small Rural	158
	Deloraine Health Centre	Small Rural	182
	Glenboro Health Centre	Small Rural	138
	Grandview District Hospital	Small Rural	412
	Melita Health Centre	Small Rural	173
	Roblin District Health Centre	Small Rural	263
	Shoal Lake-Strathclair Health Centre	Small Rural	228
Tiger Hills Health Centre (Treherne)	Small Rural	264	
Winnipegosis General Hospital	Small Rural	162	

Table 2.1: Continued

RHA	Hospital Name	Hospital Type	Total Number of Cases
Interlake-Eastern RHA	Selkirk and District General Hospital	Major Rural	4,071
	Beausejour District Hospital	Intermediate Rural	1,703
	Johnson Memorial Hospital (Gimli)	Intermediate Rural	426
	Pine Falls Health Complex	Intermediate Rural	432
	Stonewall and District Health Centre	Intermediate Rural	440
	Arborg and Districts Health Centre	Small Rural	286
	E. M. Crowe Memorial Hospital (Eriksdale)	Small Rural	347
	Lakeshore General Hospital (Ashern)	Small Rural	464
	Pinawa Hospital	Small Rural	384
Teulon-Hunter Memorial Hospital	Small Rural	266	
Northern Health Region	Flin Flon General Hospital	Major Rural	1,739
	The Pas Health Complex	Major Rural	2,652
	Thompson General Hospital	Major Rural	5,881
	Gillam Hospital	Small Rural	37
	Lynn Lake District Hospital	Small Rural	81
	Snow Lake Medical Nursing Unit	Small Rural	29

Patient Characteristics

Our first research objective was to identify how patient characteristics have changed over time. We hypothesized that changes in patient demographics would be a major predictor of hospital use over time. For example, the growing older population and changes in the socioeconomic status of the population may drive hospital costs if resource use and comorbidities are significantly associated with socioeconomic status.

We identified several patient characteristics from the DAD. For each case, we used the patient's age at admission to classify the patient according to CIHI's age groupings: 0-17, 18-69, and 70+. We also identified the patient's sex. We used the patient's postal code at admission to determine their neighbourhood income quintile, stratified by rural/urban postal codes, as a proxy for their socioeconomic status. Finally, we identified whether the patient's postal code of residence was within the hospital's Regional Health Authority (RHA), a neighbouring district within the hospital's RHA, another RHA, or out of province.

Characteristics of Hospitalizations

Our second objective was to describe how the characteristics of hospitalizations have changed over time. We constructed four indicators to describe each case seen at acute care hospitals: whether the case was an inpatient (i.e., stayed at least one night) or a "day surgery"; the major reason for hospitalization, the length of stay, and the Resource Intensity Weight (RIW) associated with the case. Each hospitalization generated a discharge abstract which summarized information pertaining to that particular case, including diagnostic and procedural data recorded using the International Classification of Diseases (ICD-10-CA) coding system. The DAD includes all abstracts generated by cases seen at acute care hospitals in Manitoba, both inpatient and day surgery cases.

Inpatient hospitalizations are cases where individuals are formally admitted to a hospital inpatient bed for diagnostic, medical, or surgical treatment. Day surgery hospitalizations occur when individuals are formally registered for a procedure and receive treatment at an acute care hospital, but are not admitted to an inpatient hospital bed. For our analyses, each hospital case was assigned to a category or a case mix group (CMG). We used CIHI's five-year CMG+ 2013 grouping to assign CMG values to each record.

Day surgery hospitalizations were classified using Day Procedure Groups. CMG codes were used to further classify inpatient hospitalizations into whether they were an (a) inpatient surgical case (excluding pregnancy and birth), (b) inpatient medical case (excluding pregnancy and birth), (c) inpatient pregnancy and birth case, or (d) an ungroupable case. Multiple admissions for the same individual – either for day surgery procedures or for inpatient services – were counted as separate hospitalizations.

We used the CIHI-calculated length of stay (LOS) associated with each discharge to describe inpatient and day surgery cases separately:

- For inpatient hospitalizations, this is the difference in days between the admission and discharge date for that case.
- For day surgeries, it is the difference in hours between admission and discharge.

Some previous MCHP research has focused on episodes of care [13]. However, in our study, we were interested in identifying the resources used at each hospital rather than describing the care an individual received over a specific episode. Thus, for example, if a person was admitted to Hospital A, stayed for two days, and then was transferred to Hospital B for five more days, we attributed the first two days to Hospital A and the subsequent five days to Hospital B.

The LOS for each case was used to identify long stays amongst inpatient hospitalizations. We used the Expected Length of Stay (ELOS) Methodology for CMG+ 2013 to identify long stays. Briefly, CIHI generates ELOS for the reference age category of each CMG category using regression modeling with LOS as the outcome variable, and CMG, age, comorbidity level, and variables capturing interventions as predictor variables. A trim point for each CMG is then calculated, based on the distribution of estimated ELOS values generated from the regression model. Cases with an actual LOS that is greater than the trim point are identified as long stays.

The final characteristic we used to describe each hospitalization was the RIW. The RIW provides a measure of the relative intensity of resources (i.e., the costs) used to provide the care associated with the various diagnostic, medical, and surgical procedures an individual receives during their hospital stay. CIHI calculates an RIW for each hospitalization based on the CMG to which the case is assigned, along with their age, comorbidity profile, and discharge status. To provide context, in the CMG+ 2013 file, a woman who has a vaginal birth with an anaesthetic and a non-major obstetric/gynecological intervention has a base RIW of 0.55. A cardiac valve replacement for a patient 18 to 59 years of age has a base RIW of 3.35. Thus, the cost of the cardiac valve replacement is approximately six times the cost of the birth.

We used case-level RIWs to generate hospital-level measures to summarize the relative intensity of resources used to provide care to all individuals seen at each acute care hospital. We first calculated the annual total weighted cases (TWC) in a fiscal year for each hospital by summing the RIWs for all cases seen at the hospital. We also calculated the average RIW for each hospital and each year by dividing the TWC by the total number of cases seen at the hospital in that year.

MIS Measures

Our third research objective was to identify major drivers of the observed variations in hospital expenditures over time. In line with previous studies in this area, we focused our analysis on the direct cost of patient care. We used the process outlined in CIHI's methodology for calculating the cost for a standard hospital stay³ to separate expenditures into three categories: inpatient costs, outpatient costs, and residual costs [4]. We modified the CIHI methodology slightly to fit the Manitoba context; this is detailed in Appendix 1. For each facility, we calculated inpatient, outpatient, and residual costs, as well as an annual cost per weighted case (CWC) using their yearly inpatient TWC and patient costs. CWC is a measure of the costs associated with providing care to a "standard" hospital patient; it is useful for describing the cost of care at several levels: hospital, health region, hospital type, and province.

³ CIHI recently revised their costing methodology; the current methodology, at the time this was published, can be found elsewhere [5]. We used the methodology that was current for the years of data used in our study.

As we applied the steps in CIHI's costing methodology, we identified functional centres where:

- Financial data were missing but activity data were present
- Activity data were missing but financial data were present

Finlayson et al. (2009) also noted that a majority of hospitals lacked activity data when constructing the cost per weighted case [2].

In order to ensure that our results were comparable between hospitals, we imputed values for each functional centre that was missing activity data; if the functional centre was missing financial data, then there were no monetary values to allocate. The missing values were imputed according to application of the CIHI costing methodology described in Appendix 1.

We conducted some additional sensitivity calculations on the CWC indicator. We calculated cost per weighted case including and excluding nursing costs to identify whether variations in CWC across regions were driven by nurse salaries or other factors.

Statistical Analyses

All data management and statistical analyses were conducted using SAS 9.4.

Descriptive Statistics

For each hospital and hospital type, we generated descriptive statistics for the following characteristics:

- Proportion of inpatient and day surgery cases
- Inpatient case type (medical, surgical, pregnancy & birth-related)
- Length of stay (in days)
- RIW by percentiles

Among inpatient cases, we determined the percentage of medical cases, surgical cases, cases of pregnancy and birth, and ungroupable cases. We described the distribution of the LOS (in days) and the RIWs using the median, 90th, 75th, 25th, and 10th percentiles of each, respectively.

We next calculated descriptive statistics for patients seen at acute care hospitals:

- Proportion of patients who were male vs. female
- Proportion of patients in the CIHI age groupings: 0-17, 18-69, and 70+ years
- Percentage of patients from rural and urban income quintiles

We considered the proportion of patients who were male vs. female to examine potential sex differences in health service use and resulting costs. Population aging is one hypothesized driver of increased health service use. To test this hypothesis, we determined whether there were observed changes in the age distribution (specifically in patients age 70+) during the study period. We also hypothesized that health service resource use would be associated with the income distribution of the patient population seen at each hospital.

Finally, we described where each hospital's patients came from: the percentage that came from within the hospital's RHA district, another district in that RHA, another RHA, or out of province.

We calculated statistics describing the percentage of functional centres that had financial data but were missing activity data, and those that had activity data but were missing financial data. Missing data reports were generated for each functional centre by fiscal year.

Analytic Methods

Our second and third research objectives focused on identifying drivers of the variation in average RIW and hospital expenditures over time.

To address these objectives, we ordered hospitals by average RIW and examined changes in the rank order over time. We identified hospitals that changed ranking by 10 or more during the 5-year study period (e.g., we flagged a hospital if it was ranked 5th in 2008/09 and ranked 22nd in 2010/11). We assessed the sensitivity of these changes to the inclusion and exclusion of long-stay cases; to do this, we ranked hospitals in each fiscal year by their average RIW, first when all inpatient cases were included, and then after excluding long-stay cases. We repeated this process by ordering and ranking hospitals by TWCs both including and excluding long-stay cases. Results where long-stay cases are excluded – both for RIWs and for TWCs – are presented in Appendix Tables 2.1 and 2.2.

We next used statistical models to identify major drivers in RIW changes over time. Our analytic approach focused on time trends, with each hospital's average RIW for each year as the outcome. We first used a group-based longitudinal model to determine which hospitals could be grouped together for these analyses. Once the models identified the number of groups to use and which hospital belonged in each group, we used growth curve models to identify time trends in resource intensity.

Growth curve models were used to examine various drivers of the average RIW, including hospital type and patient demographics obtained from the DAD. We first tested whether resource intensity changed over time, and then whether hospital-level characteristics were associated with changes in the average resource intensity over time: hospital type, percentage of patients age 70+, and percentage of birth cases. We hypothesized that changes in RIWs would be associated with hospital type, and that a growing 70+ population would be a major driver of increased resource intensity. Finally, because births have relatively low RIWs, we hypothesized that hospitals where a large proportion of births occurred would have lower RIWs than hospitals with smaller proportions of births. We tested how each factor was associated with average RIW, using a time interaction to show changes in the relationship over time.

To measure changes in hospital expenditures over time, we used generalized estimating equations to look at changes in hospital-level inpatient costs, outpatient costs, and total costs. We next tested whether changes in expenditures varied across hospital-level characteristics (hospital type, percentage of birth cases, and percentage of patients age 70+) using a time-by-hospital characteristic interaction.

In all of the analyses, a p-value of 0.05 indicated statistical significance.

CHAPTER 3: DESCRIPTIVE RESULTS

Introduction

We first examined descriptive data for the individuals admitted to Manitoba hospitals and the characteristics of their hospitalizations. All descriptive information is shown for each year of the study period – 2008/09 to 2012/13. In the first section, we present an overall description of the patients admitted to Manitoba hospitals. In the second section we summarize the types of hospitalizations over time. Finally, the chapter concludes with an update to Finlayson et al. (2009) [2] hospital RIW rankings during the study period.

Patient Demographics

Table 3.1 shows patient demographics for all of Manitoba during the study period. The proportion of patients aged 18-69 increased. We did not find any change in the proportion of patients age 70+. There was also a decrease in the proportion of patients in the lowest income quintiles. When we looked at the region of origin, there was a general decline in the proportion of patients living in the same district as the hospital. We saw a significant increase in the proportion of patients who lived in another district, but went to a hospital in their RHA.

Table 3.1: Patient Demographics for All Manitoba Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	215,194	218,871	222,220	221,781	219,723
Age at Admission (Groups Used by CIHI)					
0-17 years (d)	15.2%	15.0%	14.5%	14.0%	14.5%
18-69 years (i)	60.2%	60.8%	60.6%	61.5%	61.3%
70+ years	24.6%	24.2%	24.9%	24.4%	24.2%
Sex					
Male (i)	42.6%	42.6%	43.1%	43.0%	43.3%
Female (d)	57.4%	57.4%	56.9%	57.0%	56.7%
Income Quintile*					
Rural 1 (R1 Lowest) (d)	10.3%	9.9%	10.0%	9.9%	9.7%
R2	10.0%	9.9%	10.0%	10.1%	9.8%
R3 (i)	8.8%	9.3%	9.4%	9.5%	9.3%
R4	7.9%	8.4%	8.1%	8.2%	8.0%
Rural 5 (R5 Highest)	6.9%	6.8%	6.7%	6.9%	6.9%
Urban 1 (U1 Lowest) (d)	12.3%	11.8%	11.7%	11.5%	11.4%
U2	10.3%	10.3%	10.2%	10.1%	10.5%
U3	10.0%	9.8%	9.8%	9.9%	10.1%
U4 (i)	8.9%	9.0%	9.1%	9.0%	9.2%
Urban 5 (U5 Highest) (i)	8.3%	8.5%	8.5%	8.7%	8.9%
Patient Origin					
Same district as hospital (d)	57.8%	57.6%	57.0%	56.5%	56.8%
Same RHA, hospital in different district (i)	18.4%	18.6%	19.2%	19.5%	19.2%
Winnipeg, hospital in different RHA (i)	1.1%	1.1%	1.2%	1.3%	1.2%
Non-Winnipeg, hospital in different RHA (i)	18.1%	18.1%	18.0%	18.3%	18.4%
Outside Manitoba, hospital in any RHA (d)	4.6%	4.7%	4.6%	4.5%	4.5%

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

* Percentage of residents whose income is unknown is not shown

We also examined the distribution of patient characteristics seen at each type of hospital, (Tables 3.2-3.6). There was a significant increase in the total number of cases across except Intermediate and Small Rural Hospitals. We found an increase in the percentage of patients age 70+ at Tertiary Hospitals and Small Rural Hospitals. The proportion of patients from high-income neighbourhoods increased across all hospital types except Tertiary, Major Rural, and Intermediate Rural Hospitals in rural areas.

Table 3.2: Patient Demographics for Tertiary Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	91,425	92,998	94,023	92,911	92,894
Age at Admission (Groups Used by CIHI)					
0-17 years (d)	24.0%	23.6%	23.1%	22.8%	23.5%
18-69 years	60.2%	60.5%	60.4%	61.0%	60.3%
70+ years (i)	15.8%	15.9%	16.5%	16.2%	16.2%
Sex					
Male	41.7%	41.8%	42.0%	42.2%	42.0%
Female	58.3%	58.2%	58.0%	57.8%	58.0%
Income Quintile*					
Rural 1 (R1 Lowest) (d)	7.3%	6.9%	6.9%	6.8%	6.8%
R2 (d)	5.0%	4.4%	4.6%	4.5%	4.5%
R3 (i)	4.5%	4.7%	4.9%	5.0%	5.0%
R4 (i)	5.6%	6.5%	6.3%	6.5%	6.5%
Rural 5 (R5 Highest) (d)	6.3%	5.8%	5.7%	5.9%	5.8%
Urban 1 (U1 Lowest) (d)	17.8%	17.2%	17.4%	17.1%	16.8%
U2	12.9%	13.1%	12.9%	12.9%	13.2%
U3	11.7%	11.7%	11.6%	11.5%	11.8%
U4 (i)	10.9%	11.1%	11.4%	11.4%	11.4%
Urban 5 (U5 Highest) (i)	10.3%	10.6%	10.3%	10.6%	10.8%
Patient Origin					
Same district as hospital	63.6%	63.9%	64.0%	63.9%	64.3%
Same RHA, hospital in different district	0.1%	0.1%	0.1%	0.2%	0.1%
Winnipeg, hospital in different RHA	N/A	N/A	N/A	N/A	N/A
Non-Winnipeg, hospital in different RHA	29.8%	29.4%	29.2%	29.6%	29.5%
Outside Manitoba, hospital in any RHA (d)	6.5%	6.6%	6.7%	6.3%	6.1%

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

* Percentage of residents whose income was unknown is not shown

N/A indicates not applicable as Tertiary Hospitals are only in Winnipeg RHA

Table 3.3: Patient Demographics for Urban Community Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	67,487	67,643	68,784	69,782	69,724
Age at Admission (Groups Used by CIHI)					
0-17 years	3.9%	3.9%	3.7%	3.8%	3.8%
18-69 years (i)	64.0%	64.8%	64.6%	65.2%	65.4%
70+ years (d)	32.0%	31.3%	31.7%	31.0%	30.7%
Sex					
Male	44.0%	44.0%	44.4%	44.0%	44.4%
Female	56.0%	56.0%	55.6%	56.0%	55.6%
Income Quintile*					
Rural 1 (R1 Lowest)	4.3%	4.2%	4.1%	4.3%	4.2%
R2 (i)	6.1%	6.9%	7.2%	7.3%	7.2%
R3	6.2%	5.4%	5.8%	5.8%	5.7%
R4	3.8%	3.8%	3.9%	4.0%	3.7%
Rural 5 (R5 Highest) (i)	4.7%	5.0%	4.9%	4.9%	5.0%
Urban 1 (U1 Lowest) (d)	14.3%	13.5%	13.1%	12.9%	12.6%
U2	14.8%	14.6%	14.5%	14.2%	14.6%
U3	15.3%	15.0%	15.1%	15.3%	15.1%
U4	13.0%	13.4%	13.2%	12.8%	13.0%
Urban 5 (U5 Highest) (i)	12.0%	12.5%	12.7%	12.7%	13.2%
Patient Origin					
Same district as hospital (d)	59.7%	59.4%	58.8%	57.7%	58.3%
Same RHA, hospital in different district (i)	22.7%	22.7%	23.6%	24.1%	23.3%
Winnipeg, hospital in different RHA (i)	0.3%	0.4%	0.4%	0.4%	0.4%
Non-Winnipeg, hospital in different RHA (i)	14.3%	14.6%	14.4%	14.7%	14.9%
Outside Manitoba, hospital in any RHA	2.9%	3.0%	2.9%	3.1%	3.1%

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

* Percentage of residents whose income was unknown is not shown

Table 3.4: Patient Demographics for Major Rural Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	36,840	38,007	39,036	39,200	38,905
Age at Admission (Groups Used by CIHI)					
0-17 years (d)	18.6%	17.9%	17.3%	15.9%	16.0%
18-69 years (i)	59.9%	61.3%	60.9%	62.7%	62.1%
70+ years	21.5%	20.8%	21.9%	21.4%	21.9%
Sex					
Male (i)	40.3%	40.5%	41.5%	41.5%	42.2%
Female (d)	59.8%	59.6%	58.5%	58.5%	57.8%
Income Quintile*					
Rural 1 (R1 Lowest)	23.8%	24.7%	25.1%	24.8%	24.4%
R2 (d)	20.6%	18.0%	18.6%	18.6%	18.4%
R3 (i)	16.7%	20.0%	19.0%	18.9%	18.7%
R4	16.9%	17.5%	17.4%	17.0%	17.5%
Rural 5 (R5 Highest) (d)	13.2%	11.2%	11.3%	11.8%	12.1%
Urban 1 (U1 Lowest)	1.0%	0.9%	0.9%	1.1%	0.9%
U2 (i)	0.7%	0.6%	0.6%	0.8%	0.8%
U3 (i)	0.6%	0.6%	0.6%	0.9%	0.7%
U4	0.5%	0.6%	0.5%	0.6%	0.6%
Urban 5 (U5 Highest) (i)	0.4%	0.5%	0.5%	0.7%	0.5%
Patient Origin					
Same district as hospital (d)	35.6%	35.4%	34.3%	34.3%	34.0%
Same RHA, hospital in different district	53.6%	53.4%	54.1%	53.1%	54.3%
Winnipeg, hospital in different RHA	3.6%	3.6%	3.3%	3.8%	3.5%
Non-Winnipeg, hospital in different RHA (i)	3.6%	4.2%	4.8%	5.3%	4.7%
Outside Manitoba, hospital in any RHA	3.7%	3.5%	3.5%	3.5%	3.6%

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

* Percentage of residents whose income was unknown is not shown

Table 3.5: Patient Demographics for Intermediate Rural Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases	11,978	13,072	13,282	13,158	12,142
Age at Admission (Groups Used by CIHI)					
0-17 years (d)	6.2%	6.3%	5.6%	4.9%	5.3%
18-69 years (i)	50.7%	51.8%	52.1%	53.2%	52.9%
70+ years	43.1%	41.9%	42.3%	41.9%	41.8%
Sex					
Male	46.4%	46.3%	46.8%	46.8%	47.4%
Female	53.6%	53.7%	53.2%	53.2%	52.6%
Income Quintile*					
Rural 1 (R1 Lowest) (d)	19.6%	16.0%	17.0%	16.1%	16.5%
R2 (i)	19.5%	31.6%	29.8%	29.4%	30.1%
R3 (d)	27.2%	22.9%	22.3%	23.1%	23.4%
R4 (d)	18.4%	12.3%	11.5%	11.8%	10.2%
Rural 5 (R5 Highest)	7.9%	9.1%	9.4%	9.0%	8.0%
Urban 1 (U1 Lowest)	1.2%	1.3%	1.3%	1.4%	1.3%
U2 (i)	1.2%	1.2%	1.5%	1.7%	2.0%
U3 (i)	1.3%	1.3%	1.7%	2.2%	2.6%
U4 (i)	0.8%	1.2%	1.3%	1.4%	1.7%
Urban 5 (U5 Highest) (i)	1.0%	1.2%	1.7%	1.5%	1.9%
Patient Origin					
Same district as hospital (d)	66.4%	63.5%	61.2%	59.3%	59.5%
Same RHA, hospital in different district (i)	23.7%	26.0%	27.4%	29.2%	28.6%
Winnipeg, hospital in different RHA (i)	4.3%	4.9%	5.9%	6.0%	7.2%
Non-Winnipeg, hospital in different RHA (d)	4.3%	4.4%	4.1%	4.1%	3.4%
Outside Manitoba, hospital in any RHA	1.2%	1.2%	1.5%	1.5%	1.3%

i indicates a statistically significant increase over time period (p<0.05)

d indicates a statistically significant decrease over time period (p<0.05)

* Percentage of residents whose income was unknown is not shown

Table 3.6: Patient Demographics for Small Rural Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (d)	7,464	7,151	7,095	6,730	6,058
Age at Admission (Groups Used by CIHI)					
0-17 years (d)	8.1%	8.5%	7.5%	6.1%	7.9%
18-69 years	41.7%	39.6%	39.2%	40.4%	40.2%
70+ years (i)	50.2%	51.9%	53.3%	53.5%	51.9%
Sex					
Male	46.2%	45.1%	46.5%	45.5%	47.8%
Female	53.9%	54.9%	53.5%	54.5%	52.2%
Income Quintile*					
Rural 1 (R1 Lowest) (d)	20.7%	12.2%	13.2%	11.6%	11.1%
R2 (d)	37.7%	25.2%	25.3%	27.6%	26.8%
R3 (i)	16.8%	23.3%	26.3%	27.0%	26.7%
R4	11.9%	19.8%	16.5%	16.3%	14.7%
Rural 5 (R5 Highest) (i)	2.3%	8.2%	8.8%	8.1%	9.6%
Urban 1 (U1 Lowest)	0.9%	1.0%	0.8%	0.9%	1.1%
U2	0.6%	0.5%	0.4%	0.6%	0.4%
U3 (i)	0.3%	0.4%	0.5%	0.5%	0.5%
U4	0.5%	0.3%	0.3%	0.3%	0.3%
Urban 5 (U5 Highest) (i)	0.1%	0.2%	0.2%	0.4%	0.3%
Patient Origin					
Same district as hospital	66.1%	64.9%	65.5%	65.4%	65.2%
Same RHA, hospital in different district (i)	19.8%	20.7%	21.5%	22.4%	20.6%
Winnipeg, hospital in different RHA	3.4%	3.1%	3.3%	3.3%	3.2%
Non-Winnipeg, hospital in different RHA	4.0%	3.8%	4.0%	4.3%	4.5%
Outside Manitoba, hospital in any RHA (d)	6.7%	7.5%	5.7%	4.6%	6.4%

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

* Percentage of residents whose income was unknown is not shown

Hospitalization Characteristics

Table 3.7 shows hospitalization characteristics in all Manitoba hospitals during the study period. The total number of cases increased over the study period due to an increased number of day surgery cases. The number of non-surgical inpatient cases decreased, as did the percentage of inpatient cases. Although the average LOS among inpatients did not change over time, the average and the median inpatient RIW both increased. This would be expected if there was a shift to treat less complex patients in an outpatient setting, leaving more complex (higher acuity) inpatient cases in hospital.

Table 3.7: Hospitalization Characteristics for All Manitoba Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	215,194	218,871	222,220	221,781	219,723
Number of Inpatient Cases (d)	130,247	132,386	132,003	131,168	129,710
Number of Inpatient Surgical Cases (i)	33,221	33,985	34,832	35,731	34,899
Number of Day Procedure Cases (i)	84,947	86,485	90,217	90,613	90,013
Reason for Hospitalization					
Percentage of Inpatient Cases (d)	60.5%	60.5%	59.4%	59.1%	59.0%
Percentage of Inpatient Surgical Cases Excluding Pregnancy and Birth (i)	23.1%	23.2%	23.8%	24.6%	24.1%
Percentage of Inpatient Medical Cases Excluding Pregnancy and Birth (d)	43.3%	43.3%	42.9%	41.9%	41.6%
Percentage of Inpatient Pregnancy and Birth Cases	28.1%	27.9%	27.7%	27.9%	29.0%
Percentage of Ungroupable Inpatient Cases (d)	5.5%	5.6%	5.6%	5.6%	5.3%
Percentage of Day Procedure Cases (i)	39.5%	39.5%	40.6%	40.9%	41.0%
Length of Stay (Days), Inpatients					
Average Length of Stay	8.4	8.1	8.2	8.3	8.5
90th Percentile	17.0	16.0	16.0	17.0	17.0
75th Percentile	7.0	7.0	7.0	7.0	7.0
50th Percentile (Median)	3.0	3.0	3.0	3.0	3.0
25th Percentile	2.0	2.0	2.0	1.0	1.0
10th Percentile	1.0	1.0	1.0	1.0	1.0
Length of Stay (Hours), Day Surgeries					
Average Length Of Stay (d)	5.1	5.1	5.0	4.8	4.7
90th Percentile	9.0	9.0	9.0	8.3	8.2
75th Percentile	6.0	6.0	6.0	5.9	5.8
50th Percentile (Median) (d)	4.0	4.0	4.0	3.9	3.8
25th Percentile	3.0	3.0	3.0	2.8	2.7
10th Percentile	2.0	2.0	2.0	2.1	2.1
Resource Intensity Weights (RIWs)					
Total Weighted Cases (sum of RIWs) (i)	209,322.0	210,085.6	216,335.7	216,472.9	220,138.3
Inpatient RIWs					
Average RIW per Discharge (i)	1.47	1.45	1.50	1.51	1.56
90th Percentile	2.82	2.80	2.83	2.86	2.87
75th Percentile	1.35	1.34	1.39	1.42	1.40
50th Percentile (Median) (i)	0.67	0.68	0.69	0.70	0.70
25th Percentile	0.37	0.37	0.39	0.38	0.37
10th Percentile	0.23	0.23	0.23	0.23	0.23
Day Procedure RIWs					
Average RIW per Discharge (d)	0.21	0.21	0.21	0.20	0.20
Median RIW per Discharge (d)	0.15	0.15	0.14	0.14	0.14

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

Note: Among the percentiles only the median was tested for significant trend.

Tables 3.8 – 3.12 show descriptive statistics for hospitalizations by hospital type. The number of inpatient cases, inpatient surgical cases, and total cases increased at Tertiary Hospitals while the number of day surgery cases declined. In contrast, the number of inpatient cases decreased across all types of rural hospitals in Manitoba. We found that the median LOS among inpatients declined in Tertiary Hospitals. Finally, the average RIWs among inpatients increased across all hospital types except Urban Community Hospitals.

Table 3.8: Hospitalization Characteristics for Tertiary Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	91,425	92,998	94,023	92,911	92,894
Number of Inpatient Cases (i)	57,210	58,283	58,861	59,321	59,800
Number of Inpatient Surgical Cases (i)	16,834	17,542	18,018	18,452	18,193
Number of Day Surgery Cases (d)	34,215	34,715	35,162	33,590	33,094
Reason for Hospitalization					
Percentage of Inpatient Cases (i)	62.6%	62.7%	62.6%	63.9%	64.4%
Percentage of Inpatient Surgical Cases Excluding Pregnancy and Birth (i)	25.6%	26.4%	26.6%	27.2%	26.4%
Percentage of Inpatient Medical Cases Excluding Pregnancy and Birth (i)	27.7%	27.2%	27.5%	27.4%	27.5%
Percentage of Inpatient Pregnancy and Birth Cases (i)	41.6%	41.2%	40.9%	40.5%	41.6%
Percentage of Ungroupable Inpatient Cases (d)	5.1%	5.2%	5.1%	5.0%	4.5%
Percentage of Day Surgery Cases (d)	37.4%	37.3%	37.4%	36.2%	35.6%
Length of Stay (Days), Inpatients					
Average Length of Stay (d)	6.8	6.6	6.6	6.6	6.6
90th Percentile	14.0	14.0	14.0	14.0	13.0
75th Percentile	6.0	6.0	6.0	5.0	5.0
50th Percentile (Median) (d)	3.0	3.0	3.0	2.0	2.0
25th Percentile	2.0	2.0	1.0	1.0	1.0
10th Percentile	1.0	1.0	1.0	1.0	1.0
Length of Stay (Hours), Day Surgeries					
Average Length of Stay (d)	5.4	5.4	5.4	5.0	4.9
90th Percentile	9.0	9.0	9.0	8.7	8.6
75th Percentile	7.0	7.0	7.0	6.3	6.1
50th Percentile (Median) (d)	5.0	5.0	4.0	4.1	4.0
25th Percentile	3.0	3.0	3.0	2.9	2.8
10th Percentile	2.0	2.0	2.0	2.0	1.9
Resource Intensity Weights (RIWs)					
Total Weighted Cases (sum of RIWs) (i)	91,387.7	94,460.5	97,768.4	97,487.3	99,555.4
Inpatient Resource Intensity Weights					
Average Weight (RIW) per Discharge (i)	1.45	1.47	1.51	1.50	1.53
90th Percentile	2.90	2.93	2.94	2.98	2.95
75th Percentile	1.29	1.31	1.33	1.33	1.31
50th Percentile (Median)	0.62	0.62	0.63	0.63	0.62
25th Percentile	0.33	0.33	0.33	0.33	0.33
10th Percentile	0.14	0.14	0.14	0.14	0.14
Day Surgery Resource Intensity Weights					
Average Weight (RIW) per Discharge	0.24	0.25	0.25	0.25	0.24
Median Weight (RIW) per Discharge (d)	0.17	0.17	0.17	0.16	0.16

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

Note: Among the percentiles only the median was tested for significant trend.

Table 3.9: Hospitalization Characteristics for Urban Community Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	67,487	67,643	68,784	69,782	69,724
Number of Inpatient Cases	31,001	31,820	31,185	31,584	31,655
Number of Inpatient Surgical Cases (i)	12,260	12,055	12,142	12,560	12,427
Number of Day Surgery Cases (i)	36,486	35,823	37,599	38,198	38,069
Reason for Hospitalization					
Percentage of Inpatient Cases (d)	45.9%	47.0%	45.3%	45.3%	45.4%
Percentage of Inpatient Surgical Cases Excluding Pregnancy and Birth	38.3%	36.6%	37.6%	38.2%	37.7%
Percentage of Inpatient Medical Cases Excluding Pregnancy and Birth (d)	45.3%	46.6%	45.6%	43.9%	44.8%
Percentage of Inpatient Pregnancy and Birth Cases (i)	9.8%	10.0%	10.0%	11.0%	11.0%
Percentage of Ungroupable Inpatient Cases	6.7%	6.8%	6.8%	6.8%	6.5%
Percentage of Day Surgery Cases (i)	54.1%	53.0%	54.7%	54.7%	54.6%
Length of Stay (Days), Inpatients					
Average Length of Stay	12.6	11.2	11.5	11.6	11.9
90th Percentile	27.0	24.0	25.0	25.0	24.0
75th Percentile	10.0	10.0	10.0	10.0	9.0
50th Percentile (Median)	5.0	4.0	5.0	4.0	4.0
25th Percentile	2.0	2.0	2.0	2.0	2.0
10th Percentile	1.0	1.0	1.0	1.0	1.0
Length of Stay (Hours), Day Surgeries					
Average Length of Stay (d)	4.9	4.9	4.8	4.7	4.7
90th Percentile	8.0	8.0	8.0	8.3	8.3
75th Percentile	6.0	6.0	6.0	5.8	5.9
50th Percentile (Median)	4.0	4.0	4.0	3.5	3.6
25th Percentile	3.0	3.0	3.0	2.7	2.7
10th Percentile	2.0	2.0	2.0	2.1	2.1
Resource Intensity Weights (RIWs)					
Total Weighted Cases (sum of RIWs) (i)	67,901.8	64,660.1	65,184.1	66,561.2	67,828.3
Inpatient Resource Intensity Weights					
Average Weight (RIW) per Discharge	1.97	1.82	1.87	1.89	1.92
90th Percentile	3.75	3.39	3.48	3.49	3.45
75th Percentile	1.78	1.73	1.75	1.74	1.71
50th Percentile (Median)	1.06	1.00	1.04	1.04	1.04
25th Percentile	0.62	0.60	0.62	0.61	0.62
10th Percentile	0.37	0.33	0.36	0.34	0.34
Day Surgery Resource Intensity Weights					
Average Weight (RIW) per Discharge (d)	0.19	0.19	0.18	0.18	0.18
Median Weight (RIW) per Discharge	0.14	0.14	0.14	0.14	0.14

i indicates a statistically significant increase over time period (p<0.05)

d indicates a statistically significant decrease over time period (p<0.05)

Note: Among the percentiles only the median was tested for significant trend.

Table 3.10: Hospitalization Characteristics for Major Rural Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (i)	36,840	38,007	39,036	39,200	38,905
Number of Inpatient Cases (d)	25,284	25,741	25,792	24,895	24,458
Number of Inpatient Surgical Cases (i)	3,607	3,858	4,162	4,264	3,912
Number of Day Surgery Cases (i)	11,556	12,266	13,244	14,305	14,447
Reason for Hospitalization					
Percentage of Inpatient Cases (d)	68.6%	67.7%	66.1%	63.5%	62.9%
Percentage of Inpatient Surgical Cases Excluding Pregnancy and Birth (i)	11.9%	12.5%	13.7%	14.8%	13.3%
Percentage of Inpatient Medical Cases Excluding Pregnancy and Birth (d)	47.0%	46.8%	46.4%	45.8%	45.9%
Percentage of Inpatient Pregnancy and Birth Cases (d)	36.1%	35.4%	34.4%	34.3%	35.7%
Percentage of Ungroupable Inpatient Cases (d)	5.0%	5.2%	5.5%	5.1%	5.1%
Percentage of Day Surgery Cases (i)	31.4%	32.3%	33.9%	36.5%	37.1%
Length of Stay (Days), Inpatients					
Average Length of Stay (i)	6.2	6.3	6.6	6.7	6.7
90th Percentile	11.0	12.0	12.0	13.0	13.0
75th Percentile	5.0	5.0	5.0	5.0	5.0
50th Percentile (Median)	2.0	2.0	2.0	2.0	2.0
25th Percentile	1.0	1.0	1.0	1.0	1.0
10th Percentile	1.0	1.0	1.0	1.0	1.0
Length of Stay (Hours), Day Surgeries					
Average Length of Stay	4.5	4.7	4.8	4.8	4.6
90th Percentile	7.0	8.0	8.0	7.8	7.6
75th Percentile	5.0	6.0	6.0	5.8	5.6
50th Percentile (Median)	4.0	4.0	4.0	4.2	4.0
25th Percentile	3.0	3.0	3.0	3.1	3.0
10th Percentile	2.0	2.0	2.0	2.5	2.4
Resource Intensity Weights (RIWs)					
Total Weighted Cases (sum of RIWs) (i)	26,453.8	27,133.8	28,758.2	28,584.4	27,864.5
Inpatient Resource Intensity Weights					
Average Weight (RIW) per Discharge (i)	0.97	0.97	1.02	1.05	1.04
90th Percentile	1.72	1.71	1.78	1.84	1.82
75th Percentile	0.86	0.88	0.92	0.91	0.91
50th Percentile (Median) (i)	0.54	0.55	0.56	0.56	0.56
25th Percentile	0.32	0.33	0.33	0.33	0.33
10th Percentile	0.14	0.16	0.17	0.17	0.16
Day Surgery Resource Intensity Weights					
Average Weight (RIW) per Discharge	0.17	0.18	0.18	0.18	0.17
Median Weight (RIW) per Discharge	0.13	0.13	0.13	0.13	0.13

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

Note: Among the percentiles only the median was tested for significant trend.

Table 3.11: Hospitalization Characteristics for Intermediate Rural Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases	11,978	13,072	13,282	13,158	12,142
Number of Inpatient Cases (d)	9,488	9,634	9,276	8,823	7,995
Number of Inpatient Surgical Cases (d)	484	478	474	416	338
Number of Day Surgery Cases (i)	2,490	3,438	4,006	4,335	4,147
Reason for Hospitalization					
Percentage of Inpatient Cases (d)	79.2%	73.7%	69.8%	67.1%	65.9%
Percentage of Inpatient Surgical Cases Excluding Pregnancy and Birth (d)	4.9%	4.8%	4.9%	4.4%	4.0%
Percentage of Inpatient Medical Cases Excluding Pregnancy and Birth (d)	83.7%	84.4%	84.7%	83.8%	84.3%
Percentage of Inpatient Pregnancy and Birth Cases (d)	6.0%	5.6%	5.2%	5.8%	6.2%
Percentage of Ungroupable Inpatient Cases	5.5%	5.2%	5.1%	6.0%	5.6%
Percentage of Day Surgery Cases (i)	20.8%	26.3%	30.2%	33.0%	34.2%
Length of Stay (Days), Inpatients					
Average Length of Stay (i)	9.3	9.4	9.8	10.5	12.5
90th Percentile	17.0	17.0	18.0	19.0	23.0
75th Percentile	7.0	7.0	7.0	8.0	8.0
50th Percentile (Median)	3.0	3.0	3.0	3.0	3.0
25th Percentile	1.0	1.0	1.0	1.0	1.0
10th Percentile	1.0	1.0	1.0	1.0	1.0
Length of Stay (Hours), Day Surgeries					
Average Length of Stay (d)	5.7	5.4	4.1	3.9	3.7
90th Percentile	14.0	13.0	6.0	5.7	5.4
75th Percentile	7.0	6.0	4.0	4.3	4.1
50th Percentile (Median) (d)	4.0	4.0	3.0	3.4	3.1
25th Percentile	3.0	3.0	3.0	2.8	2.4
10th Percentile	2.0	2.0	2.0	2.3	1.9
Resource Intensity Weights (RIWs)					
Total Weighted Cases (sum of RIWs) (i)	13,042.4	13,407.9	13,552.0	13,521.6	14,383.8
Inpatient Resource Intensity Weights					
Average Weight (RIW) per Discharge (i)	1.33	1.34	1.39	1.46	1.72
90th Percentile	2.30	2.22	2.33	2.47	3.01
75th Percentile	1.01	1.02	1.03	1.07	1.15
50th Percentile (Median) (i)	0.65	0.65	0.67	0.68	0.70
25th Percentile	0.44	0.43	0.45	0.46	0.45
10th Percentile	0.32	0.31	0.31	0.30	0.31
Day Surgery Resource Intensity Weights					
Average Weight (RIW) per Discharge	0.17	0.15	0.16	0.16	0.16
Median Weight (RIW) per Discharge (d)	0.14	0.13	0.13	0.13	0.13

i indicates a statistically significant increase over time period ($p < 0.05$)

d indicates a statistically significant decrease over time period ($p < 0.05$)

Note: Among the percentiles only the median was tested for significant trend.

Table 3.12: Hospitalization Characteristics for Small Rural Hospitals, 2008/09-2012/13

Indicators	Fiscal Year				
	2008/09	2009/10	2010/11	2011/12	2012/13
Total Number of Cases (d)	7,464	7,151	7,095	6,730	6,058
Number of Inpatient Cases (d)	7,264	6,908	6,889	6,545	5,802
Number of Inpatient Surgical Cases	36	52	36	39	29
Number of Day Surgery Cases	200	243	206	185	256
Reason for Hospitalization					
Percentage of Inpatient Cases	97.3%	96.6%	97.1%	97.3%	95.8%
Percentage of Inpatient Surgical Cases Excluding Pregnancy and Birth	0.5%	0.8%	0.5%	0.6%	0.5%
Percentage of Inpatient Medical Cases Excluding Pregnancy and Birth	92.4%	92.8%	92.1%	92.2%	92.2%
Percentage of Inpatient Pregnancy and Birth Cases	1.4%	1.2%	1.1%	1.3%	1.1%
Percentage of Ungroupable Inpatient Cases	5.7%	5.3%	6.2%	5.9%	6.2%
Percentage of Day Surgery Cases (i)	2.7%	3.4%	2.9%	2.8%	4.2%
Length of Stay (Days), Inpatients					
Average Length of Stay (i)	9.7	10.6	11.5	11.2	13.1
90th Percentile	18.0	18.0	21.0	21.0	25.0
75th Percentile	8.0	8.0	9.0	8.0	9.0
50th Percentile (Median) (i)	3.0	4.0	4.0	4.0	4.0
25th Percentile	1.0	2.0	2.0	2.0	2.0
10th Percentile	1.0	1.0	1.0	1.0	1.0
Length of Stay (Hours), Day Surgeries					
Average Length of Stay	7.0	6.5	6.4	6.7	7.1
90th Percentile	9.0	9.0	9.0	9.0	10.0
75th Percentile	8.0	8.0	8.0	7.7	8.3
50th Percentile (Median)	7.0	6.0	6.0	6.5	6.8
25th Percentile	6.0	5.0	5.0	5.3	5.5
10th Percentile	5.0	4.0	4.0	4.3	4.8
Resource Intensity Weights (RIWs)					
Total Weighted Cases (sum of RIWs)	10,536.4	10,423.3	11,073.0	10,318.4	10,506.3
Inpatient Resource Intensity Weights					
Average Weight (RIW) per Discharge (i)	1.44	1.50	1.60	1.57	1.80
90th Percentile	2.34	2.41	2.72	2.81	3.01
75th Percentile	1.03	1.06	1.12	1.13	1.15
50th Percentile (Median) (i)	0.67	0.69	0.72	0.72	0.73
25th Percentile	0.47	0.47	0.47	0.47	0.47
10th Percentile	0.32	0.35	0.35	0.33	0.33
Day Surgery Resource Intensity Weights					
Average Weight (RIW) per Discharge (i)	0.25	0.26	0.26	0.26	0.26
Median Weight (RIW) per Discharge	0.26	0.26	0.26	0.26	0.26

i indicates a statistically significant increase over time period (p<0.05)

d indicates a statistically significant decrease over time period (p<0.05)

Note: Among the percentiles only the median was tested for significant trend.

Hospital Comparisons by Total Weighted Case (TWC)

We ranked hospitals within each fiscal year, first by their TWC (i.e., the sum of all case weights at a hospital for a fiscal year) and then by their average RIW. This analysis built on the ranking methodology in Finlayson et al.'s 2009 study [2]. Table 3.13 shows the hospital rankings. The TWCs are a function of both the number of cases treated and the resource intensity of each case. For example, Boundary Trails is a Major Rural Hospital in Southern Health-Santé Sud. The sum of all case weights associated with inpatient hospitalizations at Boundary Trails was 5,313 in 2008/09, and it had the 8th largest TWC of all facilities in Manitoba. The Health Sciences Centre in Winnipeg had a TWC of 54,955 in 2008/09, which was the largest TWC among all hospitals in Manitoba that year. When we examined hospital rankings over time, we saw that Tertiary Hospitals and Major Rural Hospitals had little to no change. Urban Community Hospitals had minimal changes in their hospital rankings over time. Intermediate Hospitals and Small Rural Hospitals both saw larger variation in their rankings over time. This is likely due to the influence of discharging atypical long-stay patients on variations in TWC from year to year.

Table 3.13: Hospital Rankings Based on Annual Total Weighted Cases, 2008/09-2012/13

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Total Weighted Cases (TWCs)					Ranking Based on TWCs					
			2008/09	2009/10	2010/11	2011/12	2012/13	2008/09	2009/10	2010/11	2011/12	2012/13	
Southern Health-Santé Sud	Major Rural	Bethesda Hospital (Steinbach)	3,382	3,419	3,758	3,396	3,609	11	11	11	11	11	
		Boundary Trails Health Centre (Winkler/Morden)	5,313	5,600	5,441	5,780	5,270	8	8	8	8	8	
	Intermediate Rural	Portage District General Hospital	3,865	3,714	4,761	4,318	4,027	9	9	9	9	10	
		Altona Community Memorial Health Centre	740	743	751	793	900	27	28	27	26	25	
	Small Rural	Carman Memorial Hospital	1,106	1,050	1,146	1,134	1,124	19	19	20	21	19	
		St. Anne Hospital	876	947	821	812	621	25	24	25	25	33	
	Winnipeg RHA	Tertiary	Desalaberry District Health Centre (St. Pierre-Jolys)	390	423	561	426	571	43	43	39	42	36
			Lorne Memorial Hospital (Swan Lake)	420	474	494	533	466	41	38	41	38	41
		Urban Community	Morris General Hospital	583	513	679	711	797	34	36	32	27	27
			Notre Dame Hospital	263	269	295	336	261	53	52	52	49	53
Small Rural		Rock Lake Health District Hospital (Crystal City)	323	388	403	371	368	47	45	44	48	43	
		Vita & District Health Centre Inc.	252	295	321	399	327	54	50	50	45	49	
		Health Sciences Centre	54,955	55,244	58,353	56,962	58,511	1	1	1	1	1	
		St. Boniface General Hospital	36,433	39,215	39,416	40,525	41,045	2	2	2	2	2	
Small Rural	Concordia Hospital	12,229	11,847	11,509	11,305	12,102	7	5	6	6	6		
	Grace General Hospital	14,240	13,678	14,551	14,224	13,748	4	4	4	4	4		
Small Rural	Seven Oaks General Hospital	13,156	11,716	12,207	12,469	12,592	5	6	5	5	5		
	Victoria General Hospital	12,786	11,349	11,057	11,293	11,914	6	7	7	7	7		
		Churchill Health Centre	267	274	263	270	241	52	51	54	53	55	

Table 3.13: Continued

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Total Weighted Cases (TWCs)			Ranking Based on TWCs							
			2008/09	2009/10	2010/11	2011/12	2012/13	2008/09	2009/10	2010/11	2011/12	2012/13	
Prairie Mountain Health	Urban Community	Brandon Regional Health Centre	15,492	16,070	15,861	17,270	17,472	3	3	3	3	3	
	Major Rural	Dauphin Regional Health Centre	3,721	3,707	4,006	4,108	4,157	10	10	10	10	10	9
		Swan River Valley Hospital	1,858	1,990	1,867	1,798	1,962	14	14	14	14	14	14
	Intermediate Rural	Hamiota District Health Centre	553	563	685	643	607	36	34	31	33	33	34
		Minnedosa Health Centre	958	1,127	1,193	1,139	1,253	23	18	18	20	20	18
		Neepawa District Memorial Hospital	1,208	1,340	1,272	1,298	1,321	17	16	17	16	17	17
		Russell District Hospital*	736	1,023	981	1,196	1,069	28	20	22	22	18	20
		Souris Health Centre	667	695	632	686	846	31	31	34	29	26	26
		Ste Rose General Hospital	1,089	1,020	1,050	892	970	20	21	21	22	22	22
		Tri-Lake Health Centre (Killarney)*	463	435	556	679	722	39	41	40	30	32	32
	Viriden Health Centre	675	744	685	701	749	30	27	30	28	30	30	
	Small Rural	Boissevain Health Centre	291	256	238	314	332	51	53	55	51	48	48
		Carberry Plains District Health Centre	341	365	322	320	251	45	47	49	50	54	54
Deloraine Health Centre		301	352	330	384	343	49	48	48	46	47	47	
Glenboro Health Centre		293	253	269	261	290	50	54	53	54	51	51	
Grandview District Hospital		545	687	619	487	557	37	32	35	40	37	37	
Melita Health Centre		329	314	368	307	317	46	49	46	52	50	50	
Roblin District Health Centre*		687	702	666	573	516	29	30	33	36	39	39	
Shoal Lake-Strathclair Health Centre		398	373	335	426	350	42	46	47	41	46	46	
Tiger Hills Health Centre (Treherne)		376	455	380	418	410	44	44	39	45	43	42	
Winnipegosis General Hospital		465	439	604	418	356	38	40	36	44	44	45	
Major Rural	Selkirk & District General Hospital	2,348	2,539	2,766	2,779	2,758	13	13	13	13	13	13	
	Beausejour District Hospital	1,161	1,223	1,319	1,181	1,512	18	17	16	19	16	16	
Intermediate Rural	Johnson Memorial Hospital (Gimli)	956	975	895	866	934	24	23	23	23	24	24	
	Pine Falls Health Complex	1,060	708	715	843	1,003	21	29	28	24	21	21	
Small Rural	Stonewall & District Health Centre	794	814	852	658	751	26	26	24	32	29	29	
	Arborg & Districts Health Centre	447	426	441	550	471	40	42	43	37	40	40	
	E. M. Grove Memorial Hospital (Eriksdale)	565	421	490	498	578	35	44	42	39	35	35	
	Lakeshore General Hospital (Ashern)*	322	497	568	620	551	48	37	38	34	38	38	
	Pinawa Hospital	648	530	768	662	767	33	35	26	31	28	28	
Major Rural	Teulon-Hunter Memorial Hospital	655	675	698	616	730	32	33	29	35	31	31	
	Flin Flon General Hospital Inc.	1,021	996	1,159	1,289	949	22	22	19	17	23	23	
	The Pas Health Complex Inc.	1,803	1,817	1,753	1,793	1,687	15	15	15	15	15	15	
	Thompson General Hospital	3,145	3,352	3,246	3,322	3,447	12	12	12	12	12	12	
Small Rural	Gillam Hospital*	126	99	304	19	363	55	55	51	56	44	44	
	Lynn Lake District Hospital*	1,222	932	603	377	273	16	25	37	47	52	52	
	Snow Lake Medical Nursing Unit	29	11	53	22	20	56	56	56	56	55	56	

* indicates change in facility rank by 10 or more during the time period 2008/09–2012/13

Hospital Comparisons by Average Resource Intensity Weight (RIW)

Table 3.14 shows a slightly different story vis-à-vis hospital rankings by average RIW over time. Hospitals showed larger variation in their rankings by average RIW than rankings by TWC. This was expected because TWC is largely a function of a hospital's size, and thus it is unlikely for hospitals to have substantial shifts on this measure. Average RIW, on the other hand, reflects changes in the average resource intensity for a hospitalization. Even so, as with TWC, we saw that the greatest variation in rankings by average RIW occurred among Intermediate Rural Hospitals and Small Rural Hospitals. As with TWC, this is likely due to the influence that discharging atypical long-stay patients has on variations in average RIWs from year to year.

Table 3.14: Hospital Rankings Based on Average Inpatient Resource Intensity Weight (RIW), 2008/09-2012/13

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Average RIW			Ranking Based on Average RIW						
			2008/09	2009/10	2010/11	2011/12	2012/13	2008/09	2009/10	2010/11	2011/12	2012/13
Southern Health-Santé Sud	Major Rural	Bethesda Hospital (Steinbach)	1.01	1.01	1.07	1.00	1.08	46	47	49	49	48
		Boundary Trails Health Centre (Winkler/Morden)*	1.11	1.07	0.95	1.07	0.97	39	45	52	47	50
	Intermediate Rural	Portage District General Hospital*	1.15	1.02	1.37	1.19	1.20	36	46	33	43	44
		Altona Community Memorial Health Centre*	1.56	1.48	1.79	2.50	2.68	20	23	16	16	3
	Small Rural	Carman Memorial Hospital	1.66	1.71	1.94	1.87	2.26	14	15	11	12	10
		Ste. Anne Hospital*	1.07	1.12	0.96	1.07	1.26	41	43	51	45	42
		Desalaberry District Health Centre (St. Pierre-Jolys)*	1.62	1.79	2.72	1.98	2.92	17	12	3	10	5
		Lorne Memorial Hospital (Swan Lake)*	0.87	1.12	1.35	1.33	1.15	50	42	34	38	46
		Morris General Hospital*	1.58	1.48	2.11	2.44	2.96	19	25	7	4	4
		Notre Dame Hospital*	1.02	1.20	1.28	1.32	1.11	43	38	37	40	47
	Tertiary	Rock Lake Health District Hospital (Crystal City)	0.93	1.00	1.09	1.07	1.07	48	48	48	46	49
		Vita & District Health Centre Inc.	2.65	2.84	2.63	3.41	3.41	2	2	4	2	2
Health Sciences Centre		1.53	1.52	1.60	1.61	1.66	22	20	22	25	29	
St. Boniface General Hospital*		1.35	1.41	1.40	1.37	1.37	28	28	30	34	38	
Winnipeg RHA	Urban Community	Concordia Hospital*	2.15	1.90	1.88	1.89	1.91	7	11	13	11	21
		Grace General Hospital*	2.11	2.06	2.27	2.24	2.12	9	9	5	5	15
	Small Rural	Seven Oaks General Hospital*	2.17	1.97	2.02	2.14	2.10	6	10	9	7	16
		Victoria General Hospital*	2.17	1.75	1.83	1.82	2.07	5	13	14	16	18
	Churchill Health Centre*	0.72	0.78	1.04	1.23	0.90	53	52	50	42	52	

* indicates change in facility rank by 10 or more during the time period 2008/09-2012/13

Table 3.14: Continued

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Average RIW					Ranking Based on Average RIW				
			2008/09	2009/10	2010/11	2011/12	2012/13	2008/09	2009/10	2010/11	2011/12	2012/13
			1.53	1.58	1.55	1.58	1.63	21	18	26	26	31
Prairie Mountain Health	Urban Community	Brandon Regional Health Centre*	1.19	1.21	1.23	1.32	1.30	34	37	41	39	41
		Dauphin Regional Health Centre	1.15	1.35	1.37	1.24	1.62	37	30	31	41	32
	Major Rural	Swan River Valley Hospital*	1.19	1.62	1.99	2.08	2.23	35	17	10	8	11
		Hamiota District Health Centre*	1.37	1.50	1.49	1.48	1.84	26	21	28	30	24
	Intermediate Rural	Minnedosa Health Centre	1.06	1.07	1.09	1.09	1.22	42	44	47	44	43
		Neepawa District Memorial Hospital	1.08	1.18	1.24	1.53	1.44	40	40	39	28	36
		Russell District Hospital*	1.24	1.37	1.64	1.72	2.14	33	29	20	19	14
		Souris Health Centre*	0.85	0.85	0.88	0.78	0.91	51	51	53	53	51
		Ste Rose General Hospital	1.53	1.62	1.57	1.86	1.88	23	16	24	13	23
		Tri-Lake Health Centre (Killarney)*	1.65	1.48	1.37	1.37	1.37	15	24	32	33	39
		Virden Health Centre*	1.32	1.22	1.12	1.82	1.73	31	35	46	15	26
		Boissevain Health Centre*	2.14	2.32	1.72	1.83	1.59	8	4	18	14	33
		Carberry Plains District Health Centre*	1.34	1.46	1.76	1.50	1.89	29	26	17	29	22
		Deloraine Health Centre*	1.40	1.44	1.52	1.75	2.10	24	27	27	18	17
Small Rural	Grandview District Hospital*	1.02	1.25	1.20	1.05	1.35	45	33	43	48	40	
		Melita Health Centre*	2.27	2.69	1.80	1.67	1.83	3	3	15	22	25
	Roblin District Health Centre*	1.68	1.54	1.56	1.44	1.96	13	19	25	31	20	
	Shoal Lake-Strathclair Health Centre*	1.34	1.23	1.24	1.72	1.54	30	34	40	20	35	
	Tiger Hills Health Centre (Treherne)*	2.24	2.07	1.59	1.67	1.55	4	8	23	23	34	
	Winnipegosis General Hospital*	0.98	0.91	1.15	0.84	2.19	47	50	45	51	12	
	Selkirk & District General Hospital	1.12	1.21	1.29	1.37	1.43	38	36	36	35	37	
	Beausejour District Hospital	2.07	2.16	2.24	2.00	2.83	10	6	6	9	6	
	Johnson Memorial Hospital (Gimli)*	2.01	1.73	1.90	1.61	2.19	11	14	12	24	13	
	Interlake-Eastern RHA	Intermediate Rural	Pine Falls Health Complex*	1.65	1.16	1.23	1.68	2.32	16	41	42	21
Stonewall & District Health Centre*			1.24	1.29	1.27	1.35	1.71	32	32	38	37	27
Small Rural		Arborg & Districts Health Centre*	1.40	1.19	1.45	1.80	1.65	25	39	29	17	30
		E. M. Crowe Memorial Hospital (Eriksdale)*	1.02	0.97	1.29	1.37	1.67	44	49	35	36	28
Major Rural		Lakeshore General Hospital (Ashern)*	0.87	1.48	1.16	1.43	1.19	49	22	44	32	45
		Pinawa Hospital*	1.60	1.31	2.08	1.56	2.00	18	31	8	27	19
		Teulon-Hunter Memorial Hospital*	1.87	2.19	1.62	2.14	2.74	12	5	21	6	7
		Flin Flon General Hospital Inc.	0.73	0.76	0.86	0.96	0.72	52	53	54	50	54
		The Pas Health Complex Inc.	0.67	0.65	0.70	0.76	0.71	55	56	55	54	55
		Thompson General Hospital	0.64	0.68	0.68	0.73	0.73	56	54	56	55	53
Northern Health Region	Major Rural	Gillam Hospital*	0.67	2.15	7.25	0.84	9.80	54	7	2	52	1
		Lynn Lake District Hospital	10.02	9.22	7.54	4.89	3.37	1	1	1	1	3
	Small Rural	Snow Lake Medical Nursing Unit*	1.36	0.68	1.67	0.73	0.70	27	55	19	56	56

* indicates change in facility rank by 1.0 or more during the time period 2008/09–2012/13

Summary

Overall, we found that the volume of hospital cases increased over the study period. Across the province, this was limited to outpatient procedures, which could reflect a general trend of shifting less complex patients from inpatient to outpatient care. When we dug down, however, we found that this was not true in Tertiary Hospitals; indeed, the opposite trend was found where there was an increase in inpatient cases. We found that while patients from low-income neighbourhoods made up the largest percentage of hospitalizations, this percentage also decreased slightly over time.

With regards to fluctuations in hospital rankings with respect to both their TWCs and their average RIWs over time, we observed more variation in rankings among smaller hospitals compared to larger hospitals. This reflects the sensitivity of hospital-level measures when a few resource-intensive cases are discharged from small hospitals.

CHAPTER 4: PREDICTORS OF HOSPITAL RESOURCE USE

Introduction

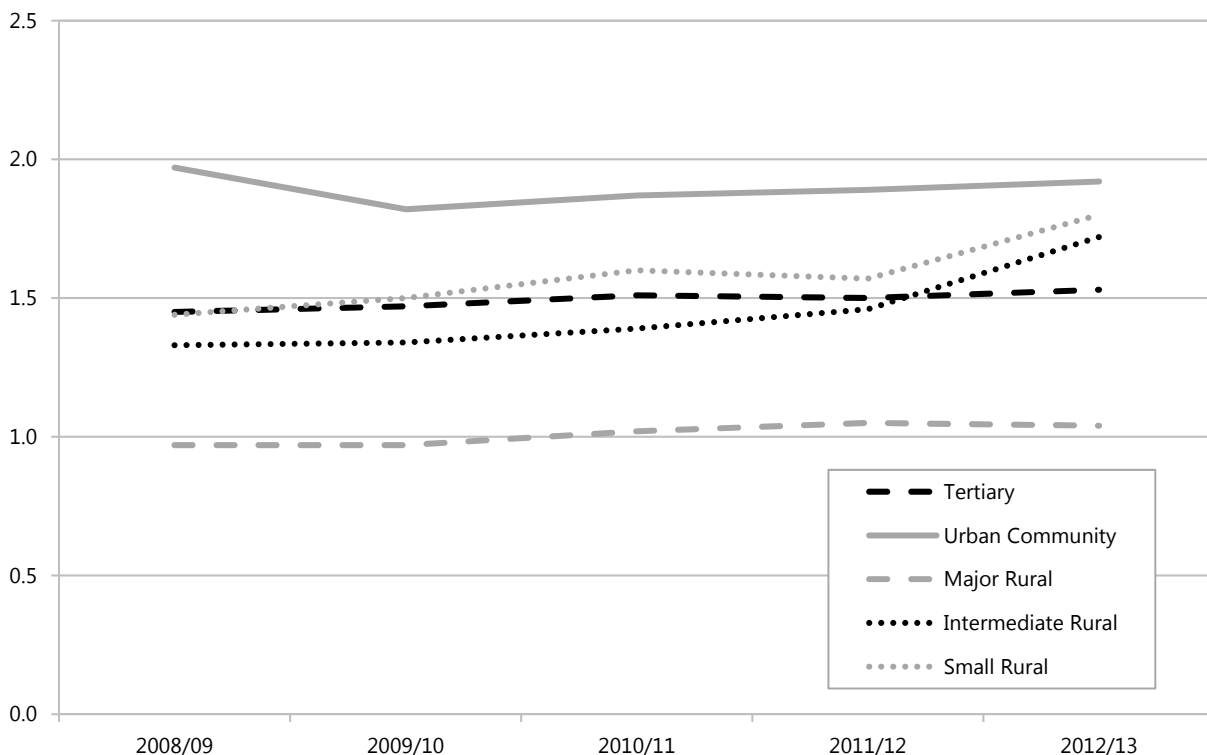
Our second research objective was to identify predictors of hospital resource use over time. In the last chapter, we showed that hospital-level average RIWs varied from hospital to hospital and increased over time. In this chapter, we present results from analyses aimed at identifying sources of this variation in hospital-level RIWs.

Average RIW Over Time

Figure 4.1 and Appendix Table 3.1 show average RIWs for each hospital type during the study period (Appendix Table 2.2 shows hospital-specific RIWs). Both highlight what was observed in the previous chapter – most hospitals had minimal variation in average RIW, while some hospitals' average RIWs varied considerably from year to year. These crude analyses of hospital-specific average RIWs suggest that hospitals may have varying patterns of the types of cases they treat.

Average RIWs increased across all hospital types except Urban Community Hospitals (Figure 4.1 and Appendix Table 3.1). The graph shows, though, that the amount of increase was relatively small among Tertiary Care Hospitals. Again, this could reflect the increasing shift from inpatient to outpatient care, leading to greater average complexity in both settings.

Figure 4.1: Average Inpatient Resource Intensity Weight by Hospital Type, 2008/09-2012/13



We used growth-curve models to identify predictors of change in hospital-level average RIWs over time. The model included time as a covariate to test for temporal changes variables for hospital type to determine whether average RIWs varied across different types of hospitals, and an interaction between hospital type and time to test whether changes in RIW over time varied across different types of hospitals.

The estimates in Table 4.1 show the relationship between the hospital characteristics and average RIW. The row for “Time (years)” shows that there was no significant change in average RIW over time ($p=1$). In addition, we found that the percentage of patients age 70+ was not associated with average RIW ($p=0.59$). We tested whether time trends in average RIW differed across hospital types by interacting the time variable with the hospital type variable in our growth curve models. These results are shown in the rows under “Interactions between Time and Hospital Type.” For example, the p -value for Urban Community ($p=0.99$) indicates that changes in RIW over time among Urban Community Hospitals did not differ from changes in RIW among Tertiary Care Hospitals. Supplementary models, excluding outliers, are presented in Appendix 3.

Table 4.1: Relationship between Hospital Characteristics and Average Inpatient Resource Intensity Weight Over Time, 2008/09-2012/13

Model Covariates	Estimate	p-Value
Intercept	2.74	0.6031
Time (years)	0.00	1
Percent of Birth Hospitalizations	0.04	0.9821
Percent of Hospitalization of Adults Age 70+	-0.58	0.5949
Hospital Type		
Tertiary (Reference)	Ref	Ref
Urban Community	-0.76	0.8656
Major Rural	-1.78	0.7121
Intermediate Rural	-1.49	0.7741
Small Rural	-0.95	0.8554
Interactions between Time and Hospital Type		
Tertiary (Reference)	Ref	Ref
Urban Community	-0.01	0.995
Major Rural	0.01	0.9967
Intermediate Rural	0.04	0.9747
Small Rural	0.07	0.9612
Interaction between Time and Percent of Birth Hospitalizations	0.00	0.9968
Interaction between Time and Percent of Hospitalization of Adults Age 70+	0.01	0.9853

Summary

Although crude analyses from Chapter 3 showed increases in RIWs over time, when we fit these data to models, the time trends became non-significant. Hospital-specific variations observed in crude analyses reflected random variations rather than systematic patterns. We tested a variety of patient-level and hospital-level factors to identify significant drivers of changes in RIWs over time. None of the patient-level nor hospital-level factors were significantly associated with average RIW levels nor changes in RIWs over time.

CHAPTER 5: HOSPITAL OPERATING COSTS

Introduction

Our third research objective was to identify major drivers of observed variations in hospital operating expenses. We focused on inpatient costs. To achieve this objective, we calculated an inpatient CWC specific to each hospital for each fiscal year. This was done by applying CIHI's Cost of a Standard Inpatient Hospital Stay methodology to the Manitoba MIS data (detailed in Appendix 1). The methodology outlines a series of steps that are used to identify the expenses associated with inpatient care. Expenses associated with inpatient care are then used to calculate a hospital's CWC. In this chapter, we first show major findings that emerged during the process of applying CIHI's costing methodology. Next, we present the resulting hospital-specific CWCs.

Missing Data

One of the first steps we took when applying CIHI's methodology was to identify all of the functional centres with missing data. We first present results which show functional centres that had activity data but were missing financial data; that is, the functional centre had either workload units, staff activity, and/or patient-related activity recorded but there were no expenses associated with those activity data. We next present results which show functional centres that had financial data but were missing activity data; i.e., expenses were incurred but we did not have data on workload units, staff activity, and/or patient-related activity which we could use to allocate those expenses to either inpatient expenses, outpatient expenses, or residual expenses.

Functional centres are identified with a five-digit numerical code followed by the functional centre type, for example, '71310 – Emergency'. It is important to note that a hospital will only have one of any type of functional centre.

Missing Financial Data

Years of Missing Financial Data

Table 5.1 shows the functional centres with activity data that were missing financial data in any of the five years of data available across all of Manitoba. As an example of how to read this table, consider functional centre 71430 - Non-Invasive Cardiology and Vascular Laboratories. Fifty-three hospitals reported activity data for this functional centre; forty of these hospitals (75.5%) were missing financial data for this functional centre in at least one year during the five-year study period. More than half of all hospitals had activity data but were missing financial data for the following functional centres: 71430 - Non-Invasive Cardiology and Vascular Laboratories (75.5%), 71445 - Clinical Nutrition (57.4%), 71455 - Occupational Therapy (56.1%), and 71310 - Emergency (55.4%).

Table 5.2 shows how consistently data were missing over the study period for the entire province. For example, for functional centre 71430 - Non-Invasive Cardiology and Vascular Laboratories, one hospital was missing only one year of financial data, another hospital was missing two years of data, and thirty-five hospitals were missing financial data for all five years.

Table 5.1: Percent of Manitoba Functional Centres with Activity Data but Missing Cost Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Cost Data	Percent
71430 - Non-Invasive Cardiology and Vascular Laboratories	53	40	75.5
71445 - Clinical Nutrition	47	27	57.4
71455 - Occupational Therapy	41	23	56.1
71310 - Emergency	56	31	55.4
71450 - Physiotherapy	42	20	47.6
71415 - Diagnostic Imaging	55	23	41.8
71460 - Audiology and Speech-Language Pathology	15	6	40.0
71367 - Day Surgery Pre- and Post-Operative Care	5	1	20.0
71425 - Electrodiagnostic Laboratories	5	1	20.0
71350 - Specialty Clinics	42	5	11.9
71410 - Clinical Laboratory	55	4	7.3
71260 - Operating Room	26	1	3.8

Table 5.2: Number of Years for which Manitoba Functional Centres with Activity Data are Missing Cost Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71430 - Non-Invasive Cardiology and Vascular Laboratories	1	1	0	3	35
71445 - Clinical Nutrition	1	0	7	0	19
71455 - Occupational Therapy	0	0	1	0	22
71310 - Emergency	1	0	2	1	27
71450 - Physiotherapy	0	0	0	2	18
71415 - Diagnostic Imaging	1	0	2	1	19
71460 - Audiology and Speech-Language Pathology	2	1	0	0	3
71367 - Day Surgery Pre- and Post-Operative Care	0	1	0	0	0
71425 - Electrodiagnostic Laboratories	0	1	0	0	0
71350 - Specialty Clinics	2	0	1	0	2
71410 - Clinical Laboratory	0	0	1	1	2
71260 - Operating Room	0	0	1	0	0

Tables 5.3 – 5.12 show these data by RHA. Note that there is variability between RHAs in terms of missing data. For example, 50.0% of hospitals in Southern Health-Santé Sud with statistics data for functional centre 71310 - Emergency were missing financial data, compared with 81.0% of hospitals in Prairie Mountain Health.

Table 5.3: Southern Health–Santé Sud Functional Centres with Activity Data but Missing Cost Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Cost Data	Percent
71430 - Non-Invasive Cardiology and Vascular Laboratories	11	9	81.8
71310 - Emergency	12	6	50.0
71415 - Diagnostic Imaging	11	5	45.5
71445 - Clinical Nutrition	9	3	33.3
71260 - Operating Room	7	1	14.3
71350 - Specialty Clinics	8	1	12.5

Table 5.4: Winnipeg Regional Health Authority Functional Centres with Activity Data but Missing Cost Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Cost Data	Percent
71367 - Day Surgery Pre- and Post-Operative Care	4	1	25.0
71310 - Emergency	7	1	14.3

Table 5.5: Prairie Mountain Health Functional Centres with Activity Data but Missing Cost Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Cost Data	Percent
71455 - Occupational Therapy	21	19	90.5
71460 - Audiology and Speech-Language Pathology	7	6	85.7
71310 - Emergency	21	17	81.0
71415 - Diagnostic Imaging	21	17	81.0
71430 - Non-Invasive Cardiology and Vascular Laboratories	21	17	81.0
71450 - Physiotherapy	21	17	81.0
71445 - Clinical Nutrition	20	15	75.0
71350 - Specialty Clinics	20	4	20.0
71410 - Clinical Laboratory	21	4	19.0

Table 5.6: Interlake-Eastern Regional Health Authority Functional Centres with Activity Data but Missing Cost Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Cost Data	Percent
71430 - Non-Invasive Cardiology and Vascular Laboratories	10	9	90.0
71445 - Clinical Nutrition	9	8	88.9
71310 - Emergency	10	5	50.0
71450 - Physiotherapy	9	3	33.3
71455 - Occupational Therapy	10	3	30.0

Table 5.7: Northern Health Region Functional Centres with Activity Data but Missing Cost Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Cost Data	Percent
71430 - Non-Invasive Cardiology and Vascular Laboratories	5	5	100.0
71425 - Electrodiagnostic Laboratories	2	1	50.0
71310 - Emergency	6	2	33.3
71445 - Clinical Nutrition	3	1	33.3
71455 - Occupational Therapy	3	1	33.3
71415 - Diagnostic Imaging	6	1	16.7

Table 5.8: Number of Years for which Southern Health-Santé Sud Functional Centres with Activity Data are Missing Cost Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71430 - Non-Invasive Cardiology and Vascular Laboratories	0	0	0	0	9
71310 - Emergency	0	0	1	0	5
71415 - Diagnostic Imaging	0	0	0	0	5
71445 - Clinical Nutrition	0	0	0	0	3
71260 - Operating Room	0	0	1	0	0
71350 - Specialty Clinics	0	0	0	0	1

Table 5.9: Number of Years for which Winnipeg Regional Health Authority Functional Centres with Activity Data are Missing Cost Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71367 - Day Surgery Pre- and Post-Operative Care	0	1	0	0	0
71310 - Emergency	0	0	0	0	1

Table 5.10: Number of Years for which Prairie Mountain Health Functional Centres with Activity Data are Missing Cost Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71455 - Occupational Therapy	0	0	0	0	19
71460 - Audiology and Speech-Language Pathology	2	1	0	0	3
71310 - Emergency	0	0	0	0	17
71415 - Diagnostic Imaging	0	0	2	1	14
71430 - Non-Invasive Cardiology and Vascular Laboratories	0	0	0	0	17
71450 - Physiotherapy	0	0	0	2	15
71445 - Clinical Nutrition	0	0	0	0	15
71350 - Specialty Clinics	2	0	1	0	1
71410 - Clinical Laboratory	0	0	1	1	2

Table 5.11: Number of Years for which Interlake-Eastern Regional Health Authority Functional Centres with Activity Data are Missing Cost Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71430 - Non-Invasive Cardiology and Vascular Laboratories	0	0	0	3	6
71445 - Clinical Nutrition	1	0	6	0	1
71310 - Emergency	1	0	1	1	2
71450 - Physiotherapy	0	0	0	0	3
71455 - Occupational Therapy	0	0	0	0	3

Table 5.12: Number of Years for which Northern Health Region Functional Centres with Activity Data are Missing Cost Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71430 - Non-Invasive Cardiology and Vascular Laboratories	1	1	0	0	3
71425 - Electrodiagnostic Laboratories	0	1	0	0	0
71310 - Emergency	0	0	0	0	2
71445 - Clinical Nutrition	0	0	1	0	0
71455 - Occupational Therapy	0	0	1	0	0
71415 - Diagnostic Imaging	1	0	0	0	0

Missing Financial Data by Fiscal Year

We identified variations in missing financial data by fiscal year. Province-wide results are presented in Table 5.13. Fiscal years 2010 and 2011 had the highest number of hospitals reporting activity data but missing financial data. Many functional centres had fairly consistent missing data patterns over time. However, we observed a decline in the number of hospitals with missing financial data for functional centre 71430 - Non-Invasive Cardiology and Vascular Laboratories.

Table 5.13: Number of Manitoba Functional Centres with Activity Data but Missing Cost Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71430 - Non-Invasive Cardiology and Vascular Laboratories	40	38	38	39	35
71445 - Clinical Nutrition	19	19	26	26	27
71455 - Occupational Therapy	22	23	23	23	22
71310 - Emergency	29	28	30	30	29
71450 - Physiotherapy	19	20	20	20	19
71415 - Diagnostic Imaging	22	22	22	20	20
71460 - Audiology and Speech-Language Pathology	3	3	3	6	4
71367 - Day Surgery Pre- and Post-Operative Care	0	1	1	0	0
71425 - Electrodiagnostic Laboratories	1	0	0	1	0
71350 - Specialty Clinics	2	2	3	4	4
71410 - Clinical Laboratory	3	4	4	3	3
71260 - Operating Room	0	1	0	1	1

We observed similar patterns when we examined missing financial data for each RHA (Tables 5.14 – 5.18). The number of functional centres with missing financial data remained relatively constant over time.

Table 5.14: Number of Southern Health–Santé Sud Functional Centres with Activity Data but Missing Cost Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71430 - Non-Invasive Cardiology and Vascular Laboratories	9	9	9	9	9
71310 - Emergency	5	5	6	6	6
71415 - Diagnostic Imaging	5	5	5	5	5
71445 - Clinical Nutrition	3	3	3	3	3
71260 - Operating Room	0	1	0	1	1
71350 - Specialty Clinics	1	1	1	1	1

Table 5.15: Number of Winnipeg Regional Health Authority Functional Centres with Activity Data Missing Cost Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12
71367 - Day Surgery Pre- and Post-Operative Care	0	1	1	0
71310 - Emergency	1	1	1	1

Table 5.16: Number of Prairie Mountain Health Functional Centres with Activity Data but Missing Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12
71455 - Occupational Therapy	19	19	19	19
71460 - Audiology and Speech-Language Pathology	3	3	3	6
71310 - Emergency	17	17	17	17
71415 - Diagnostic Imaging	17	17	17	15
71430 - Non-Invasive Cardiology and Vascular Laboratories	17	17	17	17
71450 - Physiotherapy	16	17	17	17
71445 - Clinical Nutrition	15	15	15	15
71350 - Specialty Clinics	1	1	2	3
71410 - Clinical Laboratory	3	4	4	3

Table 5.17: Number of Interlake-Eastern Regional Health Authority Functional Centres with Active but Missing Cost Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12
71430 - Non-Invasive Cardiology and Vascular Laboratories	9	9	9	9
71445 - Clinical Nutrition	1	1	7	7
71310 - Emergency	4	3	4	4
71450 - Physiotherapy	3	3	3	3
71455 - Occupational Therapy	3	3	3	3

Table 5.18: Number of Northern Health Region Functional Centres with Activity Data but Missing Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12
71430 - Non-Invasive Cardiology and Vascular Laboratories	5	3	3	4
71425 - Electrodiagnostic Laboratories	1	0	0	1
71310 - Emergency	2	2	2	2
71445 - Clinical Nutrition	0	0	1	1
71455 - Occupational Therapy	0	1	1	1
71415 - Diagnostic Imaging	0	0	0	0

Missing Activity Data

Years of Missing Activity Data

Table 5.19 lists the functional centres where expenses were incurred but the corresponding activity data were missing. All Manitoba hospitals were missing activity data for the following 18 functional centres in at least one fiscal year of the study period.

- 71210 - Medical Nursing Unit
- 71220 - Surgical Nursing Unit
- 71230 - Combined Medical/Surgical Nursing Unit
- 71240 - Intensive Care Nursing Unit
- 71250 - Obstetrics Nursing Unit
- 71270 - Pediatric Nursing Unit
- 71275 - Mental Health and Addiction Services Nursing Unit
- 71280 - Physical Rehabilitation Nursing Unit
- 71290 - Palliative Nursing Unit
- 71355 - Private Clinics
- 71362 - Day Surgery Combined Operating and Post Anesthetic Recovery Room (PARR)
- 71405 - Diagnostic and Therapeutic Nursing
- 71420 - Radiation Oncology
- 71440 - Pharmacy
- 71465 - Rehabilitation Engineering
- 71480 - Pastoral Care
- 71485 - Recreation
- 71490 - Child Life

Table 5.19: Percent of Manitoba Functional Centres with Cost Data but Missing Activity Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Activity Data	Percent
71440 - Pharmacy	53	53	100.0
71230 - Combined Medical/Surgical Nursing Unit	50	50	100.0
71485 - Recreation	34	34	100.0
71210 - Medical Nursing Unit	15	15	100.0
71480 - Pastoral Care	15	15	100.0
71220 - Surgical Nursing Unit	14	14	100.0
71250 - Obstetrics Nursing Unit	11	11	100.0
71280 - Physical Rehabilitation Nursing Unit	11	11	100.0
71290 - Palliative Nursing Unit	11	11	100.0
71240 - Intensive Care Nursing Unit	10	10	100.0
71275 - Mental Health and Addiction Services Nursing Unit	10	10	100.0
71270 - Pediatric Nursing Unit	2	2	100.0
71405 - Diagnostic and Therapeutic Nursing	2	2	100.0
71355 - Private Clinics	1	1	100.0
71362 - Day Surgery Combined Operating and PARR	1	1	100.0
71420 - Radiation Oncology	1	1	100.0
71465 - Rehabilitation Engineering	1	1	100.0
71490 - Child Life	1	1	100.0
71475 - Psychology	4	3	75.0
71470 - Social Work	21	13	61.9
71350 - Specialty Clinics	42	21	50.0
71265 - Post-Anesthetic Recovery Room (PARR)	10	3	30.0
71367 - Day Surgery Pre- and Post-Operative Care	5	1	20.0
71425 - Electrodiagnostic Laboratories	5	1	20.0
71460 - Audiology and Speech-Language Pathology	15	2	13.3
71445 - Clinical Nutrition	47	6	12.8
71260 - Operating Room	26	2	7.7
71435 - Respiratory Services	14	1	7.1
71340 - Specialty Day/Night Care	36	1	2.8
71450 - Physiotherapy	42	1	2.4
Food	56	1	1.8

Table 5.20 shows the number of hospitals that had financial data recorded, but were missing corresponding activity data for one to five years. For example, in the 71210 - Medical Nursing Unit functional centre, none of the hospitals were missing one or two years of data, one hospital was missing three years of data, and 14 were missing activity data for all five years. If a hospital was missing activity data for a functional centre, it was most likely missing data for all five years of the study.

Table 5.20: Number of Years for which Manitoba Functional Centres with Cost Data are Missing Activity Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71440 - Pharmacy	1	0	7	0	45
71230 - Combined Medical/Surgical Nursing Unit	1	0	3	0	46
71485 - Recreation	0	1	4	7	22
71210 - Medical Nursing Unit	0	0	1	0	14
71480 - Pastoral Care	0	0	4	1	10
71220 - Surgical Nursing Unit	2	0	0	0	12
71250 - Obstetrics Nursing Unit	2	0	0	0	9
71280 - Physical Rehabilitation Nursing Unit	2	0	0	0	9
71290 - Palliative Nursing Unit	0	3	1	1	6
71240 - Intensive Care Nursing Unit	0	1	0	0	9
71275 - Mental Health and Addiction Services Nursing Unit	2	1	0	0	7
71270 - Pediatric Nursing Unit	1	0	0	0	1
71405 - Diagnostic and Therapeutic Nursing	0	0	0	0	2
71355 - Private Clinics	0	0	0	0	1
71362 - Day Surgery Combined Operating and PARR	1	0	0	0	0
71420 - Radiation Oncology	0	0	1	0	0
71465 - Rehabilitation Engineering	0	0	0	0	1
71490 - Child Life	0	0	0	0	1
71475 - Psychology	0	0	1	1	1
71470 - Social Work	1	1	0	3	8
71350 - Specialty Clinics	2	5	1	4	9
71265 - Post-Anesthetic Recovery Room (PARR)	3	0	0	0	0
71367 - Day Surgery Pre- and Post-Operative Care	1	0	0	0	0
71425 - Electrodiagnostic Laboratories	0	0	1	0	0
71460 - Audiology and Speech-Language Pathology	1	0	0	0	1
71445 - Clinical Nutrition	1	4	0	0	1
71260 - Operating Room	0	1	1	0	0
71435 - Respiratory Services	0	0	0	0	1
71340 - Specialty Day/Night Care	0	0	0	1	0
71450 - Physiotherapy	0	0	0	0	1
Food	1	0	0	0	0

Tables 5.21 – 5.30 show these data by RHA. The Winnipeg Regional Health Authority had the greatest number of functional centres where expenses were recorded without corresponding activity data. Again, we found that if activity data were missing, they tended to be missing for all five years of the study.

Table 5.21: Southern Health–Santé Sud Functional Centres with Cost Data but Missing Activity Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Activity Data	Percent
71230 - Combined Medical/Surgical Nursing Unit	11	11	100.0
71440 - Pharmacy	11	11	100.0
71470 - Social Work	8	8	100.0
71485 - Recreation	6	6	100.0
71210 - Medical Nursing Unit	4	4	100.0
71290 - Palliative Nursing Unit	4	4	100.0
71480 - Pastoral Care	4	4	100.0
71220 - Surgical Nursing Unit	3	3	100.0
71280 - Physical Rehabilitation Nursing Unit	2	2	100.0
71240 - Intensive Care Nursing Unit	1	1	100.0
71250 - Obstetrics Nursing Unit	1	1	100.0
71367 - Day Surgery Pre- and Post-Operative Care	1	1	100.0
71350 - Specialty Clinics	8	5	62.5
71445 - Clinical Nutrition	9	5	55.6

Table 5.22: Winnipeg Regional Health Authority Functional Centres with Cost Data but Missing Activity Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Activity Data	Percent
71440 - Pharmacy	7	7	100.0
71210 - Medical Nursing Unit	6	6	100.0
71220 - Surgical Nursing Unit	6	6	100.0
71240 - Intensive Care Nursing Unit	6	6	100.0
71480 - Pastoral Care	6	6	100.0
71275 - Mental Health and Addiction Services Nursing Unit	5	5	100.0
71280 - Physical Rehabilitation Nursing Unit	5	5	100.0
71485 - Recreation	4	4	100.0
71230 - Combined Medical/Surgical Nursing Unit	3	3	100.0
71250 - Obstetrics Nursing Unit	3	3	100.0
71290 - Palliative Nursing Unit	2	2	100.0
71405 - Diagnostic and Therapeutic Nursing	2	2	100.0
71362 - Day Surgery Combined Operating and PARR	1	1	100.0
71465 - Rehabilitation Engineering	1	1	100.0
71490 - Child Life	1	1	100.0
71475 - Psychology	3	2	66.7
71265 - Post-Anesthetic Recovery Room	6	1	16.7
71340 - Specialty Day/Night Care	6	1	16.7
71435 - Respiratory Services	6	1	16.7
71460 - Audiology and Speech-Language Pathology	6	1	16.7
71470 - Social Work	6	1	16.7
71450 - Physiotherapy	7	1	14.3
Food	7	1	14.3

Table 5.23: Prairie Mountain Health Functional Centres with Cost Data but Missing Activity Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Activity Data	Percent
71230 - Combined Medical/Surgical Nursing Unit	21	21	100.0
71440 - Pharmacy	20	20	100.0
71485 - Recreation	16	16	100.0
71250 - Obstetrics Nursing Unit	3	3	100.0
71280 - Physical Rehabilitation Nursing Unit	3	3	100.0
71480 - Pastoral Care	3	3	100.0
71210 - Medical Nursing Unit	2	2	100.0
71220 - Surgical Nursing Unit	2	2	100.0
71240 - Intensive Care Nursing Unit	2	2	100.0
71270 - Pediatric Nursing Unit	2	2	100.0
71275 - Mental Health and Addiction Services Nursing Unit	2	2	100.0
71355 - Private Clinics	1	1	100.0
77142 - Radiation Oncology	1	1	100.0
71475 - Psychology	1	1	100.0
71350 - Specialty Clinics	20	14	70.0

Table 5.24: Interlake-Eastern Regional Health Authority Functional Centres with Cost Data but Missing Activity Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Activity Data	Percent
71440 - Pharmacy	10	10	100.0
71230 - Combined Medical/Surgical Nursing Unit	9	9	100.0
71485 - Recreation	6	6	100.0
71290 - Palliative Nursing Unit	5	5	100.0
71470 - Social Work	2	2	100.0
71210 - Medical Nursing Unit	1	1	100.0
71220 - Surgical Nursing Unit	1	1	100.0
71250 - Obstetrics Nursing Unit	1	1	100.0
71265 - Post-Anesthetic Recovery Room	1	1	100.0
71280 - Physical Rehabilitation Nursing Unit	1	1	100.0
71350 - Specialty Clinics	1	1	100.0
71260 - Operating Room	3	1	33.3
71445 - Clinical Nutrition	9	1	11.1

Table 5.25: Northern Health Region Functional Centres with Cost Data but Missing Activity Data in At Least One Year, 2008/09-2012/13

Functional Centre	Number of Functional Centres	Missing Activity Data	Percent
71230 - Combined Medical/Surgical Nursing Unit	6	6	100.0
71440 - Pharmacy	5	5	100.0
71250 - Obstetrics Nursing Unit	3	3	100.0
71275 - Mental Health and Addiction Services Nursing Unit	3	3	100.0
71210 - Medical Nursing Unit	2	2	100.0
71220 - Surgical Nursing Unit	2	2	100.0
71480 - Pastoral Care	2	2	100.0
71485 - Recreation	2	2	100.0
71240 - Intensive Care Nursing Unit	1	1	100.0
71265 - Post-Anesthetic Recovery Room	1	1	100.0
71460 - Audiology and Speech-Language Pathology	1	1	100.0
71470 - Social Work	3	2	66.7
71425 - Electrodiagnostic Laboratories	2	1	50.0
71260 - Operating Room	3	1	33.3
71350 - Specialty Clinics	6	1	16.7

Table 5.26: Number of Years for which Southern Health–Santé Sud Functional Centres with Cost Data are Missing Activity Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71230 - Combined Medical/Surgical Nursing Unit	0	0	1	0	10
71440 - Pharmacy	0	0	0	0	11
71470 - Social Work	1	1	0	1	5
71485 - Recreation	0	0	0	2	4
71210 - Medical Nursing Unit	0	0	1	0	3
71290 - Palliative Nursing Unit	0	3	0	0	1
71480 - Pastoral Care	0	0	0	0	4
71220 - Surgical Nursing Unit	0	0	0	0	3
71280 - Physical Rehabilitation Nursing Unit	0	0	0	0	2
71240 - Intensive Care Nursing Unit	0	1	0	0	0
71250 - Obstetrics Nursing Unit	0	0	0	0	1
71367 - Day Surgery Pre- and Post-Operative Care	1	0	0	0	0
71350 - Specialty Clinics	0	0	0	1	4
71445 - Clinical Nutrition	0	4	0	0	1

Table 5.27: Number of Years for which Winnipeg Regional Health Authority Functional Centres with Cost Data are Missing Activity Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71440 - Pharmacy	0	0	0	0	7
71210 - Medical Nursing Unit	0	0	0	0	6
71220 - Surgical Nursing Unit	0	0	0	0	6
71240 - Intensive Care Nursing Unit	0	0	0	0	6
71480 - Pastoral Care	0	0	1	0	5
71275 - Mental Health and Addiction Services Nursing Unit	0	1	0	0	4
71280 - Physical Rehabilitation Nursing Unit	0	0	0	0	5
71485 - Recreation	0	0	1	0	3
71230 - Combined Medical/Surgical Nursing Unit	0	0	1	0	2
71250 - Obstetrics Nursing Unit	1	0	0	0	2
71290 - Palliative Nursing Unit	0	0	1	0	1
71405 - Diagnostic and Therapeutic Nursing	0	0	0	0	2
71362 - Day Surgery Combined Operating and PARR	1	0	0	0	0
71465 - Rehabilitation Engineering	0	0	0	0	1
71490 - Child Life	0	0	0	0	1
71475 - Psychology	0	0	1	0	1
71265 - Post-Anesthetic Recovery Room	1	0	0	0	0
71340 - Specialty Day/Night Care	0	0	0	1	0
71435 - Respiratory Services	0	0	0	0	1
71460 - Audiology and Speech-Language Pathology	0	0	0	0	1
71470 - Social Work	0	0	0	0	1
71450 - Physiotherapy	0	0	0	0	1
Food	1	0	0	0	0

Table 5.28: Number of Years for which Prairie Mountain Health Functional Centres with Cost Data are Missing Activity Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71230 - Combined Medical/Surgical Nursing Unit	1	0	1	0	19
71440 - Pharmacy	0	0	0	0	20
71485 - Recreation	0	1	3	0	12
71250 - Obstetrics Nursing Unit	0	0	0	0	3
71280 - Physical Rehabilitation Nursing Unit	1	0	0	0	2
71480 - Pastoral Care	0	0	2	0	1
71210 - Medical Nursing Unit	0	0	0	0	2
71220 - Surgical Nursing Unit	0	0	0	0	2
71240 - Intensive Care Nursing Unit	0	0	0	0	2
71270 - Pediatric Nursing Unit	1	0	0	0	1
71275 - Mental Health and Addiction Services Nursing Unit	1	0	0	0	1
71355 - Private Clinics	0	0	0	0	1
77142 - Radiation Oncology	0	0	1	0	0
71475 - Psychology	0	0	0	1	0
71350 - Specialty Clinics	1	4	1	3	5

Table 5.29: Number of Years for which Interlake-Eastern Regional Health Authority Functional Centres with Cost Data are Missing Activity Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71440 - Pharmacy	0	0	7	0	3
71230 - Combined Medical/Surgical Nursing Unit	0	0	0	0	9
71485 - Recreation	0	0	0	5	1
71290 - Palliative Nursing Unit	0	0	0	1	4
71470 - Social Work	0	0	0	1	1
71210 - Medical Nursing Unit	0	0	0	0	1
71220 - Surgical Nursing Unit	0	0	0	0	1
71250 - Obstetrics Nursing Unit	0	0	0	0	1
71265 - Post-Anesthetic Recovery Room	1	0	0	0	0
71280 - Physical Rehabilitation Nursing Unit	1	0	0	0	0
71350 - Specialty Clinics	1	0	0	0	0
71260 - Operating Room	0	1	0	0	0
71445 - Clinical Nutrition	1	0	0	0	0

Table 5.30: Number of Years for which Northern Health Region Functional Centres with Cost Data are Missing Activity Data, 2008/09-2012/13

Functional Centre	1 Year	2 Years	3 Years	4 Years	5 Years
71230 - Combined Medical/Surgical Nursing Unit	0	0	0	0	6
71440 - Pharmacy	1	0	0	0	4
71250 - Obstetrics Nursing Unit	1	0	0	0	2
71275 - Mental Health and Addiction Services Nursing Unit	1	0	0	0	2
71210 - Medical Nursing Unit	0	0	0	0	2
71220 - Surgical Nursing Unit	2	0	0	0	0
71480 - Pastoral Care	0	0	1	1	0
71485 - Recreation	0	0	0	0	2
71240 - Intensive Care Nursing Unit	0	0	0	0	1
71265 - Post-Anesthetic Recovery Room	1	0	0	0	0
71460 - Audiology and Speech-Language Pathology	1	0	0	0	0
71470 - Social Work	0	0	0	1	1
71425 - Electrodiagnostic Laboratories	0	0	1	0	0
71260 - Operating Room	0	0	1	0	0
71350 - Specialty Clinics	0	1	0	0	0

Missing Statistics Data by Fiscal Year

In addition to looking at the number of years that hospitals had missing data, we also looked at the patterns of missing statistics data for the whole province over time (Table 5.31). The patterns of missing data remained fairly constant over time for most functional centres.

Table 5.31: Number of Manitoba Functional Centres with Cost Data but Missing Activity Data, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71440 - Pharmacy	52	53	52	45	45
71230 - Combined Medical/Surgical Nursing Unit	48	47	49	48	48
71485 - Recreation	34	34	33	29	22
71210 - Medical Nursing Unit	14	14	15	15	15
71480 - Pastoral Care	14	15	15	10	12
71220 - Surgical Nursing Unit	12	12	13	12	13
71250 - Obstetrics Nursing Unit	11	9	9	9	9
71280 - Physical Rehabilitation Nursing Unit	10	9	9	9	10
71290 - Palliative Nursing Unit	9	10	8	8	8
71240 - Intensive Care Nursing Unit	10	10	9	9	9
71275 - Mental Health and Addiction Services Nursing Unit	9	7	7	8	8
71270 - Pediatric Nursing Unit	2	1	1	1	1
71405 - Diagnostic and Therapeutic Nursing	2	2	2	2	2
71355 - Private Clinics	1	1	1	1	1
71362 - Day Surgery Combined Operating and PARR	0	1	0	0	0
71420 - Radiation Oncology	0	0	1	1	1
71465 - Rehabilitation Engineering	1	1	1	1	1
71490 - Child Life	1	1	1	1	1
71475 - Psychology	2	3	2	2	3
71470 - Social Work	11	11	12	11	10
71350 - Specialty Clinics	15	16	14	16	15
71265 - Post-Anesthetic Recovery Room (PARR)	0	1	0	1	1
71367 - Day Surgery Pre- and Post-Operative Care	0	0	0	0	1
71425 - Electrodiagnostic Laboratories	1	1	1	0	0
71460 - Audiology and Speech-Language Pathology	1	1	1	1	2
71445 - Clinical Nutrition	5	5	1	1	2
71260 - Operating Room	0	0	1	2	2
71435 - Respiratory Services	1	1	1	1	1
71340 - Specialty Day/Night Care	0	1	1	1	1
71450 - Physiotherapy	1	1	1	1	1
Food	0	0	0	0	1

Tables 5.32 – 5.36 show the missing data results by fiscal year for each RHA. Within each RHA, patterns of missing data were fairly consistent over time.

Table 5.32: Number of Southern Health–Santé Sud Functional Centres with Cost Data but Missing Activity Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71230 - Combined Medical/Surgical Nursing Unit	10	10	11	11	11
71440 - Pharmacy	11	11	11	11	11
71470 - Social Work	6	6	7	6	7
71485 - Recreation	6	6	6	6	4
71210 - Medical Nursing Unit	3	3	4	4	4
71290 - Palliative Nursing Unit	4	4	1	1	1
71480 - Pastoral Care	4	4	4	4	4
71220 - Surgical Nursing Unit	3	3	3	3	3
71280 - Physical Rehabilitation Nursing Unit	2	2	2	2	2
71240 - Intensive Care Nursing Unit	1	1	0	0	0
71250 - Obstetrics Nursing Unit	1	1	1	1	1
71367 - Day Surgery Pre- and Post-Operative Care	0	0	0	0	1
71350 - Specialty Clinics	4	5	5	5	5
71445 - Clinical Nutrition	5	5	1	1	1

Table 5.33: Number of Winnipeg Regional Health Authority Functional Centres with Cost Data but Missing Activity Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71440 - Pharmacy	7	7	7	7	7
71210 - Medical Nursing Unit	6	6	6	6	6
71220 - Surgical Nursing Unit	6	6	6	6	6
71240 - Intensive Care Nursing Unit	6	6	6	6	6
71480 - Pastoral Care	5	6	6	6	5
71275 - Mental Health and Addiction Services Nursing Unit	4	4	4	4	5
71280 - Physical Rehabilitation Nursing Unit	5	5	5	5	5
71485 - Recreation	3	4	4	4	3
71230 - Combined Medical/Surgical Nursing Unit	2	3	3	3	2
71250 - Obstetrics Nursing Unit	2	3	2	2	2
71290 - Palliative Nursing Unit	1	1	1	2	2
71405 - Diagnostic and Therapeutic Nursing	2	2	2	2	2
71362 - Day Surgery Combined Operating and PARR	0	0	1	0	0
71465 - Rehabilitation Engineering	1	1	1	1	1
71490 - Child Life	1	1	1	1	1
71475 - Psychology	1	2	2	1	1
71265 - Post-Anesthetic Recovery Room	0	0	1	0	0
71340 - Specialty Day/Night Care	0	0	1	1	1
71435 - Respiratory Services	1	1	1	1	1
71460 - Audiology and Speech-Language Pathology	1	1	1	1	1
71470 - Social Work	1	1	1	1	1
71450 - Physiotherapy	1	1	1	1	1
Food	0	0	0	0	0

Table 5.34: Number of Prairie Mountain Health Functional Centres with Cost Data but Missing Activity Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71230 - Combined Medical/Surgical Nursing Unit	20	19	20	20	20
71440 - Pharmacy	20	20	20	20	20
71485 - Recreation	16	16	15	12	12
71250 - Obstetrics Nursing Unit	3	3	3	3	3
71280 - Physical Rehabilitation Nursing Unit	3	2	2	2	2
71480 - Pastoral Care	3	3	3	1	1
71210 - Medical Nursing Unit	2	2	2	2	2
71220 - Surgical Nursing Unit	2	2	2	2	2
71240 - Intensive Care Nursing Unit	2	2	2	2	2
71270 - Pediatric Nursing Unit	2	1	1	1	1
71275 - Mental Health and Addiction Services Nursing Unit	2	1	1	1	1
71355 - Private Clinics	1	1	1	1	1
77142 - Radiation Oncology	0	0	1	1	1
71475 - Psychology	0	1	1	1	1
71350 - Specialty Clinics	11	11	9	9	9

Table 5.35: Number of Interlake-Eastern Regional Health Authority Functional Centres with Cost Data but Missing Activity Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71440 - Pharmacy	10	10	10	3	3
71230 - Combined Medical/Surgical Nursing Unit	9	9	9	9	9
71485 - Recreation	6	6	6	6	1
71290 - Palliative Nursing Unit	4	5	5	5	5
71470 - Social Work	2	2	2	2	1
71210 - Medical Nursing Unit	1	1	1	1	1
71220 - Surgical Nursing Unit	1	1	1	1	1
71250 - Obstetrics Nursing Unit	1	1	1	1	1
71265 - Post-Anesthetic Recovery Room	0	0	0	1	0
71280 - Physical Rehabilitation Nursing Unit	0	0	0	0	1
71350 - Specialty Clinics	0	0	0	1	0
71260 - Operating Room	0	0	0	1	1
71445 - Clinical Nutrition	0	0	0	0	1

Table 5.36: Number of Northern Health Region Functional Centres with Cost Data but Missing Activity Data by Year, 2008/09-2012/13

Functional Centre	2008/09	2009/10	2010/11	2011/12	2012/13
71230 - Combined Medical/Surgical Nursing Unit	6	6	6	6	6
71440 - Pharmacy	4	5	4	4	4
71250 - Obstetrics Nursing Unit	3	2	2	2	2
71275 - Mental Health and Addiction Services Nursing Unit	3	2	2	2	2
71210 - Medical Nursing Unit	2	2	2	2	2
71220 - Surgical Nursing Unit	0	0	1	0	1
71480 - Pastoral Care	1	2	2	0	2
71485 - Recreation	2	2	2	2	2
71240 - Intensive Care Nursing Unit	1	1	1	1	1
71265 - Post-Anesthetic Recovery Room	0	0	0	0	1
71460 - Audiology and Speech-Language Pathology	0	0	0	0	1
71470 - Social Work	2	2	2	2	1
71425 - Electrodiagnostic Laboratories	1	1	1	0	0
71260 - Operating Room	0	0	1	1	1
71350 - Specialty Clinics	0	0	0	1	1

Hospital Costs

After we identified all the functional centres with missing data, we applied the standard costing methodology described in Appendix 1 to allocate expenses to either the inpatient, outpatient, or residual cost pools. Table 5.37 shows these expenses by hospital type. After accounting for inflation, we found a statistically significant increase in total expenses across all hospital types; in other words, the increase in total hospital expenses seen in Manitoba hospitals outpaced the rate of inflation.⁴ When we separated the expenses for inpatients and outpatients, we found significant increases in inpatient expenses only among intermediate rural and small rural hospitals after accounting for inflation. Outpatient expenses increased in Tertiary and Urban Community Hospitals.

We used growth curve models to identify significant predictors of increases in hospital expenses. We tested whether increasing expenses were associated with hospital type, hospital-average RIW, average length of stay, the total number of hospital cases, the total number of inpatient hospital cases, the total number of outpatient hospital cases, percentage of patients age 70+, and changes in these characteristics over time. Perhaps unsurprisingly, the total number of cases and the total number of inpatient cases were the only predictors associated with increases in total hospital expenses; likewise, these were the only two predictors associated with increases in inpatient hospital expenses. None of the predictors were associated with increases in outpatient expenses.

⁴ Inflation-adjusted analyses used the CPI, setting all costs to 2012, (*Statistics Canada Table 326-0021 – Consumer Price Index, annual, 2002=100 unless otherwise noted*), CANISM (database). Last updated January 19, 2017 (accessed January 23, 2017).

Table 5.37: Average Costs by Hospital Type, 2008/09-2012/13

Hospital Type	2008/09	2009/10	2010/11	2011/12	2012/13
Total Costs †					
Tertiary ‡	\$358,680,000	\$389,160,000	\$403,699,000	\$409,944,000	\$427,822,000
Urban Community ‡	\$79,355,000	\$85,033,000	\$88,107,000	\$91,132,000	\$93,322,000
Major Rural ‡	\$22,519,000	\$24,811,000	\$25,413,000	\$27,532,000	\$27,763,000
Intermediate ‡	\$6,085,000	\$6,295,000	\$6,542,000	\$6,843,000	\$7,107,000
Small Rural ‡	\$4,112,000	\$4,362,000	\$4,505,000	\$4,691,000	\$4,720,000
Inpatient Costs					
Tertiary	\$226,900,000	\$245,749,000	\$250,549,000	\$245,739,000	\$254,820,000
Urban Community	\$46,792,000	\$49,047,000	\$50,488,000	\$51,812,000	\$53,053,000
Major Rural	\$11,175,000	\$12,557,000	\$12,745,000	\$13,137,000	\$14,149,000
Intermediate Rural ‡	\$3,093,000	\$3,366,000	\$3,452,000	\$3,559,000	\$3,698,000
Small Rural*	\$1,977,000	\$2,157,000	\$2,225,000	\$2,300,000	\$2,345,000
Outpatient Costs					
Tertiary ‡	\$120,900,000	\$133,360,000	\$142,476,000	\$152,881,000	\$162,130,000
Urban Community ‡	\$25,437,000	\$27,755,000	\$30,195,000	\$31,943,000	\$33,152,000
Major Rural	\$8,026,000	\$8,716,000	\$9,299,000	\$10,700,000	\$9,773,000
Intermediate Rural	\$855,000	\$710,000	\$845,000	\$967,000	\$1,037,000
Small Rural	\$488,000	\$470,000	\$542,000	\$596,000	\$548,000

† Residual costs are included in the total costs; thus, total costs are greater than the sum of inpatient and outpatient costs

‡ identifies a statistically significant time trend after accounting for inflation (*Statistics Canada Table 326-0021 – Consumer Price Index, annual*. 2002=100 unless otherwise noted), CANISM (database). <http://www5.statcan.gc.ca/cansim/a26?id=3260021> Last updated January 19, 2017 (accessed January 23, 2017))

Inpatient Cost per Weighted Case

We allocated the expenses to the three cost pools to isolate inpatient costs in order to calculate hospital-specific inpatient CWC. We did this by dividing the total inpatient expenses for each hospital by the total weighted cases. Costs per weighted case provides an estimate for the expenses associated with treating a standard case (i.e., a case with an RIW of 1). Table 5.38 presents average cost per weighted case for all hospitals in each RHA, by fiscal year. We saw that the largest variations in CWC were found among small rural hospitals while the larger hospital types had relatively stable CWCs over the study period (Table 5.39).

Table 5.38: Average Inpatient Cost per Weighted Case Including Nursing Costs by Regional Health Authority (RHA)

RHA	2008/09	2009/10	2010/11	2011/12	2012/13
Southern Health-Santé Sud	\$3,964.00	\$4,092.00	\$3,950.00	\$4,012.00	\$4,256.00
Winnipeg RHA	\$7,466.00	\$8,308.00	\$8,377.00	\$8,458.00	\$9,374.00
Prairie Mountain Health	\$4,281.00	\$4,508.00	\$4,562.00	\$4,632.00	\$4,770.00
Interlake-Eastern RHA	\$4,059.00	\$4,479.00	\$4,374.00	\$4,614.00	\$4,467.00
Northern Health Region	\$12,980.00	\$25,235.00	\$9,238.00	\$37,982.00	\$17,903.00
Manitoba	\$5,503.00	\$7,110.00	\$5,375.00	\$8,547.00	\$6,588.00

Table 5.39: Average Inpatient Cost per Weighted Case Including Nursing Costs by Hospital Type

Hospital Type	2008/09	2009/10	2010/11	2011/12	2012/13
Tertiary	\$5,393.00	\$5,636.00	\$5,553.00	\$5,435.00	\$5,495.00
Urban Community	\$4,474.00	\$4,975.00	\$5,083.00	\$5,117.00	\$5,124.00
Major Rural	\$4,565.00	\$4,891.00	\$4,753.00	\$4,824.00	\$5,484.00
Intermediate Rural	\$3,772.00	\$4,056.00	\$4,113.00	\$4,199.00	\$4,091.00
Small Rural	\$7,095.00	\$10,285.00	\$6,401.00	\$13,432.00	\$8,865.00
Manitoba	\$5,503.00	\$7,110.00	\$5,375.00	\$8,547.00	\$6,588.00

We found that CWCs in the Northern Health Region were statistically significantly higher than in the rest of the province ($p < 0.05$). However, time trends showed no significant increase in CWC over time. As a sensitivity test, we calculated hospital-specific CWCs in two ways. We were concerned with identifying whether the CWCs were sensitive to nursing costs because the hourly rate for nurses varies considerably across Manitoba. We therefore re-calculated CWCs after excluding nursing costs. As expected, excluding nursing expenses eliminated many, though not all, of the differences between RHAs with respect to average CWCs (Table 5.40).

We present hospital-specific CWCs – both including and excluding nursing costs – in Appendix 4.

Table 5.40: Average Inpatient Cost per Weighted Case without Nursing Costs by Regional Health Authority (RHA)

RHA	2008/09	2009/10	2010/11	2011/12	2012/13
Southern Health-Santé Sud	\$2,112.24	\$2,195.99	\$2,139.97	\$2,139.68	\$2,269.21
Winnipeg RHA	\$5,222.18	\$5,896.17	\$5,963.43	\$5,961.45	\$6,068.29
Prairie Mountain Health	\$2,287.96	\$2,355.26	\$2,414.06	\$2,502.94	\$2,489.61
Interlake-Eastern RHA	\$2,284.43	\$2,437.91	\$2,281.94	\$2,554.30	\$2,370.58
Northern Health Region	\$6,183.54	\$10,789.85	\$4,897.41	\$22,170.80	\$10,029.75
Manitoba	\$2,942.32	\$3,362.01	\$2,796.47	\$4,409.25	\$3,286.69

Summary

This chapter addressed several issues that are important in understanding the data used to calculate the CWC. Data necessary for determining the CWC are often missing. Therefore, it was necessary to impute values for workload measures to try to develop comparable measures between hospitals and within-hospitals over time. We used these imputed values to allocate costs to inpatient and outpatient cost pools. The average CWC is reasonably consistent over time, except for the Northern Health Region, where there was variability over time.

After applying the costing methodology to impute missing data in the Management Information System, we found that total expenses increased over time for each of the hospital types. Inpatient expenses increased exclusively among Intermediate and Small Rural Hospitals. We found that outpatient expenses increased among Tertiary and Urban Community Hospitals. These increases were over and above the rate of inflation during the study period.

CHAPTER 6: CONCLUSIONS

This report examines variations in hospital resource use and costs in Manitoba. Our first objective was to describe changes in the patient population at each hospital and changes in the types of hospitalizations over time. We also saw that, while patients from low-income neighbourhoods made up the largest percentage of hospitalizations, this percentage decreased slightly over time. When we looked at the types of hospitalizations, we saw that although the total number of hospital cases increased across the study period, it was driven by outpatient cases while the number of inpatient cases declined. The decline in inpatient cases found in this report is consistent with other Manitoba findings, and supports the conclusion that the inpatient hospitalization rate is decreasing in the province [13]. The same trend of decreasing inpatient hospitalizations has also been seen across Canada [14]. This decline may reflect a shift in which patients are hospitalized, with less complex cases previously admitted as inpatient cases now being treated as outpatients.

The descriptive analyses showed that average inpatient RIWs increased over time. Previous MCHP research observed significant variation in hospital rankings by RIWs [2]. We ranked hospitals by average RIW and TWC for each year of the study. We found that fluctuations in rankings were largely determined by hospital size; although smaller hospitals' rankings varied from year to year, larger hospitals' rankings remained stable. This is fundamentally an issue of patient volume – the impact of discharging a couple of patients with large RIWs on a hospital's average RIW and TWC would be much greater in a hospital with few hospitalizations compared with one that has many.

Our second objective was to identify factors that were driving variations in average RIWs over time. Although our unadjusted analyses showed that average inpatient RIW increased over time, when we fit models to the data we found that neither changing patient demographics nor hospital-level characteristics predicted changes in RIW. Increases in average RIW, then, are likely being driven by the observed shifting of patients from inpatient to outpatient care settings. The implication of this is that less complex cases which were previously admitted as inpatients are now being treated in an outpatient setting; thus, the inpatient case pool will comprise increasingly complex cases with higher average RIWs. Future research can investigate the types of patients that have been shifted from inpatient to outpatient care and the implications that this may have on both health outcomes and costs for the system.

Our final objective was to identify and describe major drivers of the variation in inpatient hospital costs. To accomplish this, we first separated expenses into three cost pools: inpatient costs, outpatient costs, and residual costs. During this process we found that some functional centres (sometimes thought of as departments or teams in which staff members work) had activity data recording workloads, staff activity, volume of services, and/or caseloads but were missing corresponding financial data. Far more frequently, functional centres had financial data recording information on expenses, revenues, and/or assets but were missing corresponding activity data on workloads, staff activity, etc., corresponding to those costs. One of the key requirements for tracking healthcare spending to identify opportunities for improved efficiency is to have complete and accurate information management systems that collect data on both work activity and expenses.

We applied the CIHI costing methodology to handle the missing data across functional centres to compute an inpatient CWC for each facility. It was interesting to see that increases in inpatient expenses were confined to Intermediate Hospitals and Small Rural Hospitals, even though the volume of inpatient cases declined. Due to missing activity data, we were unable to fully explore drivers for this anomaly. Future research – once the data are more complete – can investigate this trend.

We found that our calculated CWCs differed from those published by CIHI. This is likely due to how we applied the inpatient costing methodology. Rather than use a pan-Canadian average to impute missing activity data, we used the average of the hospital type to which the facility belonged; e.g., if a Small Rural Hospital was missing activity data for a nursing functional centre, we used the average for that functional centre among Small Rural Hospitals (rather than the provincial average) in order to have an imputed value that was closer to the hospitals' experience.

Given that hospital expenditures make up the largest share of Canadian healthcare spending, hospitals are often the focus of efficiency initiatives in an effort to control costs [8]. Data held in the MIS database can provide useful information on which initiatives are effective at increasing efficiency. In Manitoba, identifying effective initiatives will be challenging, given the volume of data missing from the MIS database. It is only by using the data and placing emphasis on their use that data quality will improve. Efforts to increase the completeness and accuracy of the MIS data may increase our ability to identify opportunities for improved efficiency. Without complete data, the MIS database will be limited with respect to its capabilities to provide accurate information on hospital efficiency.

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APPENDIX 1: INPATIENT COST METHODOLOGY

We used the “Canadian MIS Database—Hospital Financial Performance Indicators, 1999–2000 to 2009–2010, Methodological Notes, Revised August 2011”^[4] to estimate the inpatient cost.

This appendix is divided into three sections. The first section describes how we applied CIHI’s inpatient costing methodology. The second section provides information on how we imputed missing data needed to complete inpatient allocation. The third section outlines how we applied the allocation base rule 1 for combined operating and post-anesthetic recovery room.

Throughout this appendix we describe deviations we made from the CIHI methodology, where appropriate. For example, when data are missing, the CIHI methodology imputes national averages for the missing values. However, we do not have access to these national averages for the purpose of imputing missing data. Moreover, imputing national averages for missing data may artificially reduce observed variations, since all hospitals with missing data will appear to have the same value. Consider the situation when five hospitals are missing workload unit statistics for their nursing functional centre; imputing the national average will make it appear as though all five hospitals have the same value, thus driving variation down. Also, it is unlikely that these five hospitals will have the same value for nursing workload units, particularly if the hospitals are substantively different vis-à-vis the healthcare services they provide (e.g., a Small Rural Hospital versus an Urban Community Hospital). In cases of missing data, we used averages from similar hospitals without missing data (e.g., if a Major Rural Hospital was missing nursing workload units, rather than impute the national average, we imputed the average of nursing workload units from those Major Rural Hospitals without missing data). Our intent in doing this was to use values that were more likely reflective of resource use and inpatient expenses at the hospital with missing data.

Determining Full Costs

The goal is to determine the full inpatient cost for each hospital. The following steps are used:

1. Make the following cost adjustments to the hospital's submitted functional and accounting centre data:

Secondary Financial Account	Description	Action
120	Recoveries from External Sources	Net against expenses
121	Recoveries within legal entity	
122	Recoveries—Interdepartmental	
31085	Compensation—Management and Operational Support Personnel—Other Termination Benefits	Exclude
35085	Compensation—Unit-Producing Personnel Other Termination Benefits	
390	Compensation—Medical Personnel	Exclude
95020	Amortization—Undistributed Land Improvements ^A	Exclude
95040	Amortization—Undistributed Building ^A	Exclude
95060	Amortization—Undistributed Building Service Equipment ^A	Exclude
955	Interest on Long-Term Liabilities	Exclude

^A Undistributed amortization is sometimes incorrectly reported rolled up as secondary financial account 95000, so the portion applicable to land improvements, buildings and building service equipment cannot be ascertained. Nationally, CIHI has determined that 70% of the reported undistributed amortization applies to these types of assets, so this percentage is excluded and thus only the expenses associated with major equipment amortization—undistributed will remain for allocation purposes.

2. Take the functional centres reported for each individual facility, roll them up to level 3 and begin establishing three cost pools. Please note that the fund types of all functional centres are converted to the operating fund prior to the calculation of this indicator.

Account Number	Functional Centre Description
Inpatient Cost Pool	
71205	Nursing Inpatient/Resident Administration ^A
71207	Nursing Inpatient/Resident Medical Resources ^A
71210	Medical Nursing Unit
71220	Surgical Nursing Unit
71230	Combined Medical/Surgical Nursing Unit
71240	Intensive Care Nursing Unit
71250	Obstetrics Nursing Unit
71270	Pediatric Nursing Unit
71275	Mental Health and Addiction Services Nursing Unit
71276	Mental Health Long-Term Care Nursing Unit
71280	Physical Rehabilitation Nursing Unit
71290	Palliative Nursing Unit
71296	Contracted-Out Surgical Services
Client Cost Pool	
71305	Ambulatory Care Administration ^A
71307	Ambulatory Care Medical Resources ^A
71310	Emergency
71314	Telephone Health Services
71320	Poison and Drug Information Services
71340	Specialty Day/Night Care
71350	Specialty Clinics
71355	Private Clinics
71396	Contracted-Out Day Surgery Services
Residual Cost Pool	
71292	Long-Term Care Nursing Unit
715	Community Health Services
717	Research
718	Education (excluding 71840 In-Service Education)
719	Undistributed

^A These functional centres should have been cleared prior to the hospital's CMDB data submission. If they were not cleared, the methodology will treat them in the same manner as other inpatient functional centres.

3. Set costs aside for the following functional centres, as these will be allocated to the various cost pools later.

Account Number	Functional Centre Description
711	Administrative and Support Services
71260	Operating Room (OR)
71262	Combined Operating and Post-Anesthetic Recovery Room
71265	Post-Anesthetic Recovery Room (PARR)
71360	Day Surgery Operating Room
71362	Day Surgery Combined Operating and Post-Anesthetic Recovery Room
71365	Day Surgery Post-Anesthetic Recovery Room
71367	Day Surgery Pre- and Post-Operative Care
71369	Day Surgery Combined Operating and Post-Anesthetic Recovery Room and Pre- and Post-Operative Care
714	Diagnostic and Therapeutic Services
71840	In-Service Education
819	Accounting Centres
	Regional Shared/Centralized Services

4. Allocate costs for the functional centres to the applicable inpatient and client cost pools based on the methodologies noted in the following table. These are listed in order of preference.

Rationale for the Adjustment	Account Number	Functional Centre	Allocation Base
Costs for inpatient and client surgical services reported in the OR need to be allocated to the inpatient and client cost pools	71260	Operating Room	<ol style="list-style-type: none"> 1. Service-recipient workload units 2. Surgical visits—inpatient to client ratio 3:1^{A, B} 3. If workload units or surgical visits are not reported, all costs are assigned to the inpatient cost pool
Costs for inpatient and client surgical services reported in the PARR need to be allocated to the inpatient and client cost pools	71265	Post-Anesthetic Recovery Room	<ol style="list-style-type: none"> 1. Service-recipient workload units^C 2. PARR visits—inpatient to client ratio 3:1^{B, D} 3. If workload units or PARR visits are not reported, all costs are assigned to the inpatient cost pool
Costs for inpatient and client surgical services reported in the combined OR–PARR need to be allocated to the inpatient and client cost pools	71262	Combined Operating and Post-Anesthetic Recovery Room	<ol style="list-style-type: none"> 1. Calculate a national average^E cost per OR visit and a national average cost per PARR visit (using data from 71260 and 71265), then apply these average costs to the volume of OR and PARR visits^F in 71262, respectively (with the inpatient visits volume weighted by a factor of 3) 2. If workload units or surgical/PARR visits are not reported, use national proportions of inpatient visits to total visits and client visits to total visits reported in 71262

^A We used statistical accounts: 4371 for inpatient and 4372 for client.

^B If there are 100 inpatient surgical visits and 50 client surgical visits, the total weighted surgical visits would be 300 (100 x a weighting of 3) for inpatients + 50 for clients = 350

^C We used statistical accounts: 1021 inpatient; 1022 client

^D We used statistical accounts: 4371, 4391 inpatient; 4372, 4392 client

^E We used the Manitoba average, rather than the national average. See the section entitled "Application of Allocation Base Rule 1 Under 71262 - Combined Operating and Post-Anesthetic Room" below

^F We used statistical accounts: 4371 OR inpatient visits; 4372 OR client visits; 4391 PARR inpatient visits; 4392 PARR client visits

Rationale for the Adjustment	Account Number	Functional Centre	Allocation Base
Costs for client visits—face-to-face (or referred in visits face-to-face) reported in an inpatient/resident unit need to be moved to the ambulatory care cost pool	71210	Medical Nursing Unit	1. Service-recipient workload units ^G 2. National average cost per client visit ^H for each type of hospital ^I 3. If no workload units are reported, all cost is assigned to inpatient cost ^J
	71220	Surgical Nursing Unit	
	71230	Combined Medical/Surgical Nursing Unit	
	71240	Intensive Care Nursing Unit	
	71250	Obstetrics Nursing Unit	
	71270	Pediatric Nursing Unit	
	71275	Mental Health and Addiction Services Nursing Unit	
	71276	Mental Health Long-Term Care Nursing Unit	
	71280	Physical Rehabilitation Nursing Unit	
	71290	Palliative Nursing Unit	
	71296	Contracted-Out Surgical Services	
Costs for inpatient days reported in emergency need to be moved to the inpatient cost pool	71310	Emergency	1. Service-recipient workload units ^K 2. Average inpatient cost per day ^L determined using 71210 Medical Nursing Unit, 71220 Surgical Nursing Unit, 71230 Combined Medical/Surgical Nursing Unit, 71270 Pediatric Nursing Unit, 71275 Mental Health and Addiction Services Nursing Unit and 71290 Palliative Nursing Unit 3. If no inpatient days are reported, then 100% of costs are allocated to the client cost pool ^M

^G We used statistical accounts: 10200, 10210, 10240, 10260 inpatient workload units; 10220 client workload units.

^H The national cost per visit is determined using data from those hospitals that report client visits and workload units in any inpatient/resident functional centres. Using workload units, the percentage of each functional centre's costs applicable to clients is determined and this figure is divided by the functional centre's visits.

^I Small (fewer than 50 beds), non-teaching and teaching.

^J We added this step to the allocation methodology.

^K Workload units were not available in the Emergency Functional Centre. We first removed the inpatient days cost and allocated it to inpatient cost pool. Then we allocated the remaining costs using visits face-to-face.

^L Average inpatient cost per day was calculated at the hospital level using the functional centres specified under Allocation Base rule 2, which reported both the cost and the inpatient days. This average was multiplied by the inpatient days reported under 71310 to estimate the inpatient days cost in Emergency. We used statistical accounts: 40310 inpatient days.

^M If inpatient days were missing we did not allocate everything to the client cost pool, we went to next row below, "71310 after the costs for inpatient days are removed" and allocated the emergency cost using visits face-to-face.

Rationale for the Adjustment	Account Number	Functional Centre	Allocation Base
Costs for inpatient visits—face-to-face reported in emergency need to be moved to the inpatient cost pool	71310 (after the costs for inpatient days are removed)	Emergency	1. Service-recipient workload units ^N 2. Visits—face-to-face ^O 3. If no inpatient visits are reported, then 100% of costs are allocated to the client cost pool
Costs for inpatient visits—face-to-face reported under ambulatory care services other than emergency need to be moved to the inpatient cost pool	71340	Specialty Day/Night Care	1. Service-recipient workload units ^P 2. Visits—face-to-face ^Q 3. If workload units or visits face to face are not reported, all cost is assigned to client cost pool. ^J
	71350	Specialty Clinics	
	71355	Private Clinics	
Costs for inpatient and client surgical services reported in the day surgery OR need to be allocated to the inpatient and client cost pools	71360	Day Surgery Operating Room	1. Service-recipient workload units ^P 2. Surgical visits—inpatient to client ratio 3:1 ^{B, R} 3. If workload units or surgical visits are not reported, all costs are assigned to the client cost pool
Costs for inpatient and client surgical services reported in the day surgery combined OR–PARR need to be allocated to the inpatient and client cost pools	71362	Day Surgery Combined Operating Room and Post Anesthetic Recovery Room ^S	1. Calculate a national average cost per OR visit and a national average cost per PARR visit (using data from 71360 and 71365), then apply these average costs to the volume of OR and PARR visits in 71362, respectively (with the inpatient visits volume weighted by a factor of 3) 2. If workload units or surgical/PARR visits are not reported, use national proportions of inpatient visits to total visits and client visits to total visits reported in 71362

^N Allocating costs using workload units includes the costs of both inpatient days and inpatient visits—face-to-face.

^O We used statistical accounts: 45010, 45040 inpatient visits-face-to-face; 45020 client visits face-to-face.

^P We used statistical accounts: 10220 client workload. 10210 inpatient workload was missing.

^Q We used statistical accounts: 45010 inpatient visits face-to-face; 45000, 45020, 45030 client visits face-to-face

^R Statistical accounts: 43710 inpatient surgical visits; 43722 client surgical visits

^S This functional centre was only available in MIS data from Health Sciences Centre. We were unable to calculate a Manitoba average. We assigned all costs to client cost pool.

Rationale for the Adjustment	Account Number	Functional Centre	Allocation Base
Costs for inpatient and client surgical services reported in the PARR need to be allocated to the inpatient and client cost pools	71365	Day Surgery Post-Anesthetic Recovery Room	1. Service-recipient workload units 2. PARR visits—inpatient to client ratio 3:1 3. If workload units or PARR visits are not reported, all costs are assigned to the client cost pool
Costs for inpatient and client services reported in day surgery pre- and post-operative care need to be allocated to the inpatient and client cost pools	71367	Day Surgery Pre- and Post-Operative Care	1. Service-recipient workload units 2. Visits—face-to-face ^T
Costs for inpatient and client surgical services reported in day surgery combined OR-PARR and pre- and post-operative care need to be allocated to the inpatient and client cost pools	71369	Day Surgery Combined Operating and Post-Anesthetic Recovery Room and Pre- and Post-Operative Care	1. Calculate a national average cost per OR visit and a national average cost per PARR visit (using data from 71360 and 71365 ^U), then apply these average costs to the volume of OR and PARR visits in 71369, respectively (with the inpatient visits volume weighted by a factor of 3) 2. If workload units or surgical/PARR visits are not reported, use national ^V proportions of inpatient visits to total visits and client visits to total visits reported in 71369

^T Data on workload units were not found. We used statistical accounts: 45020 client visits-face-to-face. Account 45010 was missing in the data.

^U There were no data available in account 71365; thus, we could not obtain a Manitoba average.

^v Only three hospitals had these accounts; none reported workload unit data. The inpatient allocation is the ratio of sum of inpatient visits to total visits across the three hospitals. We used statistical accounts: 43710 inpatient surgical visits; 43722 client surgical visits.

5. Allocate costs for the following functional centres to the inpatient and client cost pools based on the methodologies noted in the following table. These are listed in order of preference.

Account Number	Functional Centre	Allocation Base
71410	Clinical Laboratory ^A	1. Service-recipient workload units 2. Procedures 3. National workload unit average by functional centre and type of hospital ^C
71420	Radiation Oncology	
71435	Respiratory Services ^B	
71465	Rehabilitation Engineering	
71415 ^D	Diagnostic Imaging ^E	1. Service-recipient workload units 2. Exams 3. National workload unit average by functional centre and type of hospital
71425	Electrodiagnostic Laboratories ^E	
71430	Non-Invasive Cardiology and Vascular Lab ^E	
71440	Pharmacy	1. Service-recipient workload units 2. Attendance days—face-to-face 3. National workload unit average by functional centre and type of hospital 4. For Pharmacy, Pastoral Care and Recreation we assigned all costs to inpatient cost pool. ^H
71445	Clinical Nutrition ^F	
71450 ^G	Physiotherapy ^F	
71455	Occupational Therapy ^F	
71460	Audiology and Speech-Language Pathology ^F	
71470	Social Work ^F	
71475	Psychology	
71476	Genetics Counselling	
71480	Pastoral Care	
71485	Recreation	
71490	Child Life	

^A Statistical accounts used: 115, 118 workload units; 458, 463 procedures.

^B Statistical accounts used: 108 workload units; 458, 463 procedures.

^C If workload units and procedures/exams/attendance days-face-to-face were missing, we used the MB workload unit average by functional centre and hospital type (Tertiary, Urban Community, Major Rural, etc.). For example, if a Major Rural hospital was missing workload unit data for a functional centre, we used the Major Rural Manitoba average for that functional centre, instead. If data were not available for the same hospital type, we used the average for the next highest hospital type. If that was missing, as well, we used the Manitoba average for next highest hospital type, and so on.

^D In the 2009–2010 methodology, account 71405-Diagnostic and Therapeutic Nursing is allocated based first on service-recipient workload units and secondly using exams. The expected service activity statistic for this functional centre is visits; therefore, it is unlikely that exams would be reported.

^E Statistical accounts used: 107 workload units; 457 exams.

^F Statistical accounts used: 102 workload units, 483 attendance days-face-to-face.

^G Account 71449 Rehabilitation Administration should have been cleared prior to the hospital's CMDB data submission. If it was not cleared, the methodology will treat it in the same manner as other therapeutic functional centres (such as 71450).

^H We added this step to the allocation methodology.

We grouped these accounts based on the 4th and 5th digits of the secondary account number. If the group (4th and 5th digits) was 10, 11 or 12, we assigned the account balance to inpatient workload units/procedures/exams/attendance days-face-to-face. If the group was 20, 21, 22, or 30, we assigned the account balance to client workload units/procedures/exams/attendance days-face-to-face. If the group was 00, 50, 60, 70 or 80, we assigned the account balance to residual workload units/procedures/exams/attendance days-face-to-face.

The only exception was when the group was 00 for statistical account 102 workload units (under functional centres 71445, 71450, 71455, 71460, and 71470); in this situation, we assigned the account balance to inpatient workload units/procedures/exams/attendance days-face-to-face, because this CIHI account (10200) was associated with the MB account (10210) we allocated to inpatient accounts.

We defined the food functional centre as 71910 and 71195. We used 264 (2641.inp, 2642.client, 2644.residual) and 280 (residual) to split the cost of the food functional centre among the cost pools

6. Sum the inpatient, client and residual cost pools.

Inpatient costs excluded those costs incurred at Regional Health Authority (RHA) offices. We were unable to differentiate between RHA costs that were attributable to hospital-related expenses and those that were not. Moreover, we were unable to identify which RHA services were provided specifically to Manitoba hospitals versus those provided to all health organizations.

7. Allocate accounting centre costs* that were set aside earlier to:

- All functional centres in the inpatient, client and residual cost pools; and
- Functional centres and costs that were set aside (that is, 711 Administrative and Support Services, 71840 In-Service Education and the hospital's share of regional shared/centralized administrative and support expenses)

Allocate accounting centre costs based on each functional centre's percentage of the total accumulated costs.*

*Per CIHI's methodology, allocations for absorbing functional centres are restricted to a minimum account value of zero.

8. Allocate accumulated 711 Administrative and Support Services costs, including the hospital's share of regional shared/centralized administrative and support expenses that were set aside earlier, to:

- All functional centres in the inpatient, client and residual cost pools; and
- 71840 In-Service Education

Allocate accumulated 711 Administrative based on each functional centre's percentage of the total accumulated costs.*

*This is the total accumulated costs, ignoring the costs in 711 so that the sum of percentages adds up to 100%.

9. Allocate accumulated 71840 In-Service Education costs to:

- All functional centres in the inpatient and client cost pools; and
- 71292 - Long-Term Care Nursing Unit in the residual cost pool

Allocate accumulated 71840 based on their percentage of the total accumulated costs.

Final Imputations for Missing Data Not Covered in CIHI Methodology

Although the CIHI methodology guided how we allocated¹ costs to inpatient or client pools, we deviated from this methodology on occasion. When activity data are missing, the CIHI methodology instructed that national average be imputed for the missing values. However, we did not have access to national averages for these values. Moreover, we opted to impute the average for the hospital type rather than the provincial average since this would likely be more reflective of the care offered in that hospital. Most imputations were simply default values

1 The inpatient allocation is the percentage of the functional center cost that is allocated to inpatient cost.

for when statistical accounts were missing in the functional centre. The default inpatient allocation is 0% in clinics, 71362 - day surgery combined operating room, and 71265 - post-anesthetic room, and 71420 - radiation oncology. The default value for inpatient allocation is 100% in Inpatient Nursing Units (see table under step 4 for included functional centres), 71480 - pastoral care, 71440 - pharmacy and 71485 – recreation functional centres.

When activity data were missing for a year or two, we imputed the inpatient allocation with its average across available years in: 71260 - operating room (Victoria, Altona, Teulon-Hunter), 71265 - post-anesthetic recovery room (Concordia), 71275 - mental health and addiction services (Dauphin Regional), 71410 - clinical laboratory (Brandon, Boundary Trails, Notre Dame, Lakeshore), 71415 - diagnostic imaging (Gillam, Lynn Lake), 71435 - respiratory services (The Pas), 71445 - clinical nutrition (Thompson), 71455 - occupational therapy (The Pas, Thompson), 71475 – Psychology (Health Sciences Centre).

The statistical accounts necessary to allocate the cost to the different cost pools were missing in 71405 - diagnostic and therapeutic nursing, 71420 - radiation oncology, 71449 - rehabilitation administration, 71465 - rehabilitation engineering, and 71490 - child life. We computed an inpatient allocation for the hospital, based on the functional centres included under diagnostic and therapeutic services, and used this hospital-level inpatient allocation to impute the missing values.

Application of Allocation Base Rule 1 under 71362 - Combined Operating and Post-Anesthetic Room

Here we describe our interpretation of the CIHI methodology for Allocation Base rule 1 under 71362 – Day Surgery Combined Operating and Post-Anesthetic Room:

1. Obtain the provincial average costs for OR and PARR using only hospitals that report both costs and visits:

$$AC_{or} = (\sum ORCost_{Hi}) / (\sum ORvis_{Hi})$$

$$AC_{parr} = (\sum PARRCost_{Hi}) / (\sum PARRvis_{Hi})$$

Where

AC_{or} = MB average cost per OR visit

AC_{parr} = MB average cost per PARR visit

$ORCost_{Hi}$ = Cost associated with OR (71260) in hospital Hi

$PARRCost_{Hi}$ = Cost associated with PARR (71265) in hospital Hi

$ORvis_{Hi}$ = Total number of weighted surgical visits associated with OR (71260) in hospital Hi

$PARRvis_{Hi}$ = Total number of weighted PARR visits associated with PARR (71265) in hospital Hi

$ORvis_{Hi} = 3 * Inp_{ORvis_{Hi}} + Cl_{ORvis_{Hi}}$

$Inp_{ORvis_{Hi}}$ = Number of inpatient surgical visits associated with OR (71260) in hospital Hi

$Cl_{ORvis_{Hi}}$ = Number of client surgical visits associated with OR (71260) in hospital Hi

Statistical accounts used: 4371 OR inpatient visits; 4372 OR client visits; 4391 PARR inpatient visits; 4392 PARR client visits

2. Estimate the cost of OR visits, using the provincial average cost of OR visits and the OR visits in the Combined OR-PARR for the hospital of interest. The assumption is that one PARR visit and one OR visit have different costs. We will use these estimated costs only to get the inpatient allocation percentage for Combined OR-PARR. This allocation percentage will be applied to the actual cost associated with the Combined OR-PARR functional centre.

$$\text{Cost}_{\text{or_Hj}} = \text{AC}_{\text{or}} * (3 * \text{Inp_ORvis_corparr_Hj} + \text{Cl_ORvis_corparr_Hj})$$

$$\text{Cost}_{\text{parr_Hj}} = \text{AC}_{\text{parr}} * (3 * \text{Inp_PARRvis_corparr_Hj} + \text{Cl_PARRvis_corparr_Hj})$$

$\text{Inp_ORvis_corparr_Hj}$ = Number of inpatient surgical visits associated with Combined OR-PARR (71262) in hospital Hj

$\text{Cl_ORvis_corparr_Hj}$ = Number of client surgical visits associated with Combined OR-PARR (71262) in hospital Hj

3. Calculate inpatient allocation

$$\text{Inpatient allocation}_{\text{Hj}} = (\text{Inpatient_cost}) / \text{Total cost} = (\text{Inpatient_cost}) / (\text{Inpatient_cost} + \text{Client cost})$$

Where:

$$\text{Inpatient_cost} = 3 * [\text{AC}_{\text{or}} * \text{Inp_ORvis_corparr_Hj} + \text{AC}_{\text{parr}} * \text{Inp_PARRvis_corparr_Hj}]$$

$$\text{Client_cost} = [\text{AC}_{\text{or}} * \text{Cl_ORvis_corparr_Hj} + \text{AC}_{\text{parr}} * \text{Cl_PARRvis_corparr_Hj}]$$

APPENDIX 2: SENSITIVITY ANALYSES FOR HOSPITAL RANKINGS BY RIW AND TWC

Appendix Table 2.1: Hospital Rankings Based on Average Inpatient Resource Intensity Weight Excluding Long Stays, 2008/09-2012/13

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Average Inpatient Resource Intensity Weight			Ranking Based on Average RIW						
			2008/09	2009/10	2010/11	2011/12	2012/13	2008/09	2009/10	2010/11	2011/12	2012/13
Southern Health-Santé Sud	Major Rural	Bethesda Hospital (Steinbach)	0.95	0.96	0.98	0.94	1.00	42	43	46	48	44
		Boundary Trails Health Centre (Winkler/Morden)	0.93	0.90	0.91	0.97	0.88	44	47	49	46	49
		Portage District General Hospital	1.09	0.98	1.10	1.07	1.07	34	42	40	43	41
	Intermediate Rural	Altona Community Memorial Health Centre*	1.40	1.32	1.40	1.60	1.83	18	22	20	14	6
		Carman Memorial Hospital*	1.10	1.12	1.38	1.54	1.72	32	33	21	15	12
	Small Rural	St. Anne Hospital	0.89	0.88	0.92	1.01	0.90	47	48	48	44	48
		Desalaberry District Health Centre (St. Pierre-Jolys)	1.54	1.46	2.00	1.94	2.07	11	11	2	4	3
		Lorne Memorial Hospital (Swan Lake)*	0.80	1.06	1.07	1.16	0.88	50	38	42	41	50
		Morris General Hospital*	1.29	1.40	1.77	1.78	1.65	22	15	6	7	15
		Notre Dame Hospital*	1.02	1.06	1.17	1.25	1.00	37	39	31	31	45
Rock Lake Health District Hospital (Crystal City)		0.92	0.90	1.01	0.96	0.74	46	46	44	44	51	
Vita & District Health Centre Inc.		1.96	2.44	2.53	2.21	3.04	3	1	1	1	1	
Winnipeg RHA	Tertiary	Health Sciences Centre	1.43	1.46	1.47	1.49	1.50	17	12	16	16	20
		St. Boniface General Hospital*	1.27	1.34	1.34	1.33	1.32	24	20	25	27	31
	Urban Community	Concordia Hospital	1.99	1.83	1.77	1.78	1.80	2	3	7	6	8
		Grace General Hospital	1.89	1.95	1.99	1.99	1.87	6	2	3	2	5
		Seven Oaks General Hospital	1.74	1.76	1.81	1.88	1.88	7	5	5	5	4
Small Rural	Victoria General Hospital*	2.00	1.64	1.65	1.67	1.77	1	9	11	12	10	
		Churchill Health Centre*	0.72	0.77	0.89	1.19	0.90	51	50	50	38	46

* indicates change in facility rank by 10 or more during the time period 2008/09-2012/13

Appendix Table 2.1: Continued

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Average Inpatient Resource Intensity Weight					Ranking Based on Average RIW					
			2008/09	2009/10	2010/11	2011/12	2012/13	2008/09	2009/10	2010/11	2011/12	2012/13	
Prairie Mountain Health	Urban Community	Brandon Regional Health Centre*	1.34	1.38	1.38	1.37	1.36	21	18	23	25	28	
	Major Rural	Dauphin Regional Health Centre*	1.11	1.12	1.12	1.20	1.17	29	34	37	35	40	
		Swan River Valley Hospital*	1.03	1.20	1.22	1.14	1.29	36	28	29	42	34	
	Intermediate Rural	Hamiota District Health Centre*	1.13	1.45	1.28	1.67	1.40	28	13	27	11	26	
		Minnedosa Health Centre*	1.11	1.34	1.34	1.33	1.52	30	21	26	28	19	
		Neepawa District Memorial Hospital	0.99	0.98	1.01	0.90	1.01	41	41	45	49	43	
	Northern Health Region	Small Rural	Russell District Hospital	0.92	1.01	1.03	1.17	1.19	45	40	43	40	38
			Souris Health Centre*	1.10	1.26	1.38	1.45	1.64	31	25	22	18	18
			Ste Rose General Hospital	0.85	0.84	0.83	0.78	0.90	49	49	51	53	47
			Tri-Lake Health Centre (Killarney)	1.47	1.37	1.52	1.63	1.64	13	19	14	13	17
			Virden Health Centre*	1.45	1.19	1.25	1.22	1.17	15	29	28	33	39
			Boissevain Health Centre*	1.16	1.13	1.10	1.67	1.41	27	32	39	10	25
			Carberry Plains District Health Centre*	1.95	1.61	1.42	1.27	1.29	5	10	18	30	33
			Deloraine Health Centre*	1.22	1.32	1.72	1.22	1.39	26	23	8	34	27
			Glenboro Health Centre*	1.34	1.22	1.14	1.44	1.79	20	26	34	19	9
Grandview District Hospital*			0.99	1.15	1.12	1.01	1.33	40	30	38	45	30	
Interlake-Eastern RHA	Major Rural	Melita Health Centre*	1.96	1.64	1.49	1.44	1.70	4	8	15	20	13	
		Roblin District Health Centre*	1.49	1.38	1.43	1.35	1.50	12	17	17	26	21	
		Shoal Lake-Strathclair Health Centre	1.27	1.20	1.18	1.39	1.34	23	27	30	23	29	
		Tiger Hills Health Centre (Treherne)*	1.45	1.69	1.52	1.40	1.22	14	7	12	22	35	
		Winnipegosis General Hospital*	0.94	0.75	0.76	0.79	1.43	43	52	53	52	23	
		Selkirk & District General Hospital	1.06	1.10	1.12	1.23	1.22	35	37	36	32	36	
		Beausejour District Hospital	1.71	1.83	1.89	1.77	2.12	8	4	4	9	2	
		Johnson Memorial Hospital (Gimli)*	1.65	1.41	1.68	1.41	1.65	9	14	9	21	14	
		Pine Falls Health Complex*	1.09	0.96	1.12	1.29	1.42	33	44	35	29	24	
		Stonewall & District Health Centre	1.01	1.10	1.17	1.17	1.30	38	36	32	39	32	
Northern Health Region	Major Rural	Arborg & Districts Health Centre	1.27	1.13	1.37	1.37	1.49	25	31	24	24	22	
		E.M. Crowe Memorial Hospital (Eriksdale)*	1.00	0.93	1.15	1.19	1.20	39	45	33	37	37	
		Lakeshore General Hospital (Ashern)*	0.85	1.29	1.09	1.20	1.06	48	24	41	36	42	
		Phawa Hospital*	1.45	1.10	1.52	1.47	1.64	16	35	13	17	16	
		Teulon-Hunter Memorial Hospital*	1.56	1.74	1.42	1.77	1.80	10	6	19	8	7	
		Flin Flon General Hospital Inc.	0.68	0.75	0.81	0.86	0.72	52	51	52	50	52	
		The Pas Health Complex Inc.	0.63	0.64	0.68	0.72	0.68	54	55	54	55	55	
		Thompson General Hospital	0.63	0.65	0.66	0.69	0.71	53	54	55	56	53	
		Gillam Hospital*	0.45	1.39	0.61	0.84	1.74	56	16	56	51	11	
		Lynn Lake District Hospital*	0.62	0.53	0.94	1.98	0.62	55	56	47	3	56	
Snow Lake Medical Nursing Unit*	1.36	0.68	1.67	0.73	0.70	19	53	10	54	54			

* indicates change in facility rank by 10 or more during the time period 2008/09-2012/13

Appendix Table 2.2: Hospital Rankings Based on Annual Total Weighted Cases Excluding Long Stays, 2008/09-2012/13

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Total Weighted Cases (TWCs)					Ranking Based on TWCs				
			2008/09	2009/10	2010/11	2011/12	2012/13	2008/09	2009/10	2010/11	2011/12	2012/13
Southern Health-Santé Sud	Major Rural	Bethesda Hospital (Steinbach)	3,178	3,255	3,461	3,176	3,332	11	11	11	11	12
		Boundary Trails Health Centre (Winkler/Morden)	4,459	4,747	5,222	5,313	4,823	8	8	8	8	8
		Portage District General Hospital	3,631	3,548	3,847	3,894	3,610	9	9	9	9	10
	Intermediate Rural	Altona Community Memorial Health Centre	656	649	577	507	602	25	26	30	33	28
		Cairman Memorial Hospital	746	707	828	929	863	22	24	21	20	22
		Ste. Anne Hospital*	732	756	788	767	439	23	23	23	23	34
		Desalaberry District Health Centre (St. Pierre-Jolys)	366	339	400	411	389	42	45	40	40	38
	Small Rural	Lorne Memorial Hospital (Swan Lake)	382	443	382	457	350	40	35	42	38	41
		Morris General Hospital	460	484	557	498	420	36	34	32	36	35
		Notre Dame Hospital	263	235	267	318	232	50	50	49	46	51
Rock Lake Health District Hospital (Crystal City)		317	346	370	330	251	43	44	43	45	47	
Vita & District Health Centre Inc.		177	244	306	241	271	53	49	47	51	45	
Winnipeg RHA	Tertiary	Health Sciences Centre	51,397	52,996	53,958	52,897	53,041	1	1	1	1	1
		St. Boniface General Hospital	34,300	37,475	37,801	39,375	39,611	2	2	2	2	2
		Concordia Hospital	11,242	11,373	10,779	10,582	11,326	6	5	6	6	5
Urban Community	Grace General Hospital	12,681	12,824	12,737	12,539	12,084	4	4	4	4	4	
	Seven Oaks General Hospital	10,529	10,469	10,883	10,919	11,256	7	7	5	5	6	
	Victoria General Hospital	11,753	10,629	10,025	10,400	10,287	5	6	7	7	7	
Small Rural	Small Rural	Churchill Health Centre	267	269	233	262	241	49	47	51	49	49

Appendix Table 2.2: Continued

Regional Health Authority (RHA)	Hospital Type	Hospital Name	Total Weighted Cases (TWCs)						Ranking Based on TWCs																		
			2008/09		2009/10		2010/11		2011/12		2012/13		2008/09		2009/10		2010/11		2011/12		2012/13						
			13,659	14,141	14,201	15,081	14,733	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3					
Prairie Mountain Health	Urban Community	Brandon Regional Health Centre	3,467	3,419	3,659	3,757	3,760	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9					
	Major Rural	Dauphin Regional Health Centre	1,654	1,739	1,650	1,631	1,556	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15					
	Intermediate Rural	Major Rural	Swan River Valley Hospital	520	495	424	503	367	35	33	38	34	34	40	40	40	40	40	40	40	40	40	40				
			Hamiota District Health Centre	785	1,012	1,076	1,029	1,045	20	18	19	19	19	18	18	18	18	18	18	18	18	18	18				
		Small Rural	Major Rural	Minnedosa Health Centre	1,127	1,223	1,168	1,076	1,097	16	16	16	16	16	16	16	16	16	16	16	16	16	16	17			
				Neepawa District Memorial Hospital	616	859	801	902	866	27	21	22	21	21	21	21	21	21	21	21	21	21	21	21			
			Small Rural	Major Rural	Russell District Hospital	592	633	525	576	638	28	27	36	29	24	24	24	24	24	24	24	24	24	24	24		
					Souris Health Centre*	1,082	1,013	984	882	953	17	17	20	22	22	19	19	19	19	19	19	19	19	19	19		
				Small Rural	Major Rural	Ste Rose General Hospital	443	360	534	589	615	37	41	34	28	26	26	26	26	26	26	26	26	26	26	26	
						Tri-Lake Health Centre (Killarney)*	575	586	619	614	637	31	30	27	26	25	25	25	25	25	25	25	25	25	25	25	
					Small Rural	Major Rural	Virden Health Centre	251	234	232	285	265	51	51	52	48	46	46	46	46	46	46	46	46	46	46	46
							Boissevain Health Centre	300	246	260	217	200	45	48	50	52	53	53	53	53	53	53	53	53	53	53	53
	Interlake-Eastern RHA	Major Rural	Carberry Plains District Health Centre	269	316	316	305	242	48	46	45	47	48	48	48	48	48	48	48	48	48	48	48				
			Deloraine Health Centre	279	212	196	212	238	46	52	53	53	53	53	53	53	53	53	53	53	53	53	53				
		Small Rural	Major Rural	Glenboro Health Centre	527	627	569	462	545	34	28	31	37	31	31	31	31	31	31	31	31	31	31	31			
				Grandview District Hospital	277	177	301	258	284	47	53	48	50	44	44	44	44	44	44	44	44	44	44	44			
			Small Rural	Major Rural	Melita Health Centre	590	614	599	523	385	29	29	29	28	31	39	39	39	39	39	39	39	39	39	39		
					Roblin District Health Centre*	372	360	315	335	305	41	40	46	44	43	43	43	43	43	43	43	43	43	43	43		
				Major Rural	Major Rural	Shoal Lake-Strathclair Health Centre	234	357	362	344	313	52	43	44	44	43	42	42	42	42	42	42	42	42	42	42	
						Tiger Hills Health Centre (Treherne)*	440	359	396	392	224	38	42	41	42	52	52	52	52	52	52	52	52	52	52	52	
Major Rural				Major Rural	Winnipegosis General Hospital*	2,231	2,319	2,435	2,510	2,371	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13		
					Selkirk & District General Hospital	933	1,009	1,091	1,036	1,126	19	19	19	18	18	18	18	18	18	18	18	18	18	18	18		
Northern Health Region	Major Rural	Major Rural	Beausejour District Hospital	765	773	780	739	674	21	22	24	24	23	23	23	23	23	23	23	23	23	23					
			Johnson Memorial Hospital (Gimli)	688	579	650	636	595	24	31	26	25	29	29	29	29	29	29	29	29	29	29	29				
	Small Rural	Major Rural	Major Rural	Pine Falls Health Complex	641	681	777	563	558	26	25	25	30	30	30	30	30	30	30	30	30	30	30				
				Stonewall & District Health Centre	401	399	411	408	418	39	39	39	41	41	41	41	41	41	41	41	41	41	41				
		Small Rural	Major Rural	Major Rural	Arborg & Districts Health Centre	548	401	433	427	405	32	38	37	39	37	37	37	37	37	37	37	37	37				
					E.M. Crowe Memorial Hospital (Eriksdale)	312	427	526	507	489	44	37	35	32	32	32	32	32	32	32	32	32	32	32			
			Major Rural	Major Rural	Major Rural	Lakeshore General Hospital (Ashern)*	576	438	552	613	613	30	36	33	27	27	27	27	27	27	27	27	27	27			
						Phawa Hospital	530	517	596	498	460	33	32	29	35	33	33	33	33	33	33	33	33	33	33		
				Major Rural	Major Rural	Major Rural	Teulon-Hunter Memorial Hospital	950	986	1,091	1,155	942	18	20	17	16	20	20	20	20	20	20	20	20	20		
							Flin Flon General Hospital Inc.	1,685	1,801	1,712	1,687	1,609	14	14	14	14	14	14	14	14	14	14	14	14	14	14	
Small Rural	Major Rural	Major Rural	The Pas Health Complex Inc.	3,101	3,197	3,165	3,137	3,340	12	12	12	12	11	11	11	11	11	11	11	11	11	11					
			Thompson General Hospital	83	61	24	19	61	54	54	56	56	54	54	54	54	54	54	54	54	54	54	54				
Small Rural	Major Rural	Major Rural	Gillam Hospital	74	51	71	148	49	55	55	54	54	54	54	54	54	54	54	54	54	54	54					
			Lynn Lake District Hospital	29	11	53	22	20	56	56	56	55	55	55	55	55	55	55	55	55	55	55	55				
			Snow Lake Medical Nursing Unit																								

* indicates change in facility rank by 10 or more during the time period 2008/09-2012/13

APPENDIX 3: RELATIONSHIP BETWEEN HOSPITAL CHARACTERISTICS AND AVERAGE INPATIENT RIWS

Appendix Table 3.1: Average Inpatient Resource Intensity Weight by Hospital Type, 2008/09-2012/13

Hospital Type	Average Resource Intensity Weight (RIW)				
	2008/09	2009/10	2010/11	2011/12	2012/13
Tertiary*	1.45	1.47	1.51	1.50	1.53
Urban Community	1.97	1.82	1.87	1.89	1.92
Major Rural*	0.97	0.97	1.02	1.05	1.04
Intermediate Rural*	1.33	1.34	1.39	1.46	1.72
Small Rural*	1.44	1.50	1.60	1.57	1.80
Manitoba*	1.47	1.45	1.50	1.51	1.56

* indicates a significant change over time period ($p < 0.05$)

Appendix Table 3.2: Model Results After Excluding Outliers, 2008/09-2012/13

Model Covariates	Estimate	p-Value
Intercept	2.31	0.2137
Time (years)	0.12	0.8965
Percent of Birth Hospitalizations	-0.10	0.8811
Percent of Hospitalization of Adults Age 70+	-0.34	0.4346
Hospital Type		
Tertiary (Reference)	Ref	Ref
Urban Community	-0.78	0.6078
Major Rural	-1.42	0.4
Intermediate Rural	-1.09	0.546
Small Rural	-0.90	0.6216
Interactions between Time and Hospital Type		
Tertiary (Reference)	Ref	Ref
Urban Community	-0.02	0.9753
Major Rural	-0.09	0.9091
Intermediate Rural	-0.06	0.9429
Small Rural	0.03	0.9701
Interaction between Time and Percent of Birth Hospitalizations	0.02	0.9435
Interaction between Time and Percent of Hospitalization of Adults Age 70+	-0.05	0.7762

Note: This model excludes Lynn Lake District Hospital due to outlying RIWs.

APPENDIX 4: INPATIENT COSTS PER WEIGHTED CASE – WITH AND WITHOUT NURSING COSTS

Appendix Table 4.1: Inpatient Cost per Weighted Case (with and without Nursing Costs included) for Southern Health-Santé Sud Hospitals, 2008/09 - 2012/13

		2008/09	2009/10	2010/11	2011/12	2012/13
Major Rural						
Bethesda Hospital (Steinbach)	with nc	\$3,486.00	\$3,851.00	\$3,648.00	\$4,298.00	\$4,250.00
	without nc	\$2,126.00	\$2,310.00	\$2,206.00	\$2,674.00	\$2,721.00
Boundary Trails Health Centre (Winkler/Morden)	with nc	\$3,053.00	\$3,351.00	\$3,745.00	\$3,634.00	\$4,093.00
	without nc	\$1,767.00	\$1,971.00	\$2,210.00	\$2,190.00	\$2,445.00
Portage District General Hospital	with nc	\$2,557.00	\$2,902.00	\$2,370.00	\$2,753.00	\$2,959.00
	without nc	\$1,393.00	\$1,577.00	\$1,308.00	\$1,587.00	\$1,685.00
Intermediate Rural						
Altona Community Memorial Health Centre	with nc	\$3,954	\$4,109	\$4,255	\$3,983	\$3,603
	without nc	\$1,990	\$2,076	\$2,100	\$2,018	\$2,039
Carman Memorial Hospital	with nc	\$2,878	\$3,196	\$3,096	\$3,166	\$3,316
	without nc	\$1,511	\$1,665	\$1,607	\$1,724	\$1,901
Ste. Anne Hospital	with nc	\$3,942	\$4,084	\$4,585	\$4,376	\$4,716
	without nc	\$2,358	\$2,435	\$2,698	\$2,613	\$2,904
Small Rural						
Desalaberry District Health Centre (St. Pierre-Jolys)	with nc	\$5,123	\$5,149	\$4,085	\$5,922	\$4,660
	without nc	\$2,578	\$2,826	\$2,266	\$3,237	\$2,546
Lorne Memorial Hospital (Swan Lake)	with nc	\$3,475	\$3,330	\$3,299	\$3,143	\$3,610
	without nc	\$1,460	\$1,458	\$1,432	\$1,448	\$1,599
Morris General Hospital	with nc	\$3,790	\$4,556	\$3,500	\$3,493	\$3,146
	without nc	\$2,237	\$2,681	\$2,037	\$2,092	\$1,874
Notre Dame Hospital	with nc	\$4,237.00	\$4,393.00	\$4,118.00	\$3,723.00	\$4,887.00
	without nc	\$1,426.00	\$1,439.00	\$1,529.00	\$1,458.00	\$1,721.00
Rock Lake Health District Hospital (Crystal City)	with nc	\$4,988.00	\$4,394.00	\$4,235.00	\$4,723.00	\$4,985.00
	without nc	\$2,713.00	\$2,517.00	\$2,302.00	\$2,380.00	\$2,344.00
Vita & District Health Centre Inc.	with nc	\$6,084.00	\$5,788.00	\$6,468.00	\$4,935.00	\$6,846.00
	without nc	\$3,787.00	\$3,398.00	\$3,983.00	\$2,255.00	\$3,451.00
Southern Health-Santé Sud						
	with nc	\$3,964.00	\$4,092.00	\$3,950.00	\$4,012.00	\$4,256.00
	without nc	\$2,112.24	\$2,195.99	\$2,139.97	\$2,139.68	\$2,269.21
Manitoba						
	with nc	\$5,503.00	\$7,110.00	\$5,375.00	\$8,547.00	\$6,588.00
	without nc	\$2,942.32	\$3,362.01	\$2,796.47	\$4,409.25	\$3,286.69

"nc" is nursing costs

Appendix Table 4.2: Inpatient Cost per Weighted Case (with and without Nursing Costs included) for Winnipeg Regional Health Authority (RHA) Hospitals, 2008/09 -2012/13

		2008/09	2009/10	2010/11	2011/12	2012/13
Tertiary						
Health Sciences Centre	with nc	\$5,732.00	\$6,147.00	\$5,910.00	\$5,815.00	\$5,874.00
	without nc	\$5,732.00	\$6,147.00	\$5,911.00	\$5,815.00	\$3,838.00
St. Boniface General Hospital	with nc	\$5,054.00	\$5,054.00	\$5,196.00	\$5,054.00	\$5,117.00
	without nc	\$3,210.00	\$3,280.00	\$3,401.00	\$3,198.00	\$3,162.00
Urban Community						
Concordia Hospital	with nc	\$4,403.00	\$4,898.00	\$5,109.00	\$5,346.00	\$5,004.00
	without nc	\$3,358.00	\$3,712.00	\$3,919.00	\$4,081.00	\$3,781.00
Grace General Hospital	with nc	\$4,243.00	\$4,702.00	\$4,642.00	\$4,834.00	\$4,766.00
	without nc	\$3,009.00	\$3,296.00	\$3,238.00	\$3,364.00	\$3,503.00
Seven Oaks General Hospital	with nc	\$4,798.00	\$5,711.00	\$5,638.00	\$5,653.00	\$5,930.00
	without nc	\$3,286.00	\$3,890.00	\$3,910.00	\$3,927.00	\$4,117.00
Victoria General Hospital	with nc	\$4,209.00	\$4,733.00	\$4,765.00	\$4,798.00	\$4,642.00
	without nc	\$2,902.00	\$3,259.00	\$3,286.00	\$3,385.00	\$3,260.00
Small Rural						
Churchill Health Centre	with nc	\$23,824.00	\$26,843.00	\$27,378.00	\$27,706.00	\$33,974.00
	without nc	\$15,057.00	\$17,689.00	\$18,079.00	\$17,960.00	\$20,817.00
Winnipeg RHA						
	with nc	\$7,466.00	\$8,308.00	\$8,377.00	\$8,458.00	\$9,374.00
	without nc	\$5,222.18	\$5,896.17	\$5,963.43	\$5,961.45	\$6,068.29
Manitoba						
	with nc	\$5,503.00	\$7,110.00	\$5,375.00	\$8,547.00	\$6,588.00
	without nc	\$2,942.32	\$3,362.01	\$2,796.47	\$4,409.25	\$3,286.69

"nc" is nursing costs

Appendix Table 4.3: Inpatient Cost per Weighted Case (with and without Nursing Costs included) for Prairie Mountain Health Hospitals, 2008/09 - 2012/13

		2008/09	2009/10	2010/11	2011/12	2012/13
Urban Community						
Brandon Regional Health Centre	with nc	\$4,714.00	\$4,833.00	\$5,259.00	\$4,955.00	\$4,962.00
	without nc	\$3,147.00	\$3,271.00	\$3,535.00	\$3,353.00	\$3,303.00
Major Rural						
Dauphin Regional Health Centre	with nc	\$4,600.00	\$5,729.00	\$4,715.00	\$4,871.00	\$4,790.00
	without nc	\$2,715.00	\$3,075.00	\$2,579.00	\$2,683.00	\$2,622.00
Swan River Valley Hospital	with nc	\$4,130.00	\$4,014.00	\$4,148.00	\$4,375.00	\$3,943.00
	without nc	\$3,033.00	\$2,854.00	\$3,053.00	\$3,237.00	\$2,811.00
Intermediate Rural						
Hamiota District Health Centre	with nc	\$3,840.00	\$3,879.00	\$3,224.00	\$3,829.00	\$3,841.00
	without nc	\$2,062.00	\$1,943.00	\$1,542.00	\$1,901.00	\$1,894.00
Minnedosa Health Centre	with nc	\$3,816.00	\$3,541.00	\$3,507.00	\$3,992.00	\$3,922.00
	without nc	\$2,138.00	\$1,923.00	\$1,952.00	\$2,269.00	\$2,183.00
Neepawa District Memorial Hospital	with nc	\$4,057.00	\$4,037.00	\$4,642.00	\$4,797.00	\$4,768.00
	without nc	\$2,474.00	\$2,593.00	\$2,882.00	\$2,976.00	\$2,912.00
Russell District Hospital	with nc	\$4,437.00	\$3,642.00	\$4,043.00	\$3,405.00	\$4,023.00
	without nc	\$2,715.00	\$2,214.00	\$2,392.00	\$2,032.00	\$2,467.00
Souris Health Centre	with nc	\$3,839.00	\$4,302.00	\$4,640.00	\$4,358.00	\$3,552.00
	without nc	\$1,871.00	\$2,021.00	\$2,304.00	\$2,176.00	\$1,695.00
Ste Rose General Hospital	with nc	\$2,766.00	\$3,132.00	\$2,839.00	\$3,213.00	\$2,950.00
	without nc	\$1,874.00	\$2,173.00	\$2,079.00	\$2,397.00	\$2,216.00
Tri-Lake Health Centre (Killarney)	with nc	\$4,981.00	\$5,965.00	\$4,511.00	\$3,932.00	\$4,750.00
	without nc	\$2,789.00	\$2,978.00	\$2,344.00	\$2,169.00	\$2,574.00
Virden Health Centre	with nc	\$4,447.00	\$4,865.00	\$5,513.00	\$5,524.00	\$5,479.00
	without nc	\$2,335.00	\$2,799.00	\$3,364.00	\$3,252.00	\$3,294.00

"nc" is nursing costs

Appendix Table 4.3: Continued

		2008/09	2009/10	2010/11	2011/12	2012/13
Small Rural						
Boissevain Health Centre	with nc	\$4,874.00	\$5,819.00	\$6,645.00	\$5,265.00	\$4,882.00
	without nc	\$2,245.00	\$2,351.00	\$2,736.00	\$2,304.00	\$1,949.00
Carberry Plains District Health Centre	with nc	\$4,396.00	\$4,284.00	\$4,987.00	\$5,319.00	\$6,686.00
	without nc	\$1,925.00	\$1,878.00	\$2,156.00	\$2,192.00	\$2,777.00
Deloraine Health Centre	with nc	\$5,572.00	\$5,549.00	\$5,465.00	\$4,739.00	\$5,470.00
	without nc	\$2,530.00	\$2,602.00	\$2,649.00	\$2,334.00	\$2,552.00
Glenboro Health Centre	with nc	\$4,762.00	\$5,551.00	\$5,537.00	\$5,759.00	\$5,046.00
	without nc	\$1,946.00	\$2,264.00	\$2,243.00	\$2,442.00	\$1,967.00
Grandview District Hospital	with nc	\$3,582.00	\$3,447.00	\$3,765.00	\$4,699.00	\$4,219.00
	without nc	\$1,790.00	\$1,846.00	\$2,017.00	\$2,744.00	\$2,352.00
Melita Health Centre	with nc	\$4,764.00	\$4,990.00	\$4,516.00	\$5,550.00	\$5,679.00
	without nc	\$2,083.00	\$2,073.00	\$1,986.00	\$2,482.00	\$2,369.00
Roblin District Health Centre	with nc	\$4,094.00	\$4,338.00	\$4,598.00	\$5,676.00	\$6,366.00
	without nc	\$2,499.00	\$2,574.00	\$2,727.00	\$3,417.00	\$3,583.00
Shoal Lake-Strathclair Health Centre	with nc	\$4,199.00	\$4,606.00	\$5,200.00	\$4,049.00	\$5,017.00
	without nc	\$1,932.00	\$2,076.00	\$2,388.00	\$1,910.00	\$2,279.00
Tiger Hills Health Centre (Treherne)	with nc	\$4,186.00	\$4,055.00	\$4,892.00	\$4,293.00	\$4,776.00
	without nc	\$1,825.00	\$1,845.00	\$2,144.00	\$1,890.00	\$1,941.00
Winnipegosis General Hospital	with nc	\$3,843.00	\$4,095.00	\$3,152.00	\$4,664.00	\$5,048.00
	without nc	\$2,119.00	\$2,109.00	\$1,623.00	\$2,401.00	\$2,542.00
Prairie Mountain Health						
	with nc	\$4,281.00	\$4,508.00	\$4,562.00	\$4,632.00	\$4,770.00
	without nc	\$2,287.96	\$2,355.26	\$2,414.06	\$2,502.94	\$2,489.61
Manitoba						
	with nc	\$5,503.00	\$7,110.00	\$5,375.00	\$8,547.00	\$6,588.00
	without nc	\$2,942.32	\$3,362.01	\$2,796.47	\$4,409.25	\$3,286.69

"nc" is nursing costs

Appendix Table 4.4: Inpatient Cost per Weighted Case (with and without Nursing Costs included) for Interlake-Eastern Regional Health Authority (RHA) Hospitals, 2008/09 - 2012/13

		2008/09	2009/10	2010/11	2011/12	2012/13
Major Rural						
Selkirk & District General Hospital	with nc	\$3,916.00	\$3,936.00	\$3,933.00	\$4,166.00	\$4,128.00
	without nc	\$2,049.00	\$2,062.00	\$2,055.00	\$2,260.00	\$2,228.00
Intermediate Rural						
Beausejour District Hospital	with nc	\$3,180.00	\$3,335.00	\$3,249.00	\$3,821.00	\$3,219.00
	without nc	\$1,751.00	\$1,866.00	\$1,818.00	\$2,173.00	\$1,770.00
Johnson Memorial Hospital (Gimli)	with nc	\$3,548.00	\$3,823.00	\$4,167.00	\$4,975.00	\$4,766.00
	without nc	\$1,824.00	\$1,939.00	\$2,110.00	\$2,662.00	\$2,434.00
Pine Falls Health Complex	with nc	\$3,596.00	\$5,500.00	\$5,995.00	\$5,053.00	\$4,222.00
	without nc	\$2,392.00	\$3,536.00	\$3,067.00	\$2,947.00	\$2,223.00
Stonewall & District Health Centre	with nc	\$3,293.00	\$3,430.00	\$3,423.00	\$4,556.00	\$4,243.00
	without nc	\$2,032.00	\$1,912.00	\$1,982.00	\$2,677.00	\$2,507.00
Small Rural						
Arborg & Districts Health Centre	with nc	\$4,245.00	\$5,002.00	\$5,338.00	\$4,678.00	\$5,704.00
	without nc	\$2,090.00	\$2,548.00	\$2,850.00	\$2,593.00	\$3,146.00
E. M. Crowe Memorial Hospital (Eriksdale)	with nc	\$4,558.00	\$5,864.00	\$5,327.00	\$5,619.00	\$4,976.00
	without nc	\$2,627.00	\$3,221.00	\$2,761.00	\$3,065.00	\$2,750.00
Lakeshore General Hospital (Ashern)	with nc	\$7,224.00	\$5,813.00	\$5,433.00	\$5,176.00	\$5,845.00
	without nc	\$4,070.00	\$2,648.00	\$2,136.00	\$2,277.00	\$2,413.00
Pinawa Hospital	with nc	\$3,889.00	\$4,847.00	\$3,423.00	\$4,221.00	\$4,141.00
	without nc	\$2,276.00	\$2,769.00	\$1,940.00	\$2,563.00	\$2,129.00
Teulon-Hunter Memorial Hospital	with nc	\$3,139.00	\$3,243.00	\$3,450.00	\$3,879.00	\$3,424.00
	without nc	\$1,732.00	\$1,879.00	\$2,100.00	\$2,325.00	\$2,106.00
Interlake-Eastern RHA						
	with nc	\$4,059.00	\$4,479.00	\$4,374.00	\$4,614.00	\$4,467.00
	without nc	\$2,284.43	\$2,437.91	\$2,281.94	\$2,554.30	\$2,370.58
Manitoba						
	with nc	\$5,503.00	\$7,110.00	\$5,375.00	\$8,547.00	\$6,588.00
	without nc	\$2,942.32	\$3,362.01	\$2,796.47	\$4,409.25	\$3,286.69

"nc" is nursing costs

Appendix Table 4.5: Inpatient Cost per Weighted Case (with and without Nursing Costs included) for Northern Health Region Hospitals, 2008/09 - 2012/13

		2008/09	2009/10	2010/11	2011/12	2012/13
Major Rural						
Flin Flon General Hospital Inc.	with nc	\$7,778.00	\$7,755.00	\$6,897.00	\$6,173.00	\$8,926.00
	without nc	\$4,154.00	\$3,982.00	\$3,829.00	\$3,295.00	\$4,797.00
The Pas Health Complex Inc.	with nc	\$5,563.00	\$5,851.00	\$6,078.00	\$5,899.00	\$7,150.00
	without nc	\$2,955.00	\$3,122.00	\$3,213.00	\$2,857.00	\$4,088.00
Thompson General Hospital	with nc	\$5,999.00	\$6,628.00	\$7,241.00	\$7,246.00	\$9,118.00
	without nc	\$3,690.00	\$4,674.00	\$4,668.00	\$4,440.00	\$6,712.00
Small Rural						
Gillam Hospital	with nc	\$17,885.00	\$25,470.00	\$8,727.00	\$142,878.00	\$6,879.00
	without nc	\$8,057.00	\$15,863.00	\$5,450.00	\$92,830.00	\$4,007.00
Lynn Lake District Hospital	with nc	\$1,791.00	\$3,117.00	\$4,332.00	\$6,539.00	\$9,648.00
	without nc	\$914.00	\$2,526.00	\$3,553.00	\$4,808.00	\$7,084.00
Snow Lake Medical Nursing Unit	with nc	\$38,862.00	\$102,585.00	\$22,153.00	\$59,155.00	\$65,697.00
	without nc	\$17,331.00	\$34,572.00	\$8,671.00	\$24,794.00	\$33,491.00
Northern Health Region						
	with nc	\$12,980.00	\$25,235.00	\$9,238.00	\$37,982.00	\$17,903.00
	without nc	\$6,183.54	\$10,789.85	\$4,897.41	\$22,170.80	\$10,029.75
Manitoba						
	with nc	\$5,503.00	\$7,110.00	\$5,375.00	\$8,547.00	\$6,588.00
	without nc	\$2,942.32	\$3,362.01	\$2,796.47	\$4,409.25	\$3,286.69

"nc" is nursing costs

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