Hospital Case Mix Costing Project 1991/92

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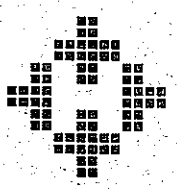

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The Manitoba Centre for Health Policy and Evaluation

The Manitoba Centre for Health Policy and Evaluation (MCHPE) is a unit within the Department of Community Health Sciences, Faculty of Medicine, University of Manitoba. The MCHPE is active in health services research, evaluation and policy analysis, concentrating on using the Manitoba health data base to describe and explain patterns of care and profiles of health and illness.

Manitoba has one of the most complete, well-organized and useful health data bases in North America. The data base provides a comprehensive, longitudinal, population-based administrative record of health care use in the province.

Members of the MCHPE consult extensively with government officials, health care administrators, and clinicians to develop a research agenda that is topical and relevant. This strength, along with its rigorous academic standards and its exceptional data base, uniquely position the MCHPE to contribute to improvements in the health policy process.

The Centre's researchers are widely published and internationally recognized. They collaborate with a number of highly respected scientists from Canada, the United States and Europe.

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Preface

In the past, the Manitoba Centre for Health Policy and Evaluation has adopted a policy of *not* releasing the names of facilities that it has studied. As a research organization, we were accustomed to keeping all such identifying information anonymous as that is the custom for papers published in scholarly journals.

Our Advisory Board has recently recommended that we routinely identify the health care facilities whose activities are reviewed in our reports. The Board felt that doing so would promote a more meaningful discussion of the results, and would be more useful to the Management and Boards of the health care facilities as well as to the public. The Board also advised that, since our health care system is publicly funded, everyone has a right to know about the activities of the various health care facilities the taxpayers are supporting. Our peer organizations in Saskatchewan (Health Services Utilization and Research Commission) and Ontario (Institute for Clinical Evaluative Science) also routinely release the names of the facilities with their reports. We will of course continue to maintain the confidentiality of individual patients and physicians.

Accordingly, in this report, we have identified the hospitals. Because the report was written prior to the Board's recommendation, you will see that the facilities are not identified by name in the report; however, in keeping with the Board's recommendation, we have provided an identification key (see page 76, Table 19: Hospitals and Hospital Categories).

I. EXECUTIVE SUMMARY

The Government of Manitoba spends approximately one-third of its total operating budget on health care, of which over half is consumed by hospitals. In view of the cost of this portion of the health care sector and the current financial constraints, Manitoba Health asked MCHPE to develop a method for assessing the cost efficiency of Manitoba hospitals.

Assessing efficiency is not easy due to the scarcity of detailed cost information and the differences in the types of patients treated in each hospital. To develop our methodology, we relied on the experience gained by Alberta and Ontario in previous work on hospital costs.

Essentially, we combined available financial information on case-mix adjusted charge data from the State of Maryland with information on the mix of cases at each Manitoba acute care hospital and actual Manitoba hospital budgets information. Adjustments were made for factors expected to affect costs: non-acute care cases, very long lengths of stay, deaths and transfers.

We used 1991/92 hospital data to develop the method described in this report. Although significant changes have occurred since then, this year was chosen because it was relatively free from major changes in all the health care sectors of Manitoba. Our intent was to develop a sound method for assessing the relative efficiency of Manitoba hospitals that could be applied to subsequent years of data.

Findings

- Our method for adjusting for case mix appears to have worked well as evidenced by the distribution of cases across Manitoba hospitals. As one would expect, most of the high resource-intensive cases were at the teaching hospitals.

- Manitoba hospitals differed markedly in the cost efficiency with which they delivered care even after adjusting for differences in the case mix of patients.

- Variations in efficiency in Winnipeg and Brandon hospitals are particularly important since these eight institutions served 65% of the patients and accounted for 76% of the provincial expenditures for inpatient care. The results indicate that:

  - Two urban community hospitals appeared to be very efficient relative to the others, with the other four urban community hospitals ranging from 4% to 35% more expensive than the most efficient urban hospital.

  - The teaching hospitals, although similar to each other in costs, spent approximately 55% more than the second most efficient urban hospitals to provide care to patients. Indirect teaching costs do not appear to explain all of this difference.

  - The teaching hospitals had a considerable portion of low acuity, low resource use cases, evidence that they function not only as tertiary care institutions but also as large community hospitals, particularly for pediatric and obstetric admissions.

- The northern hospitals were higher cost institutions than other hospitals. The reasons for this difference may be higher wages, shipping costs and, in many cases, low occupancy rates. These hospitals were among the most expensive in every hospital type. The cost of care was particularly high at the northern isolated institutions; however these units accounted for less than 1% of the total provincial hospital expenditures.

- Among the major rural hospitals, three appeared to be very efficient relative to the others. Costs at the four other (non-northern) major rural hospitals were 21% to 38% higher than the two most efficient hospitals.

- Among the intermediate rural hospitals, three appeared to be very efficient relative to the others. Costs at the six other (non-northern) intermediate rural hospitals were

11% to 27% higher than the three most efficient hospitals. The intermediate rural hospitals appeared to be the most efficient group of hospitals, having the lowest overall average cost.

- While there were marked variations in efficiency across the small rural institutions, findings based on one year of data for these small hospitals are problematic due to the small number of cases.

- High occupancy rates appeared to be associated with cost efficiency in both urban (non-teaching) and rural hospitals.

- Cost efficiency did not appear to produce lower quality care as measured by readmission rates.

The Implications of These Findings

These analyses suggest that substantial savings could have been achieved by increasing the cost efficiency of the less efficient hospitals without jeopardizing access to and quality of care, especially since expenditures per capita on hospitals in Manitoba were substantially higher than the Canadian average ($918 vs $802 in 1991/92). Indeed, we estimated that improvements in efficiency could have lead to savings of over 20% in inpatient expenditures. Close to three-quarters of these estimated savings came from the teaching and urban community hospitals. By increasing the efficiency of the provision of inpatient care at the teaching hospitals, we estimated that over 10% of the total Manitoba inpatient budget could have been saved.

It is important to bear in mind that these analyses were conducted on 1991/92 data. Since this time, there have been major changes in Manitoba with the teaching hospitals in particular experiencing bed closures and budget constraints. Whether budget reductions will translate into greater efficiency will depend on whether reductions in cases were comparatively small. If the decrease in cases was small relative to the dollars cut at the teaching hospitals, then their relative efficiency should improve markedly; however the opposite could also occur.

Clearly, replication of these analyses will be necessary not only to assess the stability of the findings, but to provide a more current assessment of the cost efficiency of the teaching hospitals.

Because the teaching institutions are so large and consume such a large proportion of the provincial hospital budget, their role in the system must be scrutinized carefully. Aside from the direct teaching costs which we excluded (salaries for interns and residents), the U.S. reimbursement system acknowledges higher indirect costs at teaching hospitals, allowing them 12% higher costs. Even taking this into consideration, the Manitoba teaching institutions were more costly than urban community hospitals. This was the case, despite the fact that the teaching hospitals served a community hospital role for many patients.

Two of the urban hospitals that operated more cost efficiently than the others were also identified in a previous study as the hospitals that discharged patients more efficiently. This suggests that it should be possible to treat patients in a shorter time period without incurring greater costs.

Conclusions

We have highlighted marked differences in cost efficiencies across hospitals for 1991/92. If analyses in subsequent years support our initial assessments, such data could provide important information with which to adjust global hospital budgets. We do not, however, recommend moving to a system of funding hospitals based only on case-mix adjusted costs because experience in both Canada and the U.S. indicates that such a system is very "gameable". Instead, information which is gained by such work should be one tool used to adjust budgets based on hospital performance; other indicators may include efficiency of discharge, age, and needs of the community. Also, committees should be established within each hospital group to monitor cost efficiency. Inefficient hospitals should be encouraged to work with more efficient institutions to identify where improvements might be made.

This report also highlights the need to:

- Improve system-wide data on outpatient care and costs. Outpatient care accounts for 20% of hospital budgets and this is increasing. It is currently impossible to assess the cost efficiency of this sector. It is important that hospitals be examined in their entirety;

- Require hospitals to report data on non-acute patients *more accurately*;

- Review the rural hospital system regarding the costs of numerous small hospitals.

Improving cost efficiency will not be easy. However, since it does not appear that more expensive hospitals offer higher quality care, government has a fundamental responsibility to the public to develop policies to encourage the efficient use of health care resources within the hospital sector.

II. INTRODUCTION

Background

The government of Manitoba spends approximately one-third of its total operating expenditures on health care (Estimates of Expenditures for the Province of Manitoba for the Fiscal Year ending March 31, 1994). Over half of those health care dollars are allocated to operating costs for hospitals. In view of the cost of this health care sector and the current financial constraints, Manitoba Health asked the Manitoba Centre for Health Policy and Evaluation (MCHPE) to develop a method for comparing the cost efficiency of Manitoba hospitals.

This request came in part from a report on hospital funding methods by Black and Frohlich (1991) that concluded global funding is one of the best mechanisms for constraining hospital expenditures. The advantages of global funding include low administrative costs, as well as a fairly efficient means of controlling overall cost increases. Global funding has its drawbacks, however, including the lack of micro data which hampers efforts to analyze the efficiency of hospitals, and the fact that funding is frequently based on precedent. The Black and Frohlich report therefore suggested that Manitoba Health maintain global funding, providing concepts of efficiency and effectiveness were incorporated into funding negotiations.

Following the Black and Frohlich report, Brownell and Roos (1992) undertook an initial assessment of hospital efficiency by comparing length of stay patterns at Manitoba's major urban hospitals. Focusing on the average length of stay for common conditions, this study identified substantial differences across hospitals in how efficiently patients were discharged. While this study did not examine cost efficiency, it did demonstrate the potential for considerable savings in bed days across urban hospitals. It also demonstrated the importance of adjusting for differences in patient types (case mix) when comparing resource use across hospitals, and that administrative data could be used for this purpose.

Wall, DeCoster and Roos (1994) and Michael Loyd and Associates (1992) examined hospital-specific costs to determine the feasibility of estimating inpatient per diems for Winnipeg

community hospitals. Two different methods and two sets of financial data for each hospital were used for these estimations. The less complex method, which used the HS-1 (Hospital Statistics, Part One)[1] data, was shown to be sufficiently robust for determining the costs for urban community hospitals. The resulting per diems could not be used to assess efficiency however, because no adjustment was made for the different types of patients treated at each of the hospitals.

The current report expands on methods developed in the previous MCHPE reports to develop a methodology for assessing the cost efficiency of Manitoba hospitals. Efficiency was assessed by combining hospital-specific cost information on all Manitoba hospitals with case mix information.

Existing Case Mix Costing Methodologies

Any hospital could determine its own cost per case simply by dividing its expenditures by the number of cases treated per year. Such a measure would not be comparable across hospitals however, due to the wide range of patient types treated in different hospitals. Case-mix costing methods employ case-mix measures to weight cases so that patients who are sicker and require more resources are assigned greater weight. Inpatient hospital costs are calculated by removing non-patient care costs, and then dividing by the weighted cases to arrive at a cost per weighted case, which can then be compared across hospitals.

One of the most commonly used case-mix classification systems is the Diagnosis Related Groups (DRG) developed by researchers at Yale University. The DRGs group together patients who are similar clinically in terms of diagnosis and treatment, and in their consumption of hospital resources, thus allowing comparisons of resource use across hospitals with varying mixes of patients. In the U.S., data on the charges for different DRGs are gathered from several million Medicare cases each year and used as a proxy for resource use. Relative weights are developed from these data and standardized so that a DRG with a weight of 2.0 is twice as expensive as the average case in the database. However, because Medicare

[1] Hospitals are required to file this report with Statistics Canada on an annual basis.

recipients are primarily aged 65 or older, weights based on American Medicare patients are not representative of all age groups, nor would they necessarily reflect the longer hospital stays generally found in Canada.

In Canada, the Hospital Medical Records Institute (HMRI) developed and introduced Case Mix Groups (CMGs), a derivative of DRGs, in 1983, to enable Canadian hospitals to compare themselves with other institutions according to how efficiently they discharged their patients. Originally, CMGs were almost identical to DRGs; today, a resemblance remains, but subsequent CMG versions have included a few unique refinements.[2]

In 1987, HMRI developed case weights for CMGs, known as Resource Intensity Weights (RIWs). Because case weight development requires large amounts of case-specific cost data, and because Canadian hospitals typically have little idea of how much it costs to treat individual patients,[3] HMRI had to rely on case-cost data from a 1985 New York database.[4] To make these data more applicable to Canadian hospitals, they used Canadian length of stay information to adjust the New York length of stay. HMRI has relied on this same cost data set for subsequent versions of its RIWs due to a continuing lack of suitable Canadian cost data.[5] However, the usefulness of these nine-year-old data has steadily decreased with changes in treatment protocols, advances in technology and increased fiscal pressures. As

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[2] Version 2, which marked the beginning of the divergence between CMGs and DRGs, expanded the number of CMGs to 553. HMRI has implemented some of the refinements that U.S. state DRG systems have developed as well as a few of its own. HMRI is now CIHI (Canadian Institute for Health Information).

[3] This is due, in part, to global funding. While global funding has the advantage of providing an efficient means of controlling overall cost increases, and lowering administrative costs relative to the U.S. (Evans et al. 1989, Woolhandler and Himmelstein 1991), there have been few incentives to track costs per case.

[4] HMRI developed its costs for some higher cost types of procedures (e.g. transplants) from sources not included in the New York cost data. It also employed other sources for some of its fine-tuning of the CMGs.

[5] All versions of HMRI RIWs prior to 1994/95 were based on 1985 New York costs. New York developed these costs in an experimental project that was never repeated.

well, the 1985 New York cost data relate to an outdated set of ICD-9-CM[6] diagnostic codes. The 1994/95 version of RIWs will employ more current Maryland charge data.

Both DRGs and CMGs have been criticized for failing to distinguish cases according to severity of illness. That is, cases within the same DRG (or the equivalent CMG in Canada) may have quite different resource requirements if comorbidities or complications are present. In response to this criticism, the researchers at Yale who developed the original DRGs developed the Refined Diagnostic Related Groups (RDRGs) (Health Systems Management Group, 1989). This system initially groups patients into 334 medical or surgical categories based on combinations of ICD-9-CM diagnosis and procedure codes found on hospital discharge abstracts. Additional diagnoses are used to subdivide the 334 categories into different levels of severity, based on different comorbidities and complications (CCs) expected to have an impact on resource use. Medical categories have three levels of severity ranging from no/minor CCs to major CCs whereas surgical categories have an additional level of severity: catastrophic CCs (Fetter, 1991). Two examples, one surgical and one medical (Table 1), demonstrate the types of CCs associated with the various RDRG categories.

In 1989, Alberta Health introduced a new funding system which used RDRGs for case-mix costing. Rather than applying RDRGs directly to a cost data set however, Alberta used the 1985 New York cost data by mapping New York DRG per diem weights onto CMGs, which were subsequently mapped onto RDRGs. Numerous problems involved in this methodology called into question the validity of these weights (Jacobs, Bay and Hall, 1993).

Due to the myriad problems associated with existing case-mix costing systems and available case weights, we opted to develop our own set of weights for the current efficiency study, using RDRGs to capture differences in severity of illness and using more up-to-date charge data.

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[6] International Classification of Diseases, 9th revision, Clinical Modification.

Table 1: Sample RDRGs and Their Case Weights

RDRG	Description	Severity Level	RCW[7]	Marginal Cost Weight
	Surgical			
1540	Stomach, Esophageal & Duodenal Procedure	No/Minor CCs	1.98	.161
1541	Stomach, Esophageal & Duodenal Procedure	Moderate CCs - e.g., renal colic	3.13	.193
1542	Stomach, Esophageal & Duodenal Procedure	Severe CCs - e.g., cellulitis of trunk	3.78	.207
1543	Stomach, Esophageal & Duodenal Procedure	Catastrophic CCs - e.g., acute myocardial infarction	6.62	.223
	Medical			
1270	Heart Failure & Shock	No/Minor CCs	1.02	.141
1271	Heart Failure & Shock	Moderate CCs - e.g., closed skull fracture	1.32	.145
1272	Heart Failure & Shock	Severe CCs - e.g., Cerebral Vascular Accident	2.13	.166

[7] RCW - Relative Case Weight and Marginal Cost Weights will be referred to in following sections. It is sufficient to say here that a larger RCW implies a more expensive case.

III. METHODS

Overview and Basic Framework

We have paid extraordinary attention to detail in the development of this methodology, improving on systems developed and used by the Ontario and Alberta governments. This section provides a brief and non-technical introduction to case-mix costing for the general reader who wants a succinct description of the approach. The appendix is available for those readers interested in a detailed description of the technical aspects of the methodology.

A hospital's cost per weighted case is its own inpatient costs for the year (derived mainly from HS-1 data) divided by its total weighted cases. To calculate the hospital's total weighted cases, one sums the case weights, which are composed of the relative case weights (RCWs), and adjustment factors for atypical cases.

Using the cost per weighted case, one can compare hospital inpatient costs across different classes of hospitals with different mixes of patients. A hospital's average cost per weighted case may exceed the provincial average because its average length of stay exceeds the provincial average for its mix of patients and/or its cost per day exceeds the average for its patient mix. In addition to case mix, one must examine other variables that drive costs to determine whether a hospital's comparatively high case costs result from inefficiency or from some other cause such as "teachingness" or a northern location.

We used 1991/92 hospital data to develop the method described in this report. Although significant changes have since occurred, this year was chosen because it was relatively free from major changes in all the health care sectors of Manitoba. Our intent was to develop a sound method for assessing the relative efficiency of Manitoba hospitals that could be applied to subsequent years of data.

The major steps involved in this project are listed below, providing an outline of how the various data sets were combined to develop specific case weights for every inpatient case as

well as an average cost per weighted case for each hospital. These steps are expanded in the subsequent sections of this report and in the appendix. A flow chart of the methodology is given in Figure 1.

Steps

1. Case Weight Development

- using Maryland Charge Data for 1991 & 1992 (~630,000 cases annually)

a) Average length of stay (ALOS) calculated for each RDRG
b) Case charges for all typical cases in each RDRG category determined and converted to weights
c) Marginal costs[8] for each RDRG category determined for Manitoba outlier days from Maryland charges and converted to weights

- using Manitoba hospital discharge data for 1990/91 and 1991/92 (~175,000 cases annually)

d) Trim point[9] and ALOS for typical[10] Manitoba patients, in each RDRG category calculated[11]
e) Manitoba relative case weights (RCWs) calculated for each RDRG using Maryland case weights adjusted with Manitoba ALOS

2. Allocation of Manitoba Hospital Cost Data

- using HS-1 hospital data, 1991/92

f) Hospital specific inpatient costs ascertained from budgetary data reported by each of the 76 acute care facilities

3. Application of Case Weights to Manitoba Hospital Data Base

- using Manitoba hospital discharge data for 1991/92 and 1992/93

g) All patients with hospital days in 1991/92 were classified into RDRGs - 175,000 cases - only days within the 1991/92 fiscal year included
h) Each 1991/92 inpatient case weighted using Manitoba RCWs

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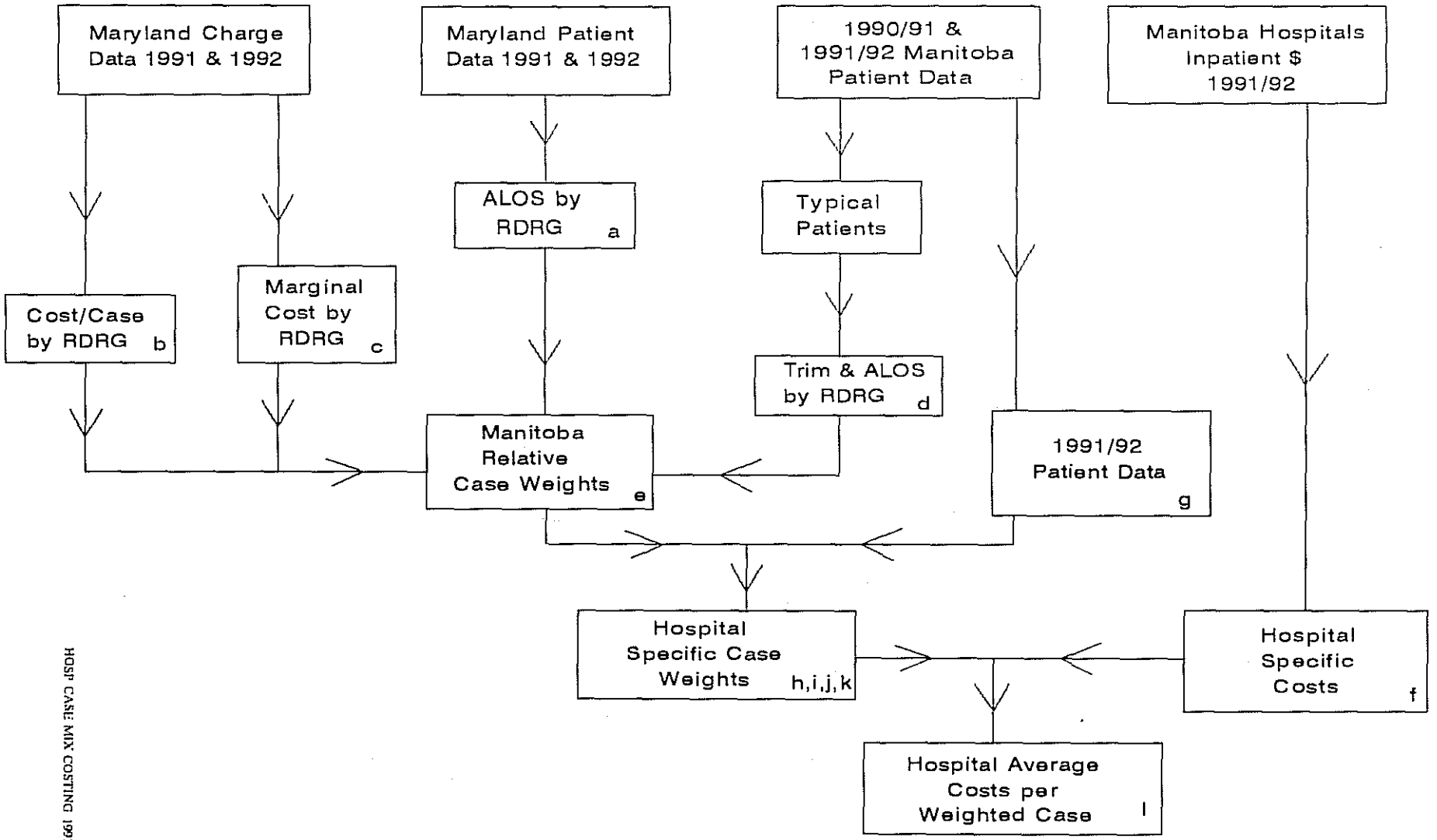
[8] The term "marginal cost" is the cost for an additional day in hospital. We converted the marginal cost into a weight that was applied to all days of stay after ALOS once the patient stayed beyond the *trim point* (Note 9).

[9] Trim point is the point after which a length of stay is determined to be abnormally long.

[10] The definition of a typical patient simply refers to all patients who are relatively homogenous in their resource use within their RDRG, where the stay does not involve transfers, end in death, have non-acute days or days beyond the trim.

[11] Two years of data (1990/91 and 1991/92) were used to determine ALOS and trim. If there were less than 15 cases in an RDRG the ALOS was estimated using available data from adjacent RDRGs. This procedure is described in Appendix A.

Figure 1: Methodology



i) Adjustment factor for non-acute days, outliers, transfers, deaths
j) Calculation of hospital specific case weights = sum all case weights in each hospital
k) Calculation of hospital specific average case weight = sum all case weights in each hospital/total hospital cases

4. Calculation of Cost per Weighted Case

l) Hospital average cost per weighted case = Total inpatient dollars (from point 2 above) / Total hospital case weights (from point 3 above)

Steps

1. Case Weight Development

When Alberta and Ontario introduced funding systems linked in part to the types of cases treated, they were forced (as we were) to estimate the relative costs of different types of cases using American hospital charge data. This approach assumes that relative costs are, on average, similar across jurisdictions. That is, in both countries it will be more costly to treat a patient undergoing bypass surgery or bone marrow transplant than to care for a mother and baby involved in a normal delivery. Since Canadian hospitals typically have longer lengths of stay than American hospitals, we have followed the approach used by HMRI and Jacobs et al. (1993), in adjusting for Manitoba typical lengths of stay.

In Alberta, Jacobs, Bay and Hall (1993) used Maryland data from 1990 and 1991 to develop marginal cost weights and case weights with length of stay adjustments. This methodology provided the basis for the current methodology. We chose data from the 1991 and 1992 Maryland Health Services Cost Review Commission data set,[12] which includes the charges for acute care patients in all Maryland general hospitals (including several teaching hospitals), to develop the RCWs for three main reasons.

- New Maryland case charges are available each year, subject to data collection and processing delays of about one year. Thus, changes in treatment protocols and the

[12] Features of the Maryland data set and a description of the regulatory environment are given in Appendix K.

resultant relative case charges, as well as ICD-9-CM changes, are reflected in the data.

- Maryland charges reflect all acute cases in the state, not just a subset, such as Medicare-based DRGs' over-65 year age group (plus dependents) or the patients of only some of the payers in a system.

- State regulation ensures that Maryland hospital charges reflect actual costs,[13] more than in hospitals which are free to vary mark-ups across product lines and thereby destroy relativity between costs and charges.[14]

The two years (1991, 1992) of Maryland charge data were combined with two years (1990/91, 1991/92) of Manitoba length of stay data to develop the RCWs. The RDRG classification system groups inpatient cases into 1,170 potential RDRG categories, using ICD-9-CM diagnostic information and procedural codes as well as other hospital abstract data. A standardized relative case weight (RCW), was developed for each category, representing the expected relative cost of treating the average case in an RDRG. (RDRGs and their RCWs are available upon request). In essence, the RCW for an RDRG is based on the average charge for treating the average patient in that RDRG in the average Maryland acute general hospital, adjusting for differences between Maryland and Manitoba hospitals in average length of stay for that RDRG. A detailed description of the allocation of Maryland charges can be found in Appendix A and steps required to derive and adjust Maryland marginal costs are provided in Appendix B.

Relativity among RCWs was established by indexing the average case costs of each RDRG against the average case cost for all RDRGs, which was assigned a value of 1.00. Thus, the anticipated cost of a case in the RDRG for heart failure with severe comorbidities and

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[13] In light of this, we will use the terms "charges" and "costs" interchangeably when referring to the Maryland data.

[14] Other researchers have shown that differences between charges and costs are increasing only slightly and that charge-based weights are more likely to represent the true dispersion between high and low resource use DRGs (Carter and Farley, 1992).

complications (CCs) (see Table 1) with an RCW of 2.1 is roughly twice the average case cost; a case with an RCW of 0.81 is expected to be 19 percent less costly than the average. A high RCW index does not necessarily imply that the average case in that RDRG involves a high intensity of expensive servicing; RDRGs with comparatively long lengths of stay and low daily intensities of servicing will also tend to have high case weight indices.

Our model adjusts *typical* RCWs for classes of cases whose average costs differ systematically from the *typical* weights for the RDRGs to which they belong. These classes of cases, denoted *atypicals*, consist of outlier cases (which stay much longer than the average), cases that end in death, and transferred-in and transferred-out cases.[15] The model also applies special weights to the non-acute portions of cases, defined as cases that are panelled (waiting for placement in a personal care home) or receiving care on a long-term unit.[16] Further details regarding our treatment of atypical cases can be found in the section: *Application of Case Weights to the Manitoba Hospital Data Base.*

The relative case weights are known as *standardized* weights because the RCW that a Manitoba hospital receives for a case depends only on its RDRG class and *typical* or *atypical* status. The RCW is otherwise independent of the actual costs of treating the particular patient. For example, each Manitoba hospital would be credited with the same weight for a *typical* case in an RDRG irrespective of whether the specific case were more expensive than the RDRG average or whether the hospital is generally a very inefficient or high cost institution.

An example of how the Manitoba RCWs were calculated is found in Table 2 where the assumption is made that there are only 5 RDRGs that include all possible disease processes. Manitoba estimated costs (Column F) are calculated using Maryland case and marginal costs and Maryland and Manitoba average lengths of stay for each RDRG, given in equation 1:

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[15] The daily costs of these atypical cases and their behaviour over different portions of the stay were inferred from Maryland data. The length of stay effects were derived from Manitoba data.

[16] These weights were largely based on Manitoba data.

Manitoba Estimated cost (F) = B + [(E-D) * C], where

B is Maryland case costs

(E - D) is the difference in ALOS between Maryland and Manitoba

C is the Maryland Marginal charge

Total resource expenditure is then calculated using the Manitoba Estimated Costs and the total number of Manitoba cases for each RDRG, given in equation 2:

total resource expenditure (H) = F * G where

F is the Manitoba estimated cost

G is the total number of Manitoba cases

The total resource expenditure (Column H) is summed across all RDRGs (1,665,000) and is then divided by the total number of cases (Column G) summed across all RDRGs (350) to obtain the average estimated charge (4757) for the data set. The RCW for each RDRG is then calculated by dividing the Manitoba estimated charge for each RDRG (Column F) by the average estimated charge for all RDRGs (4757). In this example, if the 5 RDRGs and frequency of cases defined the whole population of the provincial hospital data set, the relative weights in column I would be the RCWs for typical cases in those RDRGs.

Table 2: Example of RCW Methodology

RDRG	COST/ CASE MYLD	MARGINAL COST MYLD	ALOS MYLD	ALOS MB	MB ESTIMATED COST	MB CASES	TOTAL MB EXPEND -ITURES	REL CASE WT
A	B	C	D	E	F = B + [(E-D)*C]	G	H = G*F	I = F/4757
1	1,000	100	5	6	1,100	100	110,000	0.23
2	2,200	200	10	15	3,200	100	320,000	0.67
3	7,000	250	12	11	6,750	50	337,500	1.42
4	10,000	500	20	25	12,500	50	625,000	2.63
5	5,000	450	3	4	5,450	50	272,500	1.15
TOTAL	25,200					350	1,665,000	

2. Allocation of Manitoba Hospital Cost Data

Identifying Inpatient Costs

Historically, Canadian hospitals have been funded on the basis of global budgets, fixed envelopes of money with which they are obliged to provide services. While there have been general funding guidelines, such as one full-time equivalent (FTE) for 27,250 kgs of laundry processed and one FTE per 2,500 meal days,[17] there are many historical arrangements of one institution being funded to provide services for another which make the identification of hospital-specific costs a daunting challenge.

All Canadian hospitals annually file HS-1 forms with Statistics Canada. The HS-1, which consists of hospital costs and statistics in an aggregate form, was the primary source of financial data for our analysis. We focused on inpatient costs, excluding the costs of hospitals' outpatient activities, their non-patient care activities and the overheads associated with these activities.[18] A more complete efficiency analysis would focus on both inpatient and outpatient services. Although hospitals report outpatient surgical activity, outpatient services were excluded from this analysis because detailed diagnostic coding of non-surgical outpatient activity is not required, hence case-mix adjusted comparisons of outpatient expenditures with outpatient activity could not be made. Moreover, outpatient case-mix adjusted costing methodologies are largely in the developmental phase.

Hospitals make detailed reports on all inpatients treated, therefore our analysis of cost efficiency focused on inpatient activity. This focus on only one portion of hospitals' output made it necessary to allocate overhead costs (such as administration or housekeeping services) as well as diagnostics (laboratory and radiology), therapeutics, drugs and medical and surgical supplies to both outpatient and inpatient activities. Indicators, such as weighted units for physiotherapy and meal days were used to allocate costs between inpatient and outpatient. In

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[17] Personal correspondence August 11, 1994.

[18] Excluded costs are medical reimbursements, interns' and residents' salaries, special research, the direct costs of teaching programs (teachers' salaries and trainee remuneration), heating costs of University of Manitoba Medical School and Cadham Laboratory, all outpatient costs including those for outreach clinics, interest payments and depreciation. See Appendix G.

order to ensure accurate allocation of overhead, costs were allocated to outpatient cost centres and non-patient care areas prior to their exclusion. Observation units (OU) are included in outpatient departments but many urban hospitals in fact admit patients while they are in OU and they may remain there for several days. We determined the inpatient days spent in OU in each hospital, and for that group of patients, an average cost of $307 per day spent in the Observation Unit was added to inpatient costs.[19] We were then able to arrive at an estimate of total inpatient costs.

The lack of outpatient cost centres in many rural hospitals necessitated the development of an average cost per outpatient visit to fully remove outpatient costs from these hospitals. The average cost per visit was compiled using data from those rural Manitoba hospitals which captured salaries and supplies in outpatient cost centres.

The HS-1 data were supplemented by other sources including data from Financial Information Systems (FIS), Laboratory and Imaging Services (LIS)[20], Community Therapy Services (CTS) and South Central Therapy Services (SCTS). FIS data were used to provide audited and inventory-adjusted cost data for drugs, and medical and surgical supplies for the rural hospitals.[21]

LIS provides diagnostic services for many rural hospitals. Hospitals have agreements with LIS to pay for these services, but in many instances charges are based on historical arrangements and may not reflect the actual costs for each facility. Therefore, we excluded laboratory and imaging costs from the HS-1 data and used data provided by LIS.

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[19] These costs were based on actual cost data (including overhead costs) for the one hospital for which financial data was reported for the observation unit.

[20] Data were provided by LIS staff for all hospitals for which they provide services.

[21] Some rural hospitals do not have audited and inventory adjusted information available when the HS-1 is filed.

Expenditures on staffing and supplies, and statistics for inpatient and outpatient activity were used to estimate the costs of imaging and laboratory services for each rural hospital.[22]

Occupational therapy and physiotherapy may be provided by outside agencies without direct charges to hospitals. Community Therapy Services and South Central Therapy Services (SCTS)[23] provide services for several hospitals and the costs of these services were attributed to the hospitals which are served by these therapy services. A more complete discussion of the stepdown methodology and the estimation of laboratory, radiology and imaging costs (including other assumptions used in the development of inpatient costs for each hospital) is found in Appendix G.

Areas of Expenditure

Manitoba hospitals were classified into the following groups based on function, location and size:[24] teaching, urban community, major rural, intermediate rural, small rural, multi-use and northern isolated. A complete listing of hospitals in each group is found at the end of this report.

While results are presented for all groups of hospitals, emphasis is given to the results as they pertain to the urban hospitals (teaching and urban community) due to the percentage of the total provincial hospital budget consumed by these facilities. Manitoba Health payments to

[22] Thompson Hospital does not use LIS, while Churchill uses only the administrative and educational facilities. There are two types of arrangements with other rural hospitals: LIS providing all staff and supplies or LIS providing only supplies and administrative services.

[23] Morden Hospital, from which the SCTS is run, may be attributed with higher than actual costs for treatment to their patients as current accounting methods do not allow for full allocation of the overhead of SCTS.

[24] This was done by Manitoba Health Capital Planning and Charlyn Black for the Population Health Information System: Utilization of Hospital Resources, and reflects the size and function of the hospitals in 1991/92.

Expenditure Distribution by Hospital Type

Figure 2a: Teaching

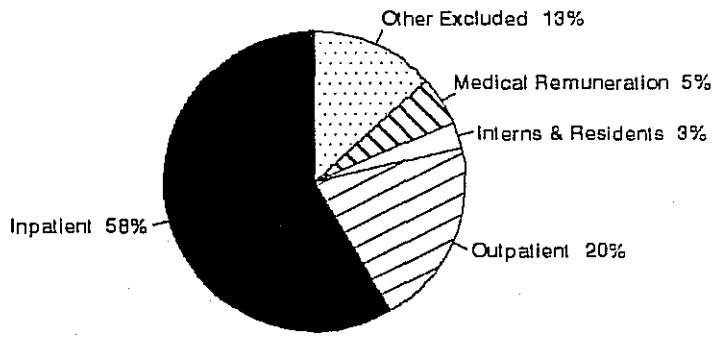


Figure 2b: Urban Community

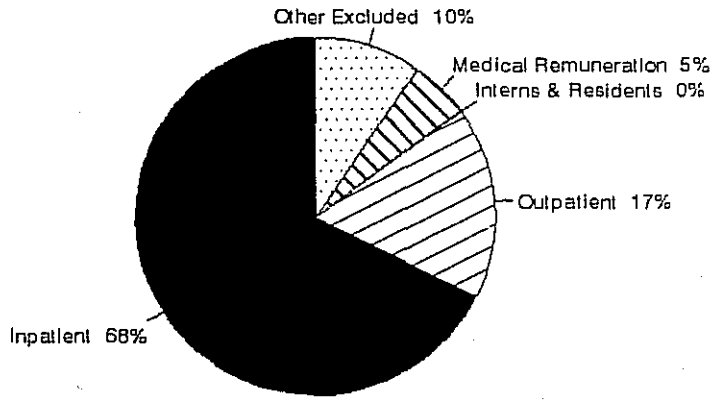
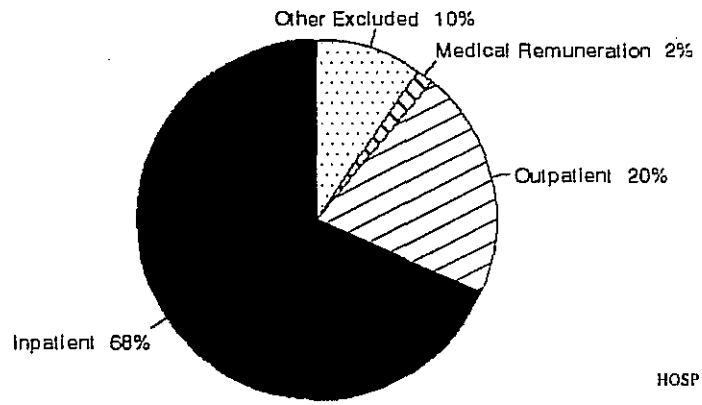


Figure 2c: Rural



the two teaching and six urban community hospitals were $677 million in 1991/92, which accounted for 80% of the total public general hospital budget.[25]

Figures 2a-2c illustrate the variation in expenditures across hospital types. Inpatient costs ranged from 58.3% of teaching hospital budgets to 68.5% of rural hospital budgets. The "other excluded" category consisted of such items as education and research costs, heating and services for the University of Manitoba Medical School and Cadham Laboratory. Excluded costs, i.e., those not directly associated with inpatient or outpatient care, were larger for teaching hospitals than for urban community and rural hospitals, 13.3% compared to 9.5%. Hospital specific information is found in Table A-1.

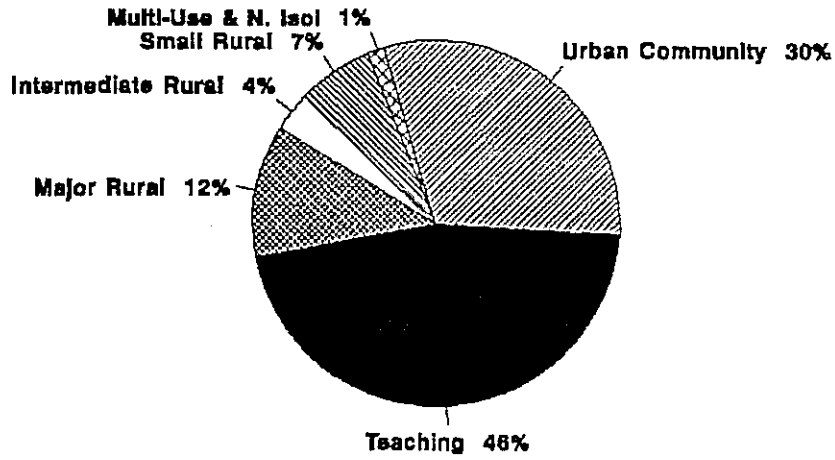
Medical remuneration, excluding intern and resident salaries, accounts for 5.4% of teaching hospital budgets compared to 1.6% of the rural hospital budgets. The removal of all medical remuneration was necessary to allow a comparison across hospitals as some hospitals pay the total salary for all physicians employed in the community and other hospitals have little or no salary expenses.

Table 3: Distribution of Dollars Within Hospital for All Hospitals

Category	All Hospitals
Inpatient Services	63.2%
Outpatient	19.4%
Medical Remuneration	4.6%
Interns & Residents	1.4%
Other Excluded	11.4%

[25] Annual Report 1991-92, Manitoba Health Services Commission.

Figure 3: Distribution of Inpatient Dollars
by Hospital Type



Overall, inpatient services accounted for 63.2% of hospital expenditures (Table 3). Of these expenditures on inpatient care, 46.3% were spent at teaching hospitals, and teaching and urban community hospitals combined accounted for 76.7% (Figure 3). Northern isolated hospitals, shown later to have the highest costs per weighted case, accounted for less than 1% of the overall inpatient budget. These proportions underscore the importance of focusing on the urban and particularly the teaching hospitals concerning issues of efficiency.

While considerable effort went into compiling total costs of patient care at all hospitals, there are missing costs. Some costs for work done by one hospital for another were not allocated to the appropriate centres because information was not available for us to do so.[26] A more complex accounting system would be necessary to track services supplied by one hospital for

[26] If the patient was at hospital A but a test was performed at hospital B both the test and the costs would be excluded from both hospitals' inpatient data, since the test would be classified as either "outpatient" or "referred-in".

another so costs could be allocated back to the hospital where the patient was admitted. Data were also not available for Cadham Laboratory[27] nor the Red Cross (blood products and tests). In order for the data to be complete we would need the actual costs from both the Cadham Laboratory and the Red Cross for services provided to hospitals, with a distinction made between inpatients and outpatients. Despite these gaps in information, the overall effect was not expected to be significant.

3. Application of Case Weights to the Manitoba Hospital Data Base

Hospital abstracts submitted to Manitoba Health for the 1991/92 fiscal year were used to obtain case-specific information. The total number of cases used for analysis was 175,062.[28] The total cases and days at each hospital type in Table 4 indicates that the teaching hospitals provided 36% of the days of care (whereas they accounted for 46.3% of the inpatient expenditures, Figure 3) and urban community hospitals used 35% of the days (and accounted for 30.4% of the inpatient expenditures, Figure 3).

[27] Other than services which are provided by LIS.

[28] Inadvertently, 800 cases were double counted, however additional analysis indicated that this did not have a significant impact on results.

Table 4: Cases and Days in Each Hospital Type, 1991/92†

Hospital Type	Total Days†	Proportion of Total Days	Total Cases†	Proportion of Total Cases
Teaching	563,701	0.36	61,221	0.35
Urban Community	541,288	0.35	52,228	0.30
Major Rural	211,753	0.14	29,886	0.17
Intermediate Rural	76,717	0.05	10,145	0.06
Small Rural	149,540	0.10	19,093	0.11
Multi-use	10,237	0.01	1,035	0.01
Northern Isolated	6,596	0.004	1,454	0.01
TOTAL	1,559,832	1.01	175,062	1.01

† Does not include those cases (and days) not yet discharged as of March 31, 1993.
* May not =1 due to rounding.

RDRG Classification

In order to account for the different mix of patients seen at different hospitals, all separations from Manitoba acute care facilities were grouped into RDRGs.[29,30,31] This classification system is dependent on the coding done on individual hospital abstracts at each of the hospitals. Table 5 illustrates that, by current coding practices, the patients at the teaching hospitals averaged a higher number of diagnoses on the discharge abstract. This is consistent

[29] It has been previously determined that the Manitoba hospital data are adequate for identifying the mix of patients treated, with diagnosis and procedures codes recorded with a high rate of validity (Roos, Roos, Cageorge & Nicol, 1982; Roos, Sharp & Wajda, 1989).

[30] The grouping was done using RDRG Version 5 grouper software. The RDRG software was designed to use the "principal diagnosis" to group patients into diagnostic categories, however Manitoba Health data do not identify a principal diagnosis, and therefore data were grouped according to the "most responsible diagnosis". The software selects the most resource intensive procedure for categorizing surgical cases.

[31] Adjustments to select for newborns were required as the newborn diagnosis may not be the most responsible diagnosis in Manitoba. The first three diagnoses positions on the abstract summary were therefore searched for the newborn diagnosis.

with expectations that the sicker, more complex patients are found at these facilities. It may also reflect a coding bias, with the larger hospitals coding more proficiently, or their physicians documenting more pertinent information.[32]

Table 5: Average Number of Diagnoses per Case by Hospital Type

Hospital Type	Average Number of Diagnoses
Teaching Hospital	3.25
Urban Community	2.79
Major Rural	2.4
Intermediate Rural	2.04
Small Rural	2.02
Multi-Use	1.91
Northern Isolated	1.71

As illustrated in Figure 4, the teaching hospitals had the lowest proportion of RDRGs with no or minor comorbidities or complications (CCs), 68% of their total case load, while the small rural hospitals averaged 79%. A large portion of urban hospital cases (10-12%) had severe or catastrophic CCs, but all hospital groups had some cases with major CCs.

While Figure 4 provides the distribution of cases "within" hospital type, Figure 5 illustrates the distribution of all cases treated in Manitoba hospitals by hospital type and case severity. RDRGs with no/minor CCs accounted for 72% of all patients, with the teaching hospitals having 24% and the urban community hospitals 22%. Cases with severe and catastrophic CCs accounted for less than 2% of all cases.[33]

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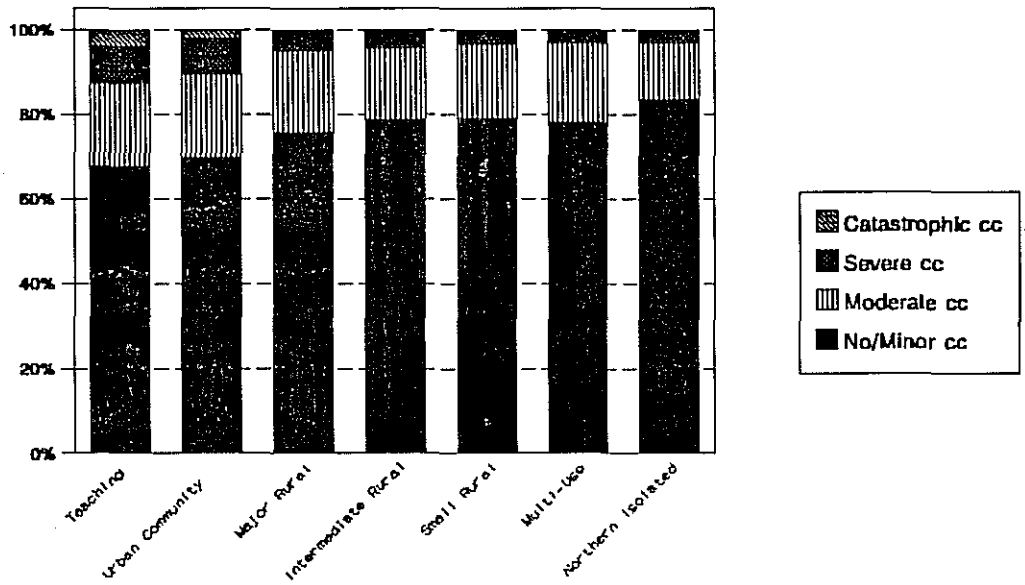
[32] Any biases in under- or over-coding of diagnoses will operate to overestimate the severity of cases at the teaching and larger hospitals and to underestimate the severity of cases treated at the smaller institutions.

[33] The distributions of cases by severity level represented in Figures 4 and 5 are very different from those of Medicare patients reported by the Health Systems Management Group (1989). These researchers found that Medicare patients with no CCs accounted for about 34% of medical patients and 47% of surgical patients. This difference is likely due to the difference in the ages of the two populations, with the Medicare population being primarily elderly patients, possibly to more accurate and detailed coding of additional diagnoses and more outpatient surgery in American hospitals.

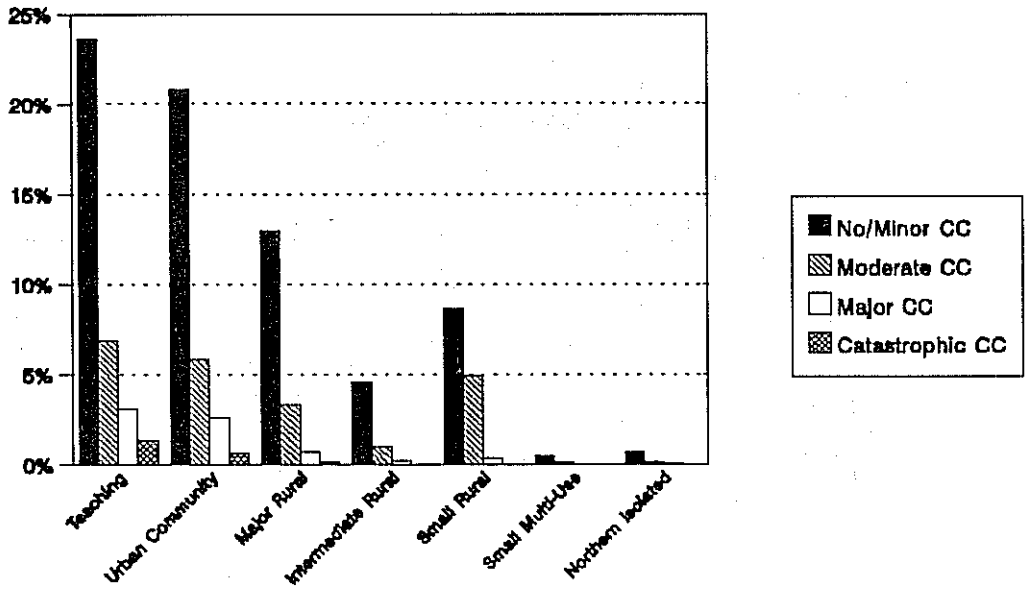
Figure 4: Distribution of Severity Levels
Within Each Hospital Type



Assignment of RCWs to Inpatient Cases - Typical and Atypical

In order to more fully understand hospital costs, it is important to examine the various characteristics of patients which affect the costs. This section examines some factors that make one patient's hospital stay more or less costly than another's. Such factors include death, transfers between acute care hospitals, time spent in an extended care bed or awaiting placement in a personal care home, or a length of stay which is unusually long for a given RDRG. Each of these factors will have resource implications which are different from the typical RCW.

Figure 5: Percentages of Cases in Each Severity Level, by Hospital Type



Typical patients are defined as those whose hospitalization had a normal length of stay (not longer than the trim point[34]), whose treatment was completed in a single acute care facility, whose course of treatment did not end in death,[35] and whose hospitalization did not include days classified as non-acute (extended care or panelled). Of the 175,062 cases, 143,606 (82%) were *typical* cases, 31,456 (18%) *atypical* (See Figure 6). HMRI reports 86.6% of cases are typical and 13.4% are atypical for the hospitals from which they collect data (HMRI, 1992).

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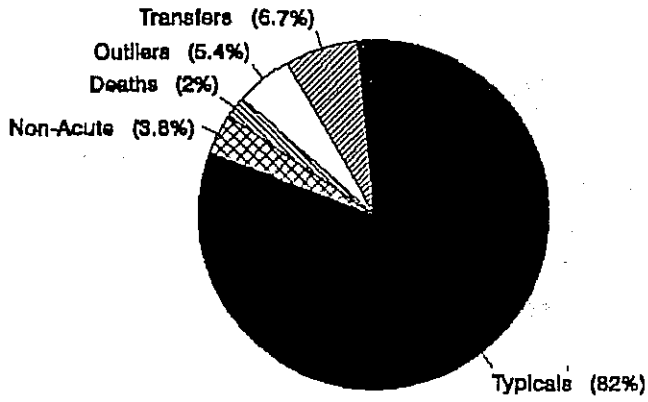
[34] The *trim point* is the point after which any additional days are classified as outlier days. Outlier days are not excluded, but costs are calculated using the marginal costs weights. The methodology used to establish the trim point for each RDRG is explained in detail in Appendix C.

[35] Patients classified as medical (as opposed to surgical), who die within 48 hours of admission are grouped into RDRGs separate from other admissions with a similar diagnosis which either do not die or die after a longer length of stay. These are not classified as *atypical* because they are relatively homogeneous within their group. There were 1001 such patients in 25 RDRGs.

Figure 6: Percentages Typical & Atypical Cases, All Hospitals

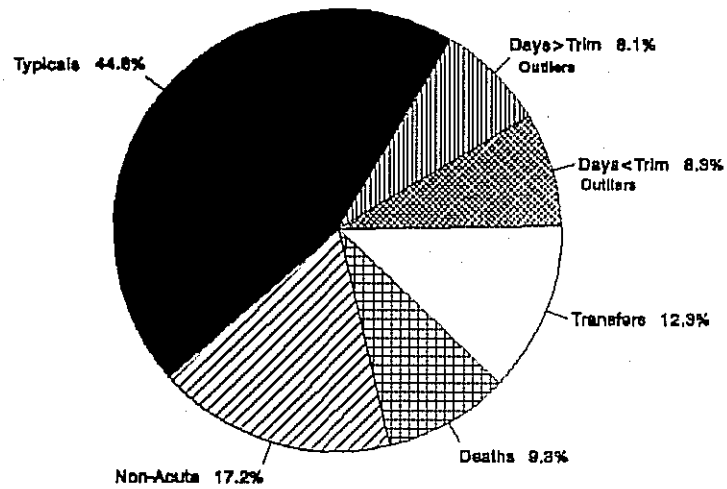


Typical cases were assigned a relative case weight (RCW, described in step 1 above) according to their RDRG category regardless of where the case occurred (teaching or rural hospital) or how long their length of stay was (as long as the patient was discharged before the trim point[36]). Referring back to Table 2, typical patients in RDRG 1540 (stomach, esophageal & duodenal procedures with no/minor CCs) received a case weight of 1.98, whether they stayed for 8 days or 15 days.

Atypical cases are defined as those whose resource use is different from typical patients within that RDRG. These include outliers (cases with stays longer than the trim point), some deaths

[36] It should be noted that patients who stayed longer than the ALOS but were discharged before the trim point were not given credit for days between the ALOS and the trim point. These patients can thus have a major impact on the efficiency of the hospital.

Figure 7: Percentages of Days for Typical & Atypical Cases, All Hospitals



(see note 35), transfers, and non-acute care patients. Although atypical[37] cases comprise a smaller number of cases than typical cases, they consume an inordinately large number of days. Across all hospitals, atypical cases accounted for only 18% of cases, but these cases accounted for 55% of the total days (Figures 6 and 7).[38] The large number of days consumed by atypical cases were not excluded from the data set, however, adjustments were made to the calculations of the weights for these cases because their resource use differs from typical cases. It is important to note that not all of the days belonging to the atypical cases

[37] Cases are classified using several independent criteria. One patient could have long-term care days, stay longer than the trim, be involved in a transfer and then die. Therefore a hierarchy was used to obtain frequencies in each category where non-acute days had highest priority followed by deaths, transfers, and lastly LOS greater than trim.

[38] HMRI found 64.4% of days were typical days, while 16.4% of days belonged to cases which were outliers, 9.6% to transfers and 8% of days belonged to cases which ended in deaths. The HMRI data set does not include days or costs for patients classified as long term care. These cases remain in our data set as the coding of these cases in not consistent across the province. Further discussion is found in the section on non-acute days.

were treated as atypical days. For example, the 5.4% of the cases which stayed beyond the trim accounted for 16.4% of all days, but only half of these days were classified as *outlier* days. These cases received the appropriate RCW for the initial portion of the stay and the marginal cost was applied to days after the ALOS. Each of the atypical classifications and their weighting formulas are discussed in detail below. Atypical cases may receive more than one adjustment. For example, cases which had non-acute days received appropriate weights for both the non-acute and acute days of their hospital stay. Similarly, cases which were outliers and whose stay ended with a transfer received both adjustments.

i) Deaths. Studies have demonstrated that costs for patients in American hospitals whose hospitalizations ended in death were consistently higher than for those patients in the same diagnostic category (DRG or CMG) who were discharged alive (HMRI, 1991; Carter, 1993). Our examination of the Maryland data using RDRGs demonstrated similar results.

Comparisons between Manitoba and Maryland data showed that the average length of stay for patients who died was much longer ***in Manitoba***. In the Maryland data base, 92% of the deaths occurred within 40 days but this was the case for only 74% of the deaths in the Manitoba data. This likely reflects the increased numbers of non-acute care cases in the Manitoba data base. Based on examination of the Maryland data and the Manitoba lengths of stay for deaths, a multiplier of 2 was used for non-medical deaths which occurred within 2 days of admission,[39] and a multiplier of 1.2 was used if length of stay was longer than 2 days.[40] The multipliers were applied on a daily basis to no more than 40 days prior to death, to days which occurred in 1991/92 fiscal year, and to cases which had no non-acute days. The full description of all analyses and subsequent adjustments regarding deaths are found in Appendix E.

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[39] Only non-medical RDRGs are included here. For medical categories, deaths within less than three days are placed into distinct RDRGs and therefore do not require adjustment. (See note 35).

[40] Analysis of the Maryland data showed that no length of stay adjustment was required for deaths because within RDRGs the per diem is constant over length of stay. That is, the same multiplier could be used for all stays of 3 days or longer because cost per day for deaths does not vary over the length of stay.

Table 6: Adjustment Factor for Patients Whose Hospital Stay Ends in Death

Length of Stay	Multiplier
2 days or less	2.00[39]
> 2 days	1.20[41]

Distribution of Deaths

The proportion of cases whose hospital stay ended in death ranged from 1.4% in northern isolated hospitals (Table 7) to 4.8% at the multi-use hospitals. Table A-4 provides hospital specific data.

Table 7: Deaths - Cases and Days as a Percentage of Totals in Each Hospital Type

Hospital Type	Deaths	Deaths as % of total cases in hospital type	% of total days by hospital type
Teaching	1,380	2.8	8.0
Urban	1,639	3.8	10.3
Major	547	2.3	8.6
Intermediate	266	3.3	13.1
Small	464	3.2	9.1
Multi-use	45	4.8	11.5
Northern Isolated	11	1.4	6.4
Total	5,353	3.1	9.2

The larger proportion of deaths at the multi-use facilities, combined with the fact that these institutions had a high proportion of non-acute days may indicate that many of these cases were comfort care. It is important to note that cases coded as non-acute care did not have a

[41] Applied to case weight, for stays not longer than 40 days, at the end of the stay, but only to those days in the 1991/92 fiscal year

multiplier applied to them.[42] As well, the restriction on the total days per stay to which the multiplier is applied, combined with the RDRG classification system, should minimize any over-estimation of costs where patients are receiving comfort care.

ii) Transfers. Transfers are defined as patients transferred between acute care facilities within the province. We undertook analyses to assess differences in length of stay and costs for patients who were transferred both from and to acute care facilities. Patients transferred from or to personal care homes, rehabilitation hospitals, nursing stations or out of province were not included in these analyses.

Analysis of the Maryland data did not demonstrate large differences in daily costs between transfers and non-transfers; thus our weight adjustment involved applying the appropriate multiplier to the case weight and giving the hospital credit for the actual length of stay, rather than the ALOS as in the typical cases.[43] The multiplier for transfers was applied only up to a maximum of 44 days. Multipliers for the various lengths of stay and the types of transfers are given in Table 8. See Appendix E for a description of all analyses and adjustments regarding transfers.

Table 8: Multipliers for Transfers In and Out

Length of Stay	Transfers Out	Transfers In To
Within 2 days	.957	1.182
3 to 5 days	.981	1.035
> 5 days	1.036[44]	0.892[45]

[42] This was done for those hospitals where coding was adequate. For hospitals which did not code non-acute days, the total hospital case weight was adjusted based on the number of long-term care days reported by Manitoba Health and ratios in good coding hospitals.

[43] For transfers and deaths, unlike typical cases, hospitals only received a portion of the RCW if the stay was less than the ALOS.

Distribution of Transfers

The percentage of cases transferred in and out, the percentage of days involved and the percentage of weights for each hospital type are given in the following tables. The percentage of cases that were received by acute care facilities (transfers in) ranged from 0.3% of the cases at the northern isolated hospitals to 6.9% at the teaching hospitals (Table 9a). The larger percentages at the teaching hospitals likely reflect the use of these institutions as referral centres for all types of cases, not just those requiring tertiary care. Intermediate rural hospitals received a relatively high 5.2% of their cases as transfers.

Transfers out of acute care facilities (Table 9b) ranged from 2.4% of cases at the teaching hospital to 9.6% of the cases in the northern isolated facilities. The low number of acute transfers out of the teaching hospitals suggests that the teaching hospitals, and to a certain degree the other urban hospitals, were not returning patients to smaller hospitals for the recuperative stages of the hospital episode.

Table 9a: Transfers In (Cases Received by Hospital)

Hospital Type	Percent of Cases	Percent of Days	Percent of Weights
Teaching	6.9	10.9	11.1
Urban Community	3.0	4.3	3.9
Major Rural	2.4	6.6	4.8
Intermediate Rural	5.2	9.6	8.3
Small Rural	2.7	8.2	6.7
Multi-use	2.7	6.7	5.7
Northern Isolated	0.3	2.5	1.5

[44] This is applied only to a maximum of 44 days at the end of the stay and only for those days within the fiscal year of 1991/92.

[45] The multiplier is applied to days at the beginning of the stay, and for no more than 44 days.

Table 9b: Transfers Out (Cases Transferred Elsewhere Upon Separation)

Transfer Out Of	Percent of Cases	Percent of Days	Percent of Weights
Teaching	2.4	5.7	5.8
Urban Community	3.8	6.8	6.5
Major Rural	4.4	5.1	4.9
Intermediate Rural	7.4	8.1	7.5
Small Rural	6.9	8.5	8.1
Multi Use	6.8	10.8	10.5
Northern Isolated	9.6	21.3	14.4

The issue of transfers is complex. Large teaching hospitals receive many acutely ill cases which are resource intensive, but the use of the RDRG methodology ensures they receive the appropriate weights for these cases. A major adjustment needs to be made only if a transferred case required many more resources than a similar case admitted directly to the teaching hospital. Since many transfers come from small rural hospitals, it is not clear why the resources used by these patients would be more expensive than those used by an urban resident admitted for the same diagnosis. This is an area which may warrant further investigation. Table A-4 provides hospital specific data for all transfers, the days involved and the percentage of weights used by patients involved in transfers at each hospital.

iii) Outliers. Outliers refer to cases that stay much longer than expected for a given RDRG. A formula was developed to determine the trim point for each RDRG, after which the case was considered an outlier. A description of outlier methodologies is found in Appendix C. Case weights for outliers were adjusted for length of stay on a daily basis using RDRG-specific marginal costs. The full explanation of the development of the marginal cost weights and their allocation is described in Appendix A. Table 10 provides information for hospital types on the frequency of outlier cases and the percentage of the total days which were

beyond the trim. The percentage of these days varied from 8% at the northern isolated facilities to 22% at the urban communities facilities.

Table 10: Outlier Cases (Excluding Deaths and Transfers)

Hospital Type	Percentage of Cases	Percentage of Days after the Trim[46]	Percentage of Total Weights
Teaching	6.3	17.2	22.5
Urban Community	7.3	21.9	28.0
Major Rural	6.6	17.9	23.8
Intermediate Rural	6.1	13.9	21.7
Small Rural	6.3	18.5	26.6
Multi-use	10.1	19.2	31.0
Northern Isolated	3.3	8.2	12.4
Total	6.6	18.9	24.9

Table 11 provides examples of the effect of long stays on case weights for four different cases, three of which stayed beyond the trim point for their particular RDRG. The RCW for RDRG heart failure and shock with no/minor CCs is 1.02; because this case was an outlier it received a marginal cost weight adjustment for all days beyond the ALOS. The resulting case weight was 20.74 = 1.02 +[.145 *(144-7.99)].[47] A more complex and higher severity case, such as cardiac valve procedure with catheterization with catastrophic CCs, has an RCW of 11.426. In this example the case's length of stay was equal to the ALOS and therefore received no adjustment. From these examples, it is clear that the many long stay patients in Manitoba hospitals have a strong impact on increasing a hospital's average case weight although this may be lessened if these patients have designated non-acute days.

[46] This is only those days after the trim relative to all days in the data set.

[47] Although outlier adjustment is triggered when there are days beyond the trim point, the adjustment is then applied to all days after the ALOS. Cases which stay longer than the ALOS but less than the trim point for that RDRG do not receive outlier adjustments, just as cases which are discharged before the ALOS do not have any negative adjustments.

Table 11: RCW vs. Case Weight for Same RDRG

Length of Stay Effect on Case Weights

RDRG Name	Relative Case Weight	Marginal Cost Weight	ALOS[48]	LOS[49]	Caseweight
Degenerative Nervous System Disorder with no/minor CCs	1.80	.132	10.71	151 days	20.32
Heart Failure & Shock with no/minor CCs	1.02	.145	7.99	144 days	20.74
Diabetes age > 35 with major CCs	2.086	.169	10.61	302 days	51.33
Cardiac Valve Procedure with Cath with catastrophic CCs	11.426	.382	24.53	24 days	11.43

[48] Average length of stay for RDRG.

[49] Actual length of stay.

iv) Non-acute days - Extended Care and Panelled Patient Days. Patients awaiting nursing home placement or receiving care on an extended care unit typically have lower daily costs. These patients are frequently referred to as long-term care cases; we have chosen to refer to them as non-acute because many of the days which we classify as non-acute occur early in a patient's stay. A marginal cost weight, developed from Manitoba data, was applied to the non-acute portion of any stay identified by the use of specific service codes. Hospitals were surveyed to determine whether specific service codes were used for chronic, respite, panelled or non-acute care days. When hospitals used distinct service codes to identify when a patient should be classified as non-acute, a weight of .085[50] was applied to those non-acute days, and the acute portion of the stay received the appropriate acute weight. Hospitals which consistently reported non-acute status of their patients were identified as "good coding" hospitals; 19% of the total days at these hospitals was spent in non-acute care. Thirty-three of the 76 hospitals were classified as "poor coding" hospitals;[51] these tended to be the smaller hospitals and accounted for only 26,303 (15%) of the total 175,062 cases or 12% of the total days.

While it was impossible to determine the number of non-acute days at "poor coding" hospitals from the hospital data base, an alternate data source[52] indicated that non-acute days accounted for 17.5% of the total days at these hospitals. Because these data were not reported on a case-by-case basis, we had no knowledge as to which RDRGs these patients were in, and it was therefore necessary to develop a way to apply non-acute weights to these days. Using the "good coding" hospitals, we identified which RDRGs had the largest proportions of non-acute days and adjusted each "poor coding" hospital's total case weights proportionately to the number of non-acute days. Further details on this step are found in

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[50] This weight was coincidentally equal to the lowest adult marginal cost weight calculated for an RDRG. A further discussion on the calculation of this weight is found in Appendix D.

[51] Several hospitals indicated that they were not using specific service codes for long-term care, but when the data were examined, it was found that they did. Also, it was found that several hospitals that reported using specific codes actually did not. In both instances hospitals were placed in the appropriate category.

[52] This information was obtained from revenue days as reported by the hospitals to Manitoba Health.

Appendix D. Table 12 provides the distribution of "good coding" and "poor coding" hospitals, cases and days across hospital types. "Percent of Total Days" indicates the percentage of non-acute days in each category (for example: Major Rural, 29% of "good coding" hospitals' days are non-acute and 13% of "poor coding" hospitals days are non-acute).

The impact of applying the non-acute weight to the non-acute days can be illustrated using the third example in Table 11; if 200 of the 302 days are actually non-acute, the case weight becomes 34.5 = 2.086+ (91.39 days * .169) + (200 days *.085) rather than 51.33. In this example it was assumed that the non-acute days were at the end of the stay but the method used allowed for adjustments if the non-acute days were interspersed with acute days.

Table 12: Non-Acute Care: Days and Cases

Hospital Type	Number of Hospitals	Cases	Non-Acute Days	Percent of Total Days	Acute Care Days[53]
Teaching					
good coding	2	2,841	124,487	22%	23,769
poor coding	0	-	-	-	-
Urban Community					
good coding	6	2,268	112,836	21%	34,044
poor coding	0	-	-	-	-
Major Rural					
good coding	7	1,160	44,915	29%	9,314
poor coding	3	NA[54]	7,908	13%	NA
Intermediate					
good coding	7	102	4,336	8%	4,183
poor coding	3	NA	7,725	30%	NA
Small					
good coding	15	114	9,389	16%	3,216
poor coding	22	NA	14,709	16%	NA
Multi-Use					
good coding	4	17	530	10%	274
poor coding	2	NA	1,812	35%	NA
Northern Isolated					
good coding	2	26	924	22%	1
poor coding	3	NA	941	16%	NA
TOTAL					
good coding	43	6,528	297,417	17.5%	74,801
poor coding	33		33,095		

[53] These are the acute care days for only those patients who have non-acute days.

[54] For those hospitals classified as "poor coders" we do not know either the number of cases involved nor the acute care days used by those patients.

Comparison of Case Mix Across Hospitals Using Case Weights

Once an RCW was determined for every RDRG, we examined the *typical* cases to determine whether their distribution was logical. This was done by first dividing all *typical* cases into five groups, based on their RCWs, ranging from the most expensive (top 1%) to the least expensive (lowest 20%). Table 13 provides examples of diagnoses found in each of the groups.[55] As mentioned previously, the RCW represents **expected** resource use for each RDRG rather than **actual** resource use. Procedures such as bone marrow transplant, kidney transplant and cardiac valve procedures were found among the most expensive (top 1%) while non-surgical back problems with moderate CCs were found in the intermediate class (21-80%). Diagnoses such as D&C, tonsillectomy, and urinary stones fell into the least resource intensive group (lowest 20%).

Table 13: Examples of Typical Weights From Each Resource Use Group

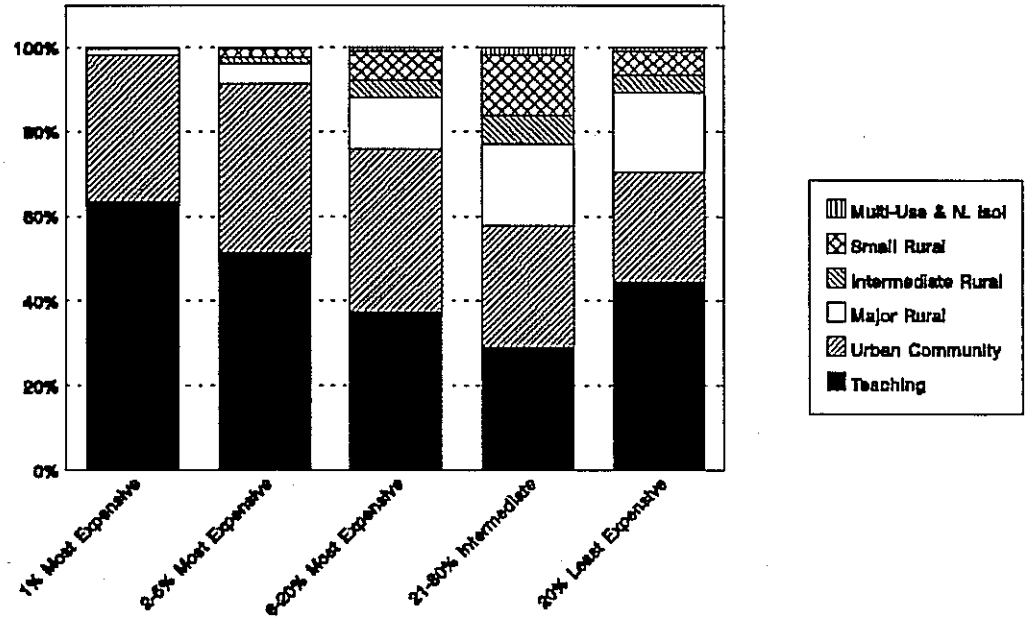
RDRG	Frequency	RCW	Description
1% Most Resource Intensive			
4813	9	64.947	Bone Marrow Transplant w catastrophic CCs
3023	4	22.950	Kidney Transplant w catastrophic CCs
3863	63	21.044	Birth weight < 1000G w catastrophic Neonate CCs
4830	179	13.433	Tracheostomy w no/minor CCs
1043	26	10.984	Cardiac Valve Proc w Pump & w Card Cath w catastrophic CCs
2-5% Most Resource Intensive			
1072	172	5.057	Coronary Bypass w/o Cardiac Cath w major CCs
1483	335	5.023	Major Small & Large Bowel Procs w catastrophic CCs
2090	709	4.660	Major Joint & Limb Reattachment Procs w no/minor CCs
1953	11	4.065	Total Cholecystectomy w C.D.E. w catastrophic CCs
4302	78	4.072	Psychoses w major CCs

[55] A full list of RDRGs, weights and marginal cost weights can be obtained upon request.

RDRG	Frequency	RCW	Description
6-20% Most Resource Intensive			
3342	46	2.899	Major Male Pelvic Procedures with major CCs
2712	12	2.855	Skin Ulcers with major CCs
3882	94	2.797	Birth Weight 1000-2499G with major Neonate CCs
3162	120	2.794	Renal Failure with major CCs
3363	36	2.779	Transurethral Prostatectomy with catastrophic CCs
21-80% Most Resource Intensive (Intermediate)			
3242	15	1.485	Urinary Stones with major CCs
1572	51	1.463	Anal and Stomal Procedures with major CCs
2431	231	1.457	Medical Back Problems with moderate CCs
4601	20	1.444	Non-Extensive Burns w/o O.R. Procedure with no/minor CCs
4401	21	1.432	Wound Debridement for Injuries with moderate CCs
20% Least Resource Intensive			
3641	40	0.476	D&C, Conization Except for Malignancy with moderate CCs
0592	25	0.474	Tonsillectomy &/or Adenoidectomy only with moderate CCs
3280	15	0.470	Urethral Stricture with no/minor CCs
0240	1085	0.455	Seizure and Headache with no/minor CCs
3240	737	0.454	Urinary Stones with no/minor CCs

As one would expect, the distribution of *typical* cases across hospitals shows that those RDRGs that are relatively more expensive (i.e., have the larger weights) were found primarily at the teaching and urban community hospitals (Figure 8). The teaching hospitals had 65% of the most expensive (top 1%) RDRGs and 50% of the 2-5% most expensive RDRGs; the urban community hospitals had 35% and 40% respectively. Also of note, the teaching hospitals had 40% of the least expensive *typical* cases as well.

Figure 8: Percentages of Cases Treated by Each Hospital Type, Within Each Resource Use Group (Typical Cases)



The high cost, high resource intensive cases (top two groups) accounted for less than 10% of any hospital type's *typical* patient load (Figure 9). Although the teaching hospitals had the more expensive cases, it is also important to note that over 20% of their typical cases were found in the least resource intensive, least expensive RDRGs. A large portion of these cases are normal newborns, uncomplicated deliveries and pediatrics, however it has also been found that a considerable proportion of the surgical cases at the teaching hospitals are of relatively low intensity and low severity (Barer, Brownell, Sheps, 1994). Even though the teaching hospitals have the tertiary care cases, it is clear that they also function as community hospitals, and only a small minority of patients treated at the teaching hospitals require complex, expensive treatment.

Figure 9: Distribution of Resouce Use Groups
Within Each Hospital Type (Typical Cases)

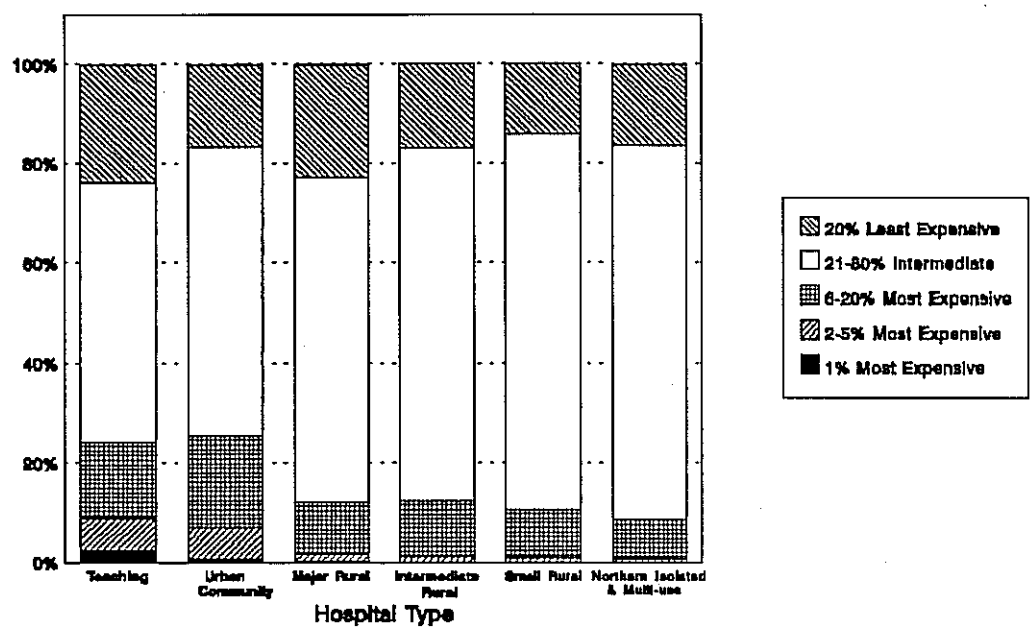


Figure 10 shows the average indexed[56] RCWs for all *typical* cases in each hospital type.[57] This figure makes it possible to compare the various types of hospitals according to how complex and/or resource intensive, on average, their typical cases are expected to be. (Each + represents the average cost for one specific hospital, and the • represents the average of all hospitals in that group.) Reassuringly, we found that the overall complexity/resource intensity at the teaching hospitals and the other urban hospitals was markedly higher than that at the rural hospitals (large black dots on Figure 10). The average indexed RCWs for various rural hospital groups were essentially the same, at .96 to .98, with the northern isolated at .90.

[56] The average of all hospitals' RCWs was indexed to 1 and each hospital type's RCW (and each hospital's RCW) is presented relative to the provincial average.

[57] Keep in mind that the RCWs represent expected complexity and/or expected resource use per case, and are therefore an indication of the case mix at each of the hospitals and do not depict the costs per weighted case (discussed below in the Findings Section).

Figure 10: Average Indexed Case Weights by Hospital, (Expected Average Resource Use), Typical Cases

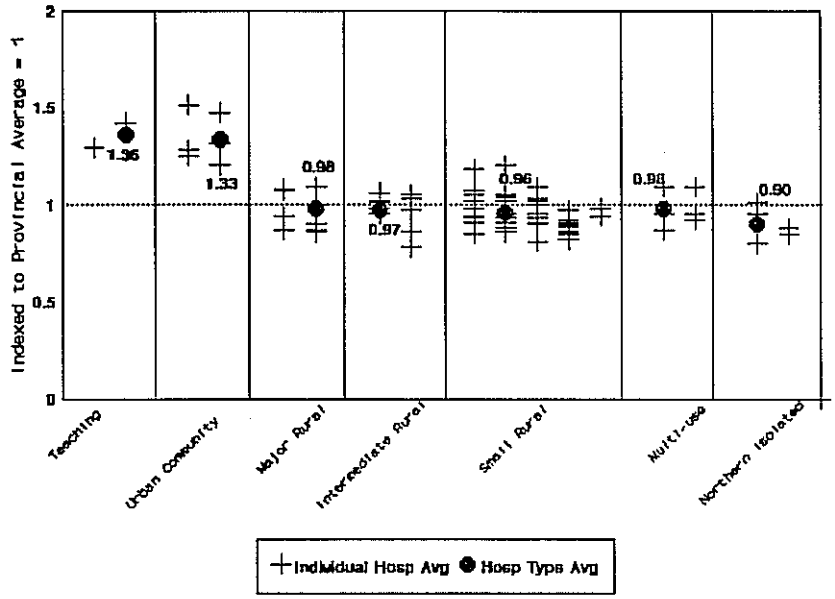


Figure 10 also shows average indexed RCWs for each hospital (as plus signs). As one might expect, there was little variation across rural hospitals in the mix of cases. Interestingly, two of the urban community hospitals had higher average case weights than the two teaching hospitals. The reason for this unexpected finding appears to be the absence of obstetrics at these two hospitals. Although obstetrics cases may be resource intensive on a daily basis, they tend to have lower case weights relative to other RDRGs, due to very short lengths of stay. This results in lowering the average case weights for hospitals with significant numbers of obstetric cases. When one looks at the average expected *day weights* of typical cases for each hospital, the impact of *length of stay* on the obstetrical and normal newborn cases disappears (Figure 11). This figure also provides some insight as to the average daily acuity level at each of the hospitals. This value is calculated using the actual case weights for each hospital and the expected total days (based on ALOS) given the mix of cases in each hospital. In this figure the results are as one would expect with the urban hospitals having the highest

expected day weights and the smaller rural hospitals having lower expected day weights, reflecting lower expected resource use.

All cases

Because Figures 8 to 11 include only typical cases, they tell only part of the story. While the typical cases made up 82% of the total cases, they accounted for only 45% of the days spent in Manitoba's acute hospitals; therefore data for all cases (typicals and atypicals) were examined. Figure 12 is comparable to Figure 8, except that it includes all cases in the data set. When all cases were included only 40% of the most expensive cases were found at the teaching hospitals, down from 65% when only *typical* cases were examined. The rural hospitals jumped to treating 21% of the most expensive cases, compared to less than 5% when only the *typicals* were examined. This suggests that once long stay cases, deaths and transfers are included there are some very expensive cases in the rural hospitals.

Figure 11: Expected Day Weights by Hospitals

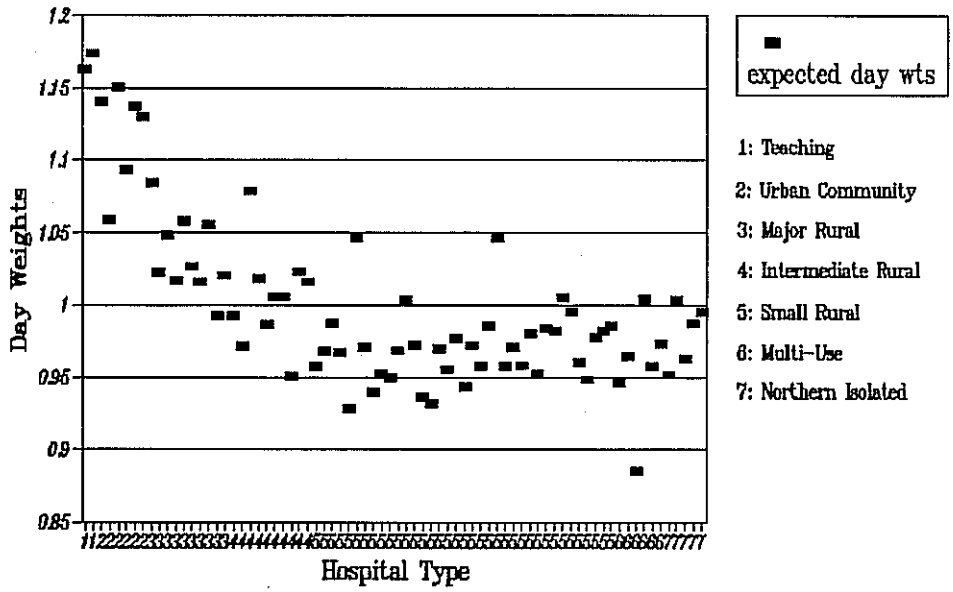


Figure 12: Percentage of Cases Treated by Each Hospital Type, Within Each Resource Use Group (All Cases)

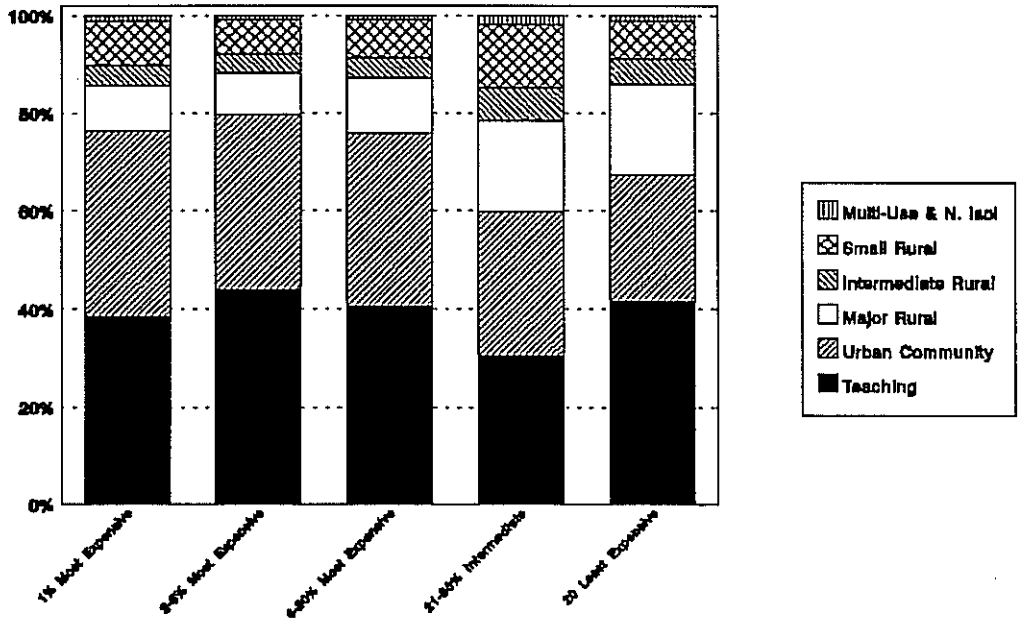
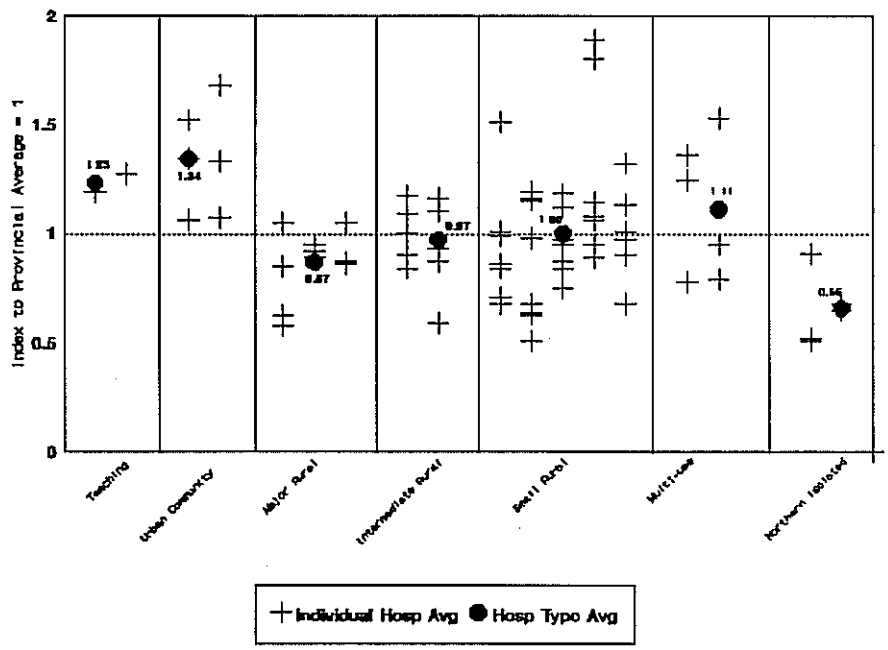


Table 14: Characteristics of Resource Groups - All Cases

Resource Group	ALOS	Mean Weight	Percent Deaths	Percent Transfers	Percent Non-Acute	Percent Outliers	Percent Typical
1% most expensive	181	25.1	20.7	44.6	46.7	93.4	3.6
2-5% most expensive	42	4.2	15.0	21.5	16.2	57.0	29.1
6-20% most expensive	13	2.4	5.7	12.2	5.2	22.7	61.5
21-80% most expensive	4	0.9	1.9	4.5	1.9	2.5	90.2
20% least expensive	2.3	0.3	0.8	9.8	3.0	0.7	86.5

It is clear from the striking changes between Figures 8 and 12 that *atypical* cases have a huge impact on case weights, and Table 14 provides insight into this impact. Using the previously defined resource groups, the types of cases within each group were examined. Cases with the highest case weights (the 1% most expensive) were primarily *atypical*; for example, 93% of those in the most expensive group were outliers and 44% were transfers.[58] Indeed, only 3.6% of the cases in the most expensive group were classified as typical. In the intermediate group (21-80% most expensive), only 2.5% were outliers, 1.9% were deaths and the average length of stay was 4 days, down from 181 days in the most expensive group. Clearly, the more expensive the group, the greater the concentration of *atypical* cases, especially long stay outliers.

Figure 13: Average Indexed Case Weights by Hospital, All Cases



[58] Keep in mind that these atypical categories are not mutually exclusive, thus the same patient could be classified as outlier, transfer, non-acute and death.

The average case weights for each hospital, when all cases were included, are found in Figure 13. A much wider range in expected costliness of the average case was found within hospital types when atypical cases were included. The importance of the weights attributed to the *atypical* cases becomes obvious since the teaching hospital group was not identified as having the highest average case weights. Indeed, four of the major urban hospitals had higher average case weights than the two teaching hospitals when all cases were examined. The high average case weights found in small hospitals may be a result of only a few *atypical* cases in each facility; with small caseloads these ***atypical*** cases have a major impact on average case weight.[59]

Calculation of the case weights for a second more recent year of data 1992/93; demonstrated that overall there was a strong positive correlation ($r=.81$, $p=.0001$) between hospital average case weights for 1991/92 and those for 1992/93. The relationship was weaker, though still highly significant, for the small rural hospitals ($r=.65$, $p=.0001$). When small hospitals' data were examined individually, it was found that those hospitals which had average case weights that were very different from the mean for their hospital type in 1991/92 all had substantially different results in 1992/93. These hospitals had case loads of fewer than 300 cases suggesting that our method is unstable for hospitals with low case loads. Further study is required to determine the case load level necessary for stable results.

Advantages of Using CMGs versus RDRGs

RDRGs were chosen by MCHPE because they measure the acuity level of hospital cases. Our use of RDRGs has the disadvantage that Manitoba hospitals that use CMGs to describe their cases cannot easily translate our results. As we want this analysis to be useful, we have attempted to determine if the additional precision which we believe the RDRG system provides to case-mix costing is worth the inconvenience to the urban hospitals.

Since the CMGs as well as the RDRGs were both developed directly from the original DRG system, there are many similarities between the two. To illustrate this, Table 15 demonstrates

[59] If this pattern is not consistent over time, the results have less predictive power.

how the CMG and the RDRG systems classify patients with acute myocardial infarction (AMI). CMG has two categories of AMI patients: those with cardiovascular complications and those without (CMGs 194 and 195 respectively). The RDRG system has four categories of AMI patients, each with different levels of cardiovascular complications as well as other CCs expected to have an impact on resource use.[60] The RCWs for each RDRG level (far right column in Table 15) indicate the different resource use expected for each category. Of the 570 cases the CMG categorizes as having complications, the RDRG system classifies 95% [(350 + 120 + 69)/570] as having CCs, with 120 (21%) of these receiving additional weight because they had severe CCs. Only 31 (5%) of the cases identified as having complications in the CMG system were not classified as CCs in the RDRG system. In contrast, fully 27% [(279 + 63)/1247] of the cases that the CMG system would put in the no complication category were classified as having moderate or severe CCs by the RDRG system, and therefore received higher case weights accordingly.

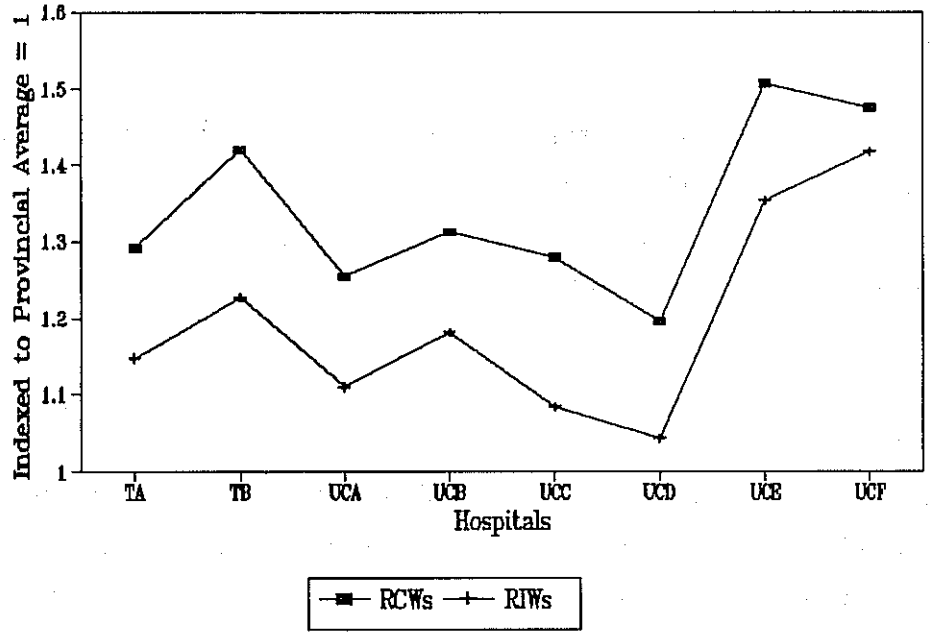
Table 15: RDRGs versus CMGs - Distribution of Cases for AMI

RDRG	CMG		
	194 No Cardiovasc Comp	**195 Cardiovasc Comp**	**RCW**
1210 - no/minor CCs	814	31	1.998
1211 - Moderate CCs	279	350	2.295
1212 - Severe CCs	63	120	3.121
Early Death (2 days or less)	91	69	0.571
TOTAL	1247	570	

[60] AMI cases resulting in death within 48 hours are categorized separately by the RDRG system reflecting the cost experience of these patients found in Maryland and New York data.

To further investigate whether using the RDRG case-mix system affected our assessment of hospital case weights, we calculated both an average CMG weight (using the RIW developed by HMRI) and an average RCW for cases treated at each hospital during the year. All *typical* patients were used in this analysis. A Spearman Rank order correlation test suggested that there was a strong positive relationship between the rankings of the two methods (corr=.83, p=.0001); hospitals that had a costly case mix using the CMG system also had a costly case mix using the RDRG system.

Figure 14: RCWs versus RIWs
For Urban Hospitals (Typical Cases)



As can be seen in Figure 14, the RDRG system also appeared to give more credit to the urban hospitals for having a more complex case mix, a result that seems reasonable given our expectations that this system does a better job of distinguishing acuity. The urban community and teaching hospitals had a higher indexed weight when judged by RCWs, which suggests that the increased acuity levels picked up by the RDRG coding system benefited the teaching and urban hospitals. Over half of the 42 smaller and multi-use hospitals had a lower average RCW than RIW index and among those with a higher RCW index the difference was very

small. This suggests that the use of CMGs to develop case-mix adjusted costs would tend to underestimate the costs at urban hospitals relative to the rural hospitals.

In summary, the system used to describe the costliness of cases treated at Manitoba's acute hospitals appears to have worked well. The RDRG system provided a method more sensitive to capturing case severity than did the simpler CMG system with which hospitals are more familiar. Using RDRGs, we found a large proportion of the costliest cases being treated at the urban hospitals and few at the smaller hospitals. However, the teaching hospitals also had a large secondary care component and thus performed many community hospital functions (such as obstetrics and pediatrics). The vast majority of their cases were of relatively low levels of complexity and without characteristics (transfers, deaths or very long stays) which would classify them as *atypical* .

When only the *typical* cases were examined, the average hospital case weights appeared in a more logical pattern, with the highest average case weights for the teaching hospitals and the lowest for the northern isolated hospitals. Since the *atypical* cases made up about 55% of the overall days at Manitoba hospitals, as Figure 7 illustrates, they had a major impact on how costly, on average, each hospital's cases were expected to be.

4. Cost per Weighted Case

The average cost per weighted case (CWC) was calculated for each hospital by summing the weights assigned to all cases treated by a hospital during the 1991/92 fiscal year (described in step 3 above) and dividing the resulting number into the hospital's total inpatient expenditures (step 2 above).[61] This was the final step in the flow chart (Figure 1), and the focus of this report. As discussed earlier, in calculating the case weights we made every attempt to adjust for differences in patient acuity across hospitals.

[61] Because the denominator for the CWC consists of weights developed using Maryland charges and Manitoba lengths of stay, the values calculated will not represent actual dollars spent per case, but relative costs.

IV. FINDINGS

The CWCs for each hospital represent their average cost per case, adjusted for the types of patients they treated. We compared CWCs across hospitals to determine whether there were major differences across Manitoba hospitals in the relative efficiency with which cases were treated.

Figure 15: Average Indexed Cost Per Weighted Case by Hospital (All Cases)

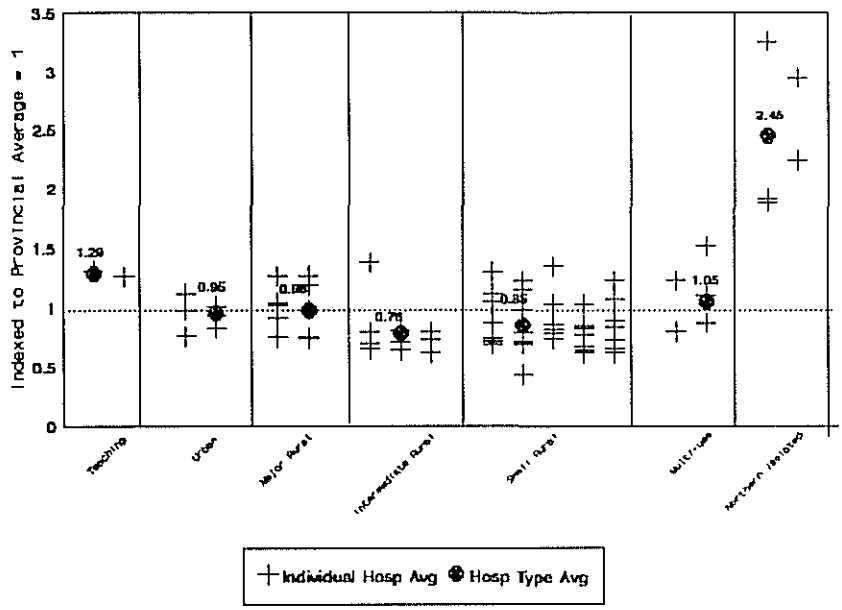


Figure 15 plots the indexed[62] average CWC for each hospital within their hospital type, along with the mean for that type. There was considerable variation both within and across most types of hospitals. The costs at northern isolated hospitals were significantly higher than those of other hospitals. The reasons for these differences were not explored in detail, but

[62] The provincial average, calculated by summing all hospitals' average cost per weighted case and dividing that by the number of hospitals, was indexed to 1, and each hospital's CWC was indexed accordingly.

were likely due to very low occupancy rates, which ranged from 20.2 to 40%, in combination with such probable factors as northern transportation costs, higher wages and/or past funding patterns. Because these are relatively small institutions treating 105 to 747 cases a year with total budgets ranging from $666,166 to $2 million compared with urban hospital budgets of $24 to $287 million, we did not further investigate the reasons for their apparent costliness in the current study.

The costs for the remaining hospitals ranged from 57% lower to 52% higher than the provincial mean CWC. The teaching hospitals were considerably less efficient than other hospitals, scoring 29% higher than the provincial average, while the intermediate rural hospitals were on average the most efficient, scoring 22% lower than the provincial average. The greatest range in efficiency was found at the small rural hospitals, although due to the small number of cases treated at some of these institutions, we will be more confident about assessing efficiency for this group after additional years of data have been examined.

Urban Hospitals

The urban hospitals (teaching and non-teaching) ranged from 14% below to 31% above the provincial average CWC. Variations in efficiency in these hospitals are particularly important considering these eight institutions served 65% of the patients and accounted for 76% of the provincial expenditures for inpatient care. Two urban community hospitals had relatively low CWCs when compared to the other urban hospitals, (that is they were more efficient) and the two teaching hospitals were considerably more expensive. Using the second most efficient urban community hospital (UCB) as the standard, the other urban community hospitals were 14 to 35% more expensive, while one teaching hospital was 56% more expensive than this hospital.

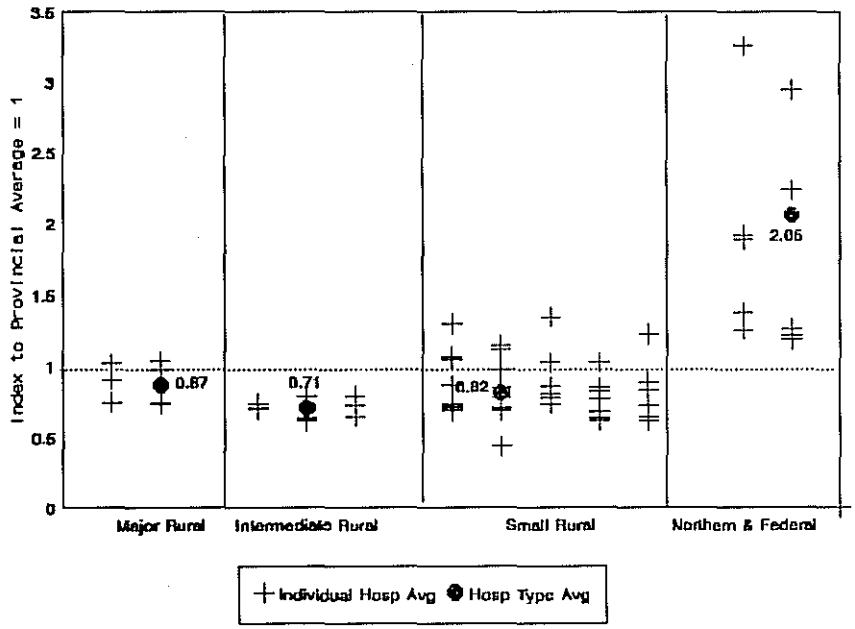
Interestingly, the two urban hospitals with the lowest CWCs were also identified in a previous study as two of the hospitals that discharged patients more efficiently (Brownell and Roos, 1992). This suggests that it should be possible to treat patients in a shorter time period without incurring greater costs.

Rural Hospitals

As was discussed earlier, the placement of the hospitals into the various groups was done based on both the size and the function of the hospital. One would then expect that CWCs should be relatively similar within the groups. Yet the range for rural hospitals in Figure 15 is considerable, from 57% below to 52% above the provincial mean. Among the major rural hospitals, three appeared to be very efficient relative to the others. Costs at the other (non-northern) major rural hospitals were 21 to 38% higher than the two most efficient hospitals. There were also three intermediate rural hospitals that appeared to be very efficient relative to the others, with costs at the other (non-northern) intermediate rural hospitals 11 to 27% higher than the three most efficient hospitals. While there were marked variations in efficiency across the small rural institutions, findings based on one year of data for these small hospitals are problematic due to the small number of cases.

Figure 16: Average Indexed Cost Per Weighted Case

For Rural Hospitals With Northern and Federal Hospitals Separated (All Cases)



One factor that likely affected northern hospital costs, for which we did not adjust in this analysis, was northern location. We therefore placed the three major rural hospitals, the one intermediate rural hospital, and the one small rural hospital that are located in the north into a group which also included the northern isolated facilities (Figure 16). By moving the northern hospitals into a separate group, the mean for each of the rural hospital groups declined as did the variation across hospitals (compare Figures 15 and 16). In Figure 16 the more expensive facilities in the northern group were the northern isolated facilities. Even with the separation of all northern facilities, there remained considerable variation between CWCs across all rural hospitals, with the largest variation in the *small rural* and *multi-use* facilities. Average indexed CWCs and their standard deviations by hospital type are found in Table 16.

Table 16: Average Indexed CWC by Hospital Type

Hospital Type	Average Indexed CWC	Standard deviation
Teaching	1.29	0.035
Urban Community	0.95	0.127
Major Rural	0.88[63]	0.13[63]
Intermediate Rural	0.71[63]	0.07[63]
Small Rural	0.86	0.292
Multi-use	1.05	0.621
Northern Isolated	2.45	0.478

As a group, the intermediate rural hospitals appeared to function the most cost-efficiently; the northern isolated facilities the least so. Within the small rural and multi-use groups there

[63] These values were calculated without the northern hospitals. When the northern hospitals were included the corresponding values were: mean CWC of .98, with a standard deviation of .221 for the major rural hospitals and a mean CWC of .78, with a standard deviation of .213 for the intermediate rural hospitals.

were several hospitals that were substantially more expensive than the others. While this may suggest that there was considerable room for improvement in efficiency within these groups, one must be cautious when interpreting these data as there were very few cases in many of these hospitals. Additional years of data will make it possible to review the costs of numerous small hospitals.

How Important Are the Cost Differences?

Major attention is currently being paid to the costliness of the acute hospital sector. Hospitals account for approximately 60% of health care costs in Manitoba and any attempt to move funding towards community-based alternatives will focus on the acute hospital sector as the source of the shift. Since a major reason for undertaking this report was to determine if some hospitals are more costly than others, holding case mix constant, it is useful to highlight where the major cost inefficiencies were identified and the effect of these inefficiencies.

Using various efficient hospitals as benchmarks we estimated the percentage savings possible if hospitals could achieve a given level of efficiency. Table 17 shows these potential savings, given the following assumptions: teaching hospitals operating at the level of the average of the urban community hospitals; urban community hospitals operating at the level of efficiency of the second most efficient urban community hospital (UCB); the major rural hospitals operating at the level of the three most efficient major rural hospitals; the intermediate rural hospitals operating at the level of the three most efficient intermediate hospitals; the small and multi-use facilities operating at the average of the small rural hospitals, and; the northern isolated hospitals operating at the provincial average CWC. The majority of savings came from improved efficiency at the teaching hospitals, with over half of the estimated savings found at these institutions. This is a function of the size and average efficiency, as measured by the CWC, at these two hospitals. If the teaching hospitals were to reach the level of efficiency of the average of the urban community hospitals, savings of 10.7% of the total inpatient budget for the province could be achieved. Although the northern isolated hospitals were very expensive and there were large variations across the small rural and multi-use facilities, the estimated potential savings in percentage terms at these facilities were low. The total estimated savings, given these assumptions, were 21% of the inpatient budget. If the

benchmark for the teaching hospitals was changed so that they were operating at the efficiency level of the second most efficient urban community hospital, (with all other hospital benchmarks remaining the same) the total estimated savings for all hospitals would be 25% of the inpatient budget. *It must be noted that these calculations were done at a point prior to the extensive changes that have since occurred at the teaching hospitals.* Further, the teaching hospitals did not have an adjustment for "teachingness" factored into their CWCs. However, even if a 10% teachingness factor was allowed, which is roughly what is used in the U.S, considerable differences between the teaching hospitals and least expensive urban community hospitals would have remained.

Table 17: Percentage Savings

Conditions Required at each of the Hospitals	Percentage Savings of Total Provincial Inpatient Expenditures
Teaching @ CWC of Average of Urban Community	10.68
Urban Community @ CWC of UCB	3.57
Major Rural @ average CWC of MRI & MRF	4.04
Intermediate Rural @ average CWC of IB, IG & II	0.84
Small Rural @ Small Rural Average CWC	0.59
Northern Isolated @ Provincial Average CWC	0.92
Total Savings	20.82

How Accurately Are We Assessing Efficiency?

1. Adjusting for Patient Acuity and Complexity

Although every effort was made to adjust for key patient characteristics that might make care more costly, no system is perfect. We attempted to determine if key factors that affect the costliness of some hospitals were overlooked, or if the methodology described above did not adjust sufficiently for the resource requirements of certain types of cases. For example, if the method for case-mix adjustment worked as it should, we should find that hospitals which treat many patients who are near death were in general no more costly (after adjustment) than were hospitals who treat relatively few patients of this type.

Our approach to case-mix adjustment appears to have worked well. We tested our methods statistically by correlating hospitals' average cost per weighted case with a number of different characteristics that could potentially influence cost. After adjustment, hospitals with a high proportion of elderly cases, very short-stay cases, non-acute days, or cases resulting in death were no more likely to be costly than hospitals with a low proportion of such cases.

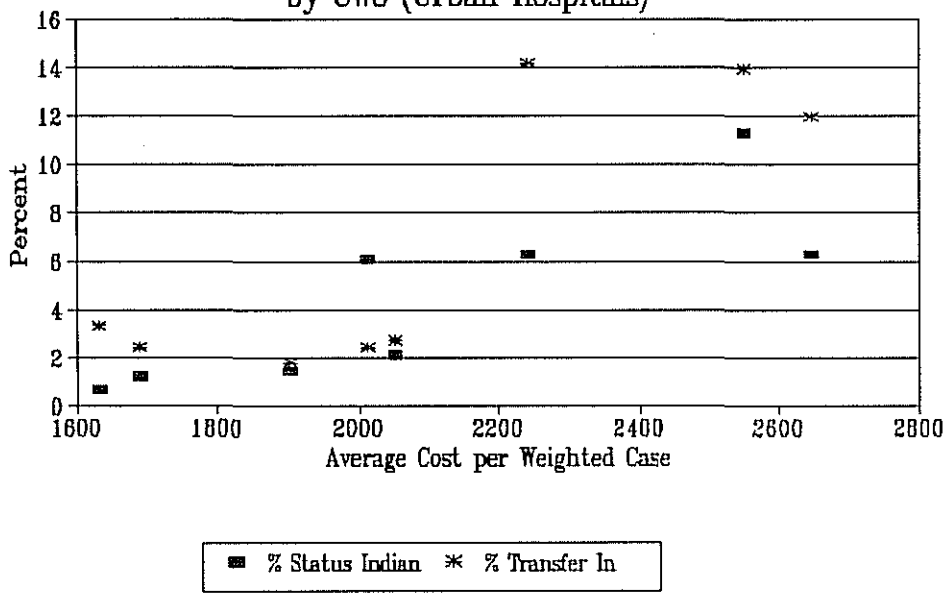
Sensitivity tests

These findings were further supported with the use of regression analysis in which we found no significant relationship between cost per weighted case and the following variables: outlier cases, cases that ended in 1-3 days, Status Indian cases, cases transferred in and out, typical cases, pediatric cases, elderly cases, and cases with non-acute days and cases discharged before the trim. Similar analysis was done using the case weights rather than number of cases and again the results held.

It is possible that hospitals with large outpatient surgical programs might have only sicker, more complex cases treated surgically on an inpatient basis. Although RDRGs should handle any differences in inpatient acuity arising from differences in emphasis on outpatient surgery, we still wanted to test for the possibility that there was a relationship between the proportion of cases operated upon using outpatient surgery and the costliness of the hospital. For rural hospitals, case-mix adjusted rates of outpatient surgery were actually found to be negatively correlated with high inpatient costs, indicating that higher cost hospitals did *less* outpatient

surgery. Urban hospitals that performed more outpatient surgery also had a negative, though not statistically significant, relationship between CWC and outpatient surgery. Therefore, the RDRG system with its varying levels of acuity appears to adjust well for hospitals which had high outpatient surgery rates.

Figure 17: Percent Status Indian & Percent Transfer-In by CWC (Urban Hospitals)



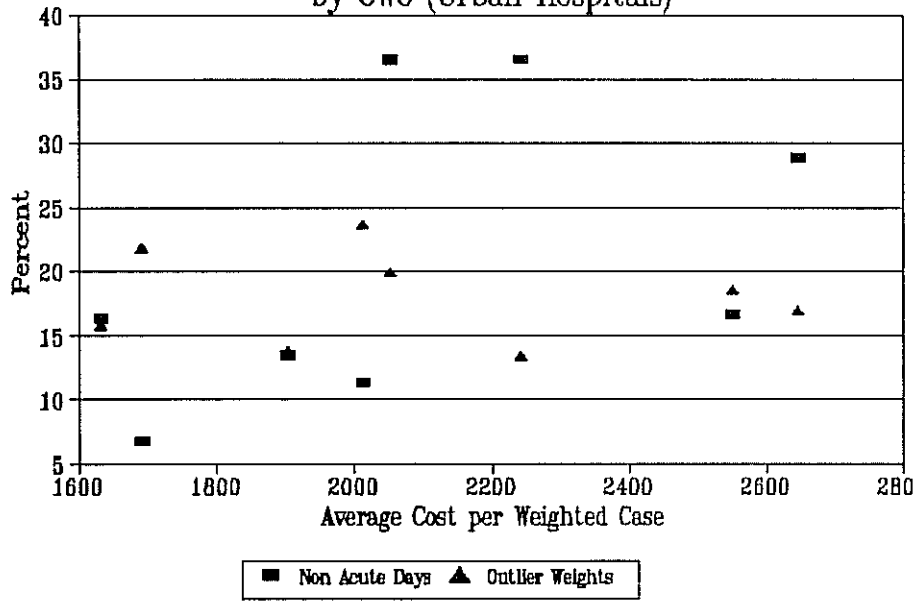
Across rural hospitals there appeared to be no characteristics associated with the acuity or complexity of cases. However, across the eight urban hospitals, we found that those hospitals treating a higher proportion of Status Indian patients tended to have higher than average CWCs ($p=.006$, Table 18) and that the three urban hospitals that had a higher than average proportion of their case weights associated with cases transferred in from another hospital (12 to 14% compared with 2 to 3% for the lower cost urban hospitals) tended to be more costly (Figure 17). Statistical correlations do not measure cause and effect. Hence, this could be a coincidental finding given the domination of the costly hospitals by the teaching institutions; the teaching hospitals receive more transfers and treat more Status Indians. Neither factor (percent Status Indians nor percent of case weights associated with cases transferred in) was associated with higher CWCs in the rural hospitals or northern facilities. To explore the potential impact of transfers on efficiency ratings, sensitivity analysis was performed, where

the case weights for all transfers into urban hospitals were increased by 20%. This resulted in only a 1% change in average CWC for these hospitals, thus it does not explain the large differences in costs. Whether these are real limitations of our adjustment techniques or whether the correlations are influenced by the small number of urban hospitals requires further examination.

Table 18: Significant Correlations[64] Between CWC and:

Hospitals	Number of Hospitals	% Cases Status Indian	Occupancy Rates	Percent of total Weights for Cases Transferred Into a Hospital
All excluding Northern Isolated	71		-.22 (p=.05)	
All Rural	63		-.48 (p=.0001)	
Urban	8	.84 (p=.009)		.70 (p=.05)
Northern and Federal	10		-.74 (p=.002)	

Figure 18: Percent Non-Acute Days & Outlier Weights by CWC (Urban Hospitals)



[64] For all correlations in this table, the probability was < .05.

2. Adjustment for Atypical Cases

Our approach for adjusting case weights for cases that had an *atypical* hospital stay and for non-acute cases appears to have worked well. Hospitals with a high proportion of such patients were not found to be either particularly costly or inexpensive. Figure 18 graphs both the percentage of non-acute days and percentage of total case weights attributed to outliers against the average CWC for each of the urban hospitals. There was no direct relationship between CWCs and these measures. Nor was there a direct relationship between the percentage of outlier cases and CWCs. Similar results were also found when rural hospitals were examined using these variables.

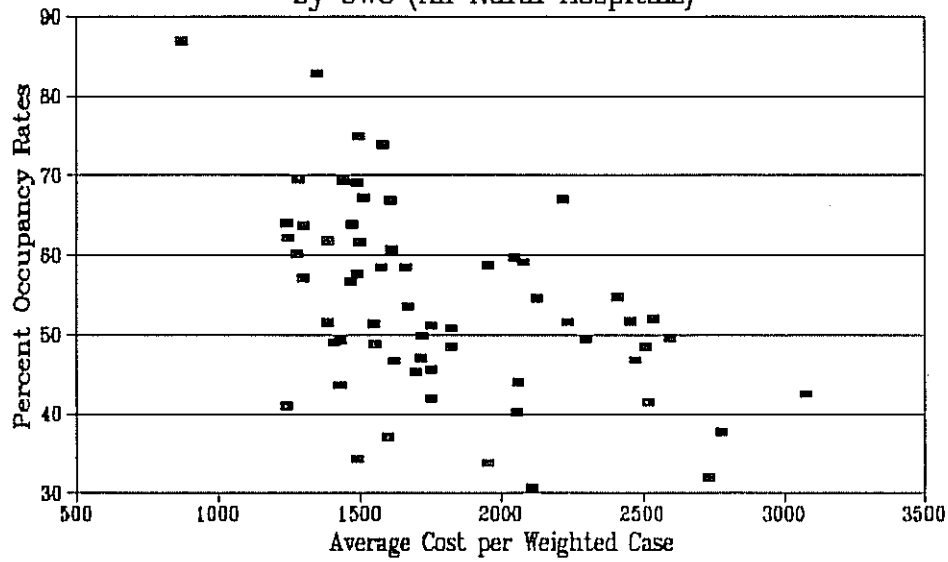
The adjustment for cases that were transferred out of facilities appears to work well as there is no correlation in any of the hospital groups between CWC and either the percent that were transferred out or their total case weights.

Other Characteristics Associated with High or Low Cost per Weighted Case

Urban Hospitals

The two teaching hospitals were clearly the most costly urban hospitals even after adjusting for the complexity and acuity of their case mix. This has been observed in other jurisdictions (Case Mix Research, 1989; Thorpe, 1988; Rogowski, 1992). Since the two teaching hospitals are by far the largest institutions it is difficult to assess the finding that size was strongly associated with costliness, whether size is judged by total cases or by funded beds. Correlations done with both teaching hospitals and northern isolated hospitals removed from the analysis found size was not significant among the remaining 63 hospitals.

Figure 19: Occupancy Rates
by CWC (All Rural Hospitals)



Rural Hospitals

Across the rural hospitals we found no relationship between size and costliness. There were costly large hospitals and costly small hospitals; this was true even when the larger northern hospitals were excluded. However, occupancy rates and costliness were related, with the nine costliest hospitals having occupancy rates of 60% or less (Table 18, Figure 19).

As surgical programs are often thought to be associated with high costs, particularly in smaller hospitals, we also examined whether rural hospitals' relative costliness was associated with having a small (or large) surgical program. No correlation was found (Figure 20).

Nursing Costs

To determine whether differences in nursing costs drive differences in CWCs, total inpatient nursing costs were examined. A nursing CWC was calculated and proved to be highly correlated with the total CWC suggesting that those hospitals with high CWCs also had high nursing expenditures (Figure 21). In other words, those hospitals that were least efficient in all aspects of nursing seemed to be those that were also least efficient in terms of overall costs.

Figure 20: Percent Surgical Cases
by CWC (Small Rural Hospitals)

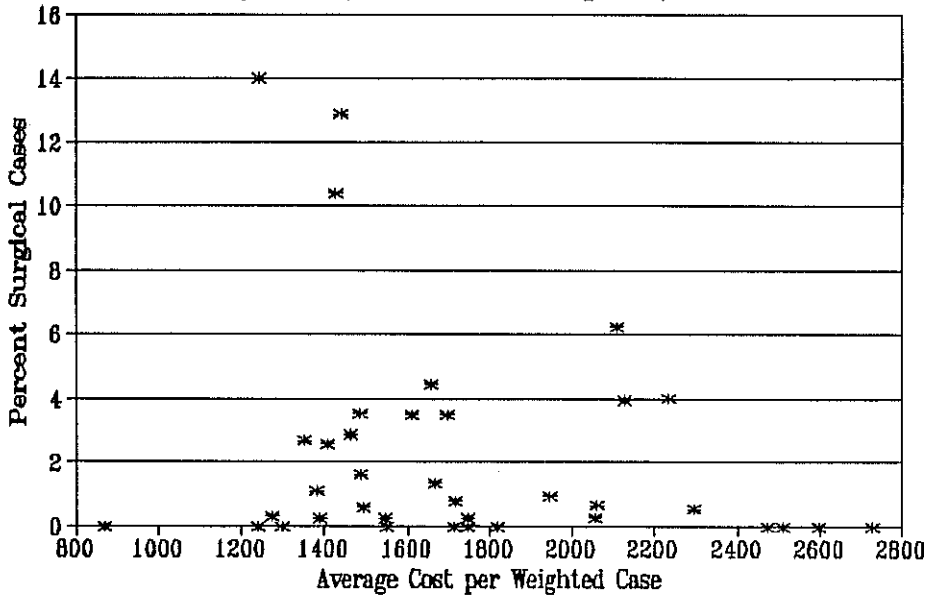
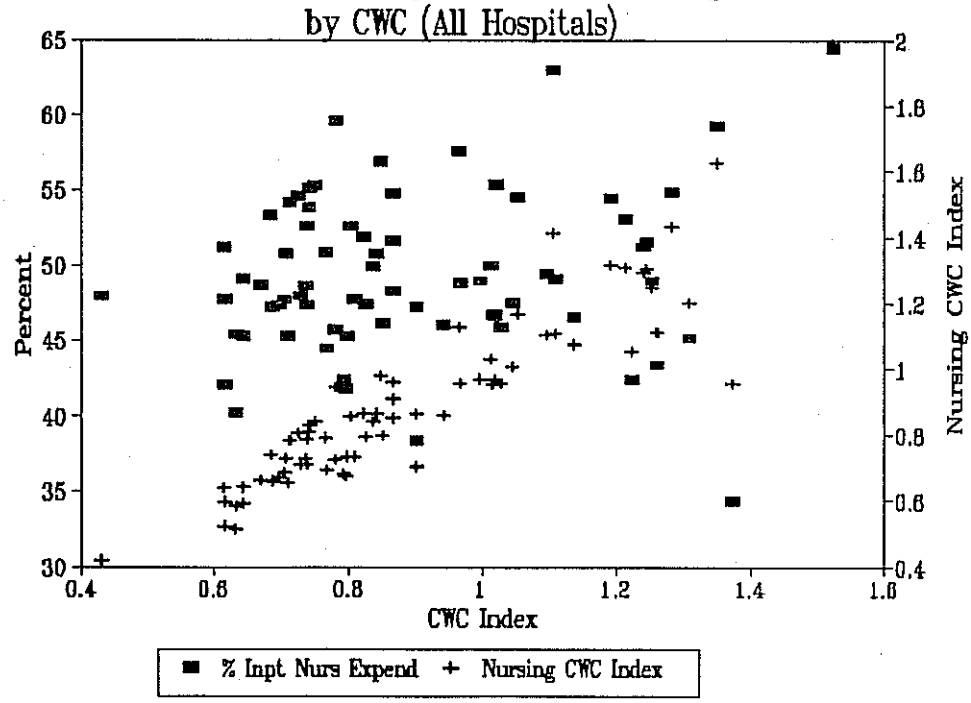


Figure 21: Nursing Expenditures & Nursing CWC Index
by CWC (All Hospitals)



The total CWC and percent of total inpatient budget allocated to nursing departments were not significantly correlated. Further investigation is required to understand the importance of nursing costs and their effect on CWC.

Teaching Hospital Analysis

One striking finding of this study was the difference between teaching and urban community hospitals' average costs per weighted case. It is often argued that there is a "teachingness" factor, resulting from indirect costs incurred by interns and residents, which would explain the differences between the costs at teaching and non-teaching hospitals.

If one accepts that the difference between costs after case-mix adjustment is entirely related to the indirect costs of interns and residents, this would imply that *each* of the 372 interns and residents enroled at the Manitoba Medical School were responsible for more than $175,000 of indirect costs each year. Once one adds the direct costs (largely interns' and residents' salaries), this number increases to over $220,000 per year for each intern and resident. It is hard to believe that all these excess costs associated with teaching hospitals are the result of the activities of residents and interns.

Interprovincial Comparisons

As a first step in further investigating the relationships between teaching and community hospital costs we compared Manitoba data[65] to similar data available for Alberta and Ontario. Due to different methodologies, direct comparisons of costs per weighted case are misleading; therefore we compared cost relationships between the different types of hospitals. The difference in CWC between teaching hospitals and the major urban hospitals ranged from 6% in Alberta to 40% in Manitoba, with Ontario teaching hospitals being in between at 33% more expensive than urban community hospitals. This implies that in Alberta the teaching hospital CWCs were only 6% greater than at urban community hospitals while in Manitoba they were 40% higher.

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[65] Brandon Hospital was not included as a Major Urban Hospital for interprovincial comparisons. Only hospitals in cities larger or similar in size to Winnipeg, Edmonton and Calgary were included in the Major Urban category.

Before one accepts that teaching hospitals are inevitably more expensive, one must consider possible explanations. For example previous funding patterns may have reinforced these differences, as in Ontario where teaching hospital peer groups were funded on a higher cost per weighted case than other hospital groups. A more detailed discussion of these data and their implications can be found in Appendix J.

American Experience

The differences between teaching and community hospitals have been studied in depth in the United States and results suggest that a "teachingness" adjustment would not be sufficient to explain why teaching hospitals were 35% more expensive than the Urban Community[66] hospitals.

When two models specified by Thorpe (1988) were applied to Manitoba urban hospital data it was estimated that 6.7% to 9.4% of TA's costs and 7.7% to 9.4% of TB's costs could be attributed to teachingness. Another model by Rogowski estimated a teachingness variable which would explain only 1.2% of each hospitals' costs.[67]

These regression models used the ratio of interns and residents to beds as one of the independent variables to capture the teachingness costs. If teachingness costs are indeed a significant factor in the cost difference between teaching and urban community hospitals then as the number of interns and residents decreases in the province so should the total costs attributed to the teachingness factor. While there was considerable variation in results using these different specifications, (described in more detail in Appendix J), the message is the same: none of the U.S. models explain the 35% plus difference between the teaching hospital CWC and that of the Urban Community hospitals. There may well be other logical reasons as to why the teaching hospitals' costs per weighted case were higher than that of urban

[66] Here Brandon General Hospital was included in the Urban Community Hospital analysis.

[67] Application of a U.S. econometric model which excluded bed size variables (Rogowski and Newhouse, 1992) suggested that 16.8% and 19.2% of the costs at TA and TB, respectively, could be attributed to teachingness.

community hospitals. This may relate to the practice habits of those physicians who admit or consult at teaching hospitals. It may be that they order more tests and prescribe more expensive drugs than do physicians practising in non-teaching hospitals. The issues surrounding indirect teaching costs and other costs associated with teaching hospitals are complex and this is an area which requires further examination.

Sensitivity of the Results to Changes in the Case Weight Methodology - Relative Case Weights

The method for calculating case weights described in this paper was *a priori* our preferred method. This method used all cost components available in the Maryland data (diagnostics, nursing, supplies etc.), information on cost data over various length of stay intervals and different types of cases (medical, surgical, obstetrics and others). As a test of how sensitive our results were to complex adjustments, we used a second, less complex method, dropped the detailed analysis of costs and examined differences between type of case (surgical, obstetrics, etc). This is similar to the methodology used by the Rand Corporation researchers (Carter and Farley, 1992).

Correlations on the average case weights obtained for each hospital across the two methods ($r=.99$, $p=.0001$), suggested that Method 1 (our preferred method) is robust. Regressions were run with the actual cost per case[68] for each hospital as the dependent variable and mean case weight, from each of Methods 1 and 2, as the independent variables. The explanatory power of the case weights from both methods was similar, with the mean case weight explaining 56% of the variation in costs in method 1 and 54% in method 2. Thus, significant changes in the methodology led to very little difference in the results; the much simpler methodology may be sufficient in any subsequent work. The regressions also demonstrated that the variation in average case costs explained by the case-mix adjustment was significant and similar to that found by others.

[68] Northern isolated hospitals were excluded.

Concerning the adjustment for non-acute cases, we wondered if the marginal cost weight over-estimated the actual costs of long-stay outliers, and whether or not those hospitals which correctly coded these cases may have been penalized by being assigned non-acute weights. Two different sensitivity tests were done of the marginal costs. The first used 60% of the marginal cost weights in Method 2 and yielded results similar to those we have reported here, with the correlations between rankings significant and explaining 55% of the variation in costs. The second method decreased the marginal cost weights used in Method 1 by 25%, and again we found that the relative cost per weighted case changed very little across hospitals. While this was a crude analysis which implied a constant reduction in all marginal cost weights (unlikely in reality), it demonstrated that the sheer quantity of outlier days had a major impact on hospital costs. Thus, despite the numerous *atypical* cases and their impact on case weights, altering the marginal cost weight did not significantly alter the findings, suggesting that hospitals that code non-acute cases accurately were not negatively affected.

Any small problems regarding allocations of costs or missing data appear unlikely to affect results. The above findings, in combination with the previous allocation study (Wall, DeCoster, Roos, 1993) which yielded comparable results when using two very different allocation methods, suggest that our results are likely very robust.

Hospital Cost Analysis Regressions

While the goal of this paper was to adjust for case mix at the hospital level we also conducted regression analyses to examine the importance of determinants of hospital costs. Teaching hospitals and northern isolated hospitals were excluded from the following analysis due to their anomalous costs.

Regression analysis was performed using cost per case as the dependent variable with the following independent variables: indexed hospital average case weight (referred to as case mix index CMI); occupancy rates; North - whether hospital was located in Norman or Thompson region; and proportion of cases that involved a stay in an Intensive care unit (ICU). As we expected, the CMI explained the greatest amount of variation between costs. Also not surprisingly, we found a negative relationship between cost per weighted case and higher

occupancy rates. When one included the ICU variable as an additional measure of case mix, we found that the higher the proportion of ICU days the higher the expected CWC. It may be that the ICU variable captures some differences in case mix which are missed by the RDRGs and may explain higher CWC costs at certain hospitals, although it would seemingly do little to explain the differences in costs between the urban community hospitals and teaching hospitals. One of the teaching hospital's proportion of ICU days was .8 percent higher and the other about .6 percent lower than the average for the Winnipeg community hospitals. The use of ICU days to supplement case mix will be further investigated when examining 1993/94 data. It is important to remind the reader that the RDRGs appear to have done a better job of explaining acuity levels than did the CMGs in 1991/92 for the urban hospitals.

The North variable implied that the average cost per case at northern hospitals would be 28% higher than otherwise expected. It is not surprising that Northern cost per case would be higher given the northern allowances and generally higher cost of goods and services. A more complete discussion of the regression analysis is found in Appendix I.

V. QUALITY OF CARE - READMISSIONS

Readmission rates have been used in other studies to examine the issue of quality of care and available resources. (HMRI, 1992; Corrigan and Martin, 1991; Burstin et al., 1993). To investigate whether those hospitals that had been found to be more cost efficient were delivering poorer quality care, we examined 30-day readmission rates for several high frequency patient categories (*typical* patients only). Correlations between readmission rates and CWCs were calculated for nine different diagnostic categories in each of the urban and major rural hospitals (18 hospitals). No relationship was found between higher readmission rates and lower average CWCs. In fact, the only significant relationship found was that high cost hospitals had higher readmission rates for uterine procedures. Overall there appears to be no evidence that hospitals that were more efficient delivered lower quality care.

VI. LIMITATIONS OF THE STUDY AND POSSIBLE IMPROVEMENTS

Analyses Conducted on 1991/92 Data

It is important to bear in mind that these analyses were conducted on 1991/92 data. Since this time, there have been major changes in the Manitoba system, with the teaching hospitals in particular experiencing bed closures and budget constraints. Whether budget reductions will translate into greater efficiency will depend on whether reductions in cases were comparatively small. If the decrease in cases was small relative to the dollars cut at the teaching hospitals, then their relative efficiency should improve markedly; however the opposite could also occur. Clearly, replication of these analyses will be necessary not only to assess the stability of the findings, but to provide a more current assessment of the cost efficiency of the teaching hospitals.

Lack of Local Cost Data

A major concern regarding this type of research in general is the use of American charges to build weights. The implicit assumption underlying the use of American charge data is that there is a constant relationship in relative case costs between Canada and the United States, with, for example, cardiac bypass surgery being more expensive than hernia repair. Certainly, Ontario and Alberta have been confident enough in the relative equivalencies between Canadian and American hospital costs to make funding decisions based on similar comparisons. We have used 1991 and 1992 Maryland charge data which are more current than the 1985 New York data used by HMRI in Ontario and by Alberta. The fit of our regression model suggests that U.S. charges can be used with some confidence to measure expected costliness of Manitoba hospitals. The assumption about relativity of costs between the two jurisdictions will continue to be made until Canadian specific cost data are available; however, we have no reason to believe the use of Maryland charges in conjunction with Manitoba length of stay data would distort the weights to the extent that the results would be inaccurate, particularly given the robust nature of the findings.

Until patient-specific Canadian cost data are available, several improvements could be made to existing Manitoba data sources to ensure reliable and valid results:

1. Hospitals should be required to report HS-1 data in a consistent and correct manner. This would alleviate much of the manual checking and verification of results in such areas as census days. Requiring supplemental information, such as allocation of drugs and medical and surgical supplies between inpatient and outpatient areas, would enhance the analysis.

2. Coding of diagnoses and procedures should be consistent across hospitals. Currently some hospitals are very diligent about coding additional diagnoses, while others are not. This may be a function of physicians failing to document all appropriate diagnoses or a failure of these diagnoses to be abstracted. To understand more clearly the prevalence and overall costs of non-acute patients in acute care beds, the coding of these cases should be improved at "poor-coding" hospitals by appropriate use of the available service codes. Alternately, all hospitals could indicate non-acute status with a separate admission (as in Ontario).

3. Many hospitals with attached personal care homes (PCH) are uncertain as to the accuracy of the division of costs between the hospital and personal care home for shared services. In order to obtain pure inpatient hospital costs, it is necessary to investigate further, although to date we have not found any relationship between CWCs and hospitals with attached PCHs.

4. More specific data should be collected regarding the provision of services by one hospital for another. Many facilities are funded as regional centres, where pharmacy services, dietetic advice or physiotherapy services are provided for another facility. Where possible we reallocated costs to the appropriate facility, but in many cases it was not possible to do so.

5. In order for the data to be complete, actual costs from both the Cadham Laboratory and the Red Cross for services provided to hospitals are needed, with a distinction made between inpatients and outpatients.

The lack of these cost data may create a bias against the two teaching hospitals as they will more completely capture total costs for their patients. On the other hand, given the complexity of their patients they are also proportionately more likely to use the yet uncosted Red Cross and Cadham Laboratory services. Attempts will be made to quantify these services when the work is repeated for another year. The extent to which services are provided by major rural hospitals to other smaller rural hospitals needs to be further explored.

Transfers

Further examination of transfers between acute care facilities needs to be undertaken in order to determine if and how the case weights developed in this report should be adjusted. The dual roles of large teaching hospitals as both tertiary care centres and community hospitals make this a complex issue, particularly if they receive many transfers that do not require tertiary care.

Appropriateness

This study examined the types of cases being treated at the acute care facilities, and how efficiently they were treated, but did not examine the appropriateness of admission or treatment. Of concern is whether or not all patients admitted to hospital actually required acute hospital services. A recent study in Ontario found that some areas of the province had hysterectomy rates several times higher than those found in other areas of the province (ICES, 1994); whether all of the procedures, particularly those performed in high rate areas, were appropriate is an important issue, but is not addressed by the current analysis. Likewise, a recent study of medical admissions across Saskatchewan hospitals (HSURC, 1994) estimated that 39 to 58% of adult medical days in urban hospitals and 45 to 76% of days in major and intermediate rural hospitals could have been spent in alternative levels of care, such as outpatient facilities, home care, or nursing homes. Since no such analysis of use of Manitoba hospitals has been undertaken (although the MCHPE has begun such a study) we do not know if there is a relationship between efficiency and appropriateness: a hospital that admits patients who do not in fact require hospital care, and then discharges them quickly, could actually look quite cost efficient using the current methodology.

Generalizability of Results

It should also be kept in mind that the results reported above are all relative to Manitoba data. That is, using the current methodology, we have no way of determining how efficiently Manitoba hospitals are operating with respect to hospitals in other parts of the country. Considering that expenditures per capita on hospitals in Manitoba are substantially higher than the Canadian average ($918 vs $802 in 1991/92), this is an important area for future study.

Other Limitations

The results for small rural hospitals should be considered preliminary due to the small number of cases at each of these facilities. Several years of data may be necessary to ascertain the stability of the findings for these hospitals. As mentioned previously, although the costs at northern isolated hospitals were significantly higher than those of other hospitals, the reasons for these differences were not explored in detail. If these institutions are to be included in efficiency comparisons in the future, an adjustment should be developed that will take into consideration the high costs of such factors as extremely low occupancy, shipping of supplies, higher wages and/or past funding patterns.

VII. SUGGESTIONS FOR MANITOBA HEALTH AND GOVERNMENT POLICY IMPLICATIONS

There are several areas where data collection could be improved in order to enhance this area of investigation, some of which have been mentioned in the preceding section. One other important area for improvement regards outpatient services and costs. In order to comprehend fully the efficiency of hospitals in Manitoba, all areas of expenditure need to be included. Outpatient services represent fully 20% of hospital activity, and this proportion is increasing, underscoring the importance of comprehensive data on both costs and cases. Improvements are required in both hospital data and charge data. More detailed coding of all diagnoses and procedures would enable a distinction between a routine clinic visit and a true emergency visit. Charge data should include: actual cost data for emergency rooms and other outpatient areas; separate reporting of outpatient costs by all hospitals (currently not done by

some rural hospitals); and a distinction between types of outpatient costs, for example, separate cost centres for such diverse outpatient areas as dialysis units and obstetrical clinics.

Because the use of case-mix costing as a funding mechanism has led to gaming the system in many instances, we would not recommend adopting case-mix costing as a sole funding mechanism. In the U.S., where DRGs are used for case-mix funding, specific software has been developed for coding diagnoses to maximize hospital case weights. As well, the implementation of DRG-based funding led to an increase in diagnoses per case recorded. In Canada, there is evidence of the shifting of inpatient costs to outpatient areas by hospitals to maximize funding formulas to their advantage (Jacobs and Hall, 1993). Such a system could also create incentives for over-admitting patients to hospital. We do recommend, however, that the CWCs described in this report be used as part of a "report card" for hospitals so that efficient hospitals could be rewarded for their efforts. Such a report card would also consider factors such as efficiency of discharge, appropriateness of admission, available resources in the community, as well as the age and health needs of the populations served.

Committees should be established within each hospital group to monitor efficiency. Inefficient hospitals should be encouraged to work with more efficient institutions to identify where improvements might be made.

VIII. CONCLUSIONS

Our case-mix adjustment for different types of patients across hospitals works well. Case weights across Manitoba hospitals for *typical* patients were distributed the way one would expect: most of the high resource-intensive, expensive cases were found at the teaching hospitals, and the overall complexity/resource intensity of cases found at these two hospitals, and at the other urban facilities, was markedly higher than that at the rural hospitals. Less expected, perhaps, was the finding that the teaching hospitals also treat a considerable portion of the low acuity, low resource intensive cases, suggesting they function not only as tertiary care institutions but also as large community hospitals, particularly for pediatric and obstetric admissions.

We have highlighted marked differences in cost efficiencies across hospitals for 1991/92. If further analyses support our assessments, such data could provide important information with which to adjust global hospital budgets. We do not, however, recommend moving to a system of funding hospitals based only on case-mix adjusted costs because experience in both Canada and the U.S. indicate that such a system is very "gameable". Instead, information which is gained by such work could be used as part of a "report card" for hospitals so that efficient hospitals could be rewarded for their efforts. Such a report card would also consider factors such as efficiency of discharge, appropriateness of admission, available resources in the community, as well as the age and health needs of the populations served.

Table 19: Hospitals and Hospital Categories

Hospital Type	Hospital	Code	Beds
Teaching	St. Boniface General Hospital	TA	756
	Health Sciences Centre	TB	986
Urban Community	Brandon General Hospital	UCA	381
	Grace General Hospital	UCB	333
	Misericordia General Hospital	UCC	388
	Victoria General Hospital	UCD	241
	Concordia General Hospital	UCE	136
	Seven Oaks General Hospital	UCF	329
Major Rural	Bethel Hospital, Winkler	MRA	57
	Bethesda Health & Social Services, Steinbach	MRB	80
	Dauphin Regional Health Centre	MRC	124
	Flin Flon General Hospital Inc.	MRD	100
	Morden District General Hospital	MRE	71
	Portage District General Hospital	MRF	131
	The Pas Health Complex Inc.	MRG	84
	Selkirk and District General Hospital	MRH	75
	Swan River Valley Hospital	MRI	87
	Thompson General Hospital	MRJ	100
Intermediate Rural	Altona Community Memorial Health Centre	IA	32
	Beausejour District Hospital	IB	30
	Carman Memorial Hospital	IC	30
	Churchill Health Centre	ID	31
	Johnson Memorial Hospital, Gimli	IE	35
	Minnedosa District Hospital	IF	27
	Neepawa District Memorial Hospital	IG	38
	Ste. Rose General Hospital	IH	68

Hospital Type	Hospital	Code	Beds
	Souris Health District	II	30
	Health District No.10, Virden	IJ	25
Small Rural	Arborg & District Health Centre	SA	16
	Baldur Health District	SB	16
	Boissevain Health District	SC	12
	Winnipegosis General Hospital	SD	18
	Rock Lake Health District, Crystal City	SE	16
	Southwest Health District, Deloraine	SF	20
	De Salaberry District Health Centre, St. Pierre	SG	16
	E.M. Crowe Memorial Hospital, Eriksdale	SH	17
	Erickson District Health Centre	SI	12
	Emerson Hospital	SJ	12
	Carberry Plains District Health Centre	SK	29
	Seven Regions Health Centre, Gladstone	SL	20
	Glenboro Health District	SM	14
	Grandview District Hospital	SN	18
	Hamiota District Health Centre	SO	23
	Teulon-Hunter Memorial Health District	SP	20
	Lorne Memorial Hospital, Swan Lake	SQ	22
	Tri-Lake Health Centre, Killarney	SR	26
	McCreary Alonsa Health Centre	SS	13
	Morris General Hospital	ST	33
	Notre Dame Medical Nursing Unit	SU	10
	Pine Falls Health Complex	SV	35
	Pinawa Hospital	SW	20
	Roblin District Health Centre	SX	25
	Riverdale Health Services District, Rivers	SY	16
	Russell District Hospital	SZ	38
	Birtle Health Services District	SAA	19

Hospital Type	Hospital	Code	Beds
	Shoal Lake-Strathclair Health Centre	SBB	23
	Stonewall and District Health Centre	SCC	18
	Lakeshore General Hospital, Ashern	SDD	16
	Ste. Anne Hospital	SEE	21
	Vita and District Health Centre Inc.	SFF	11
	St. Claude Hospital	SGG	12
	Tiger Hills Health District, Treherne	SHH	18
	Melita Health Centre	SII	11
	Wawanesa District Memorial Health Centre	SJJ	9
	Percy E. Moore Hospital, Hodgson	SKK	16
Multi-use	Benito Health Centre	MUA	5
	Pembina-Manitou Health Centre	MUB	8
	MacGregor and District Health Centre	MUC	6
	Health District No.10, Reston	MUD	17
	Rossburn District Health Centre	MUE	10
	Whitemouth District Health Centre	MUF	6
Northern Isolated	Snow Lake Medical Nursing Unit	NIA	5
	Gillam Hospital Inc.	NIB	10
	Lynn Lake Hospital	NIC	25
	Leaf Rapids Health Centre	NID	8
	Norway House Hospital	NIE	16

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Appendix Tables

These six Appendix Tables provide case, cost and weight information for individual hospitals -the key to these tables is found in Table 19 of the main document. There are three additional Appendix Tables, not included here, that provide case, cost and weight information for each of the RDRG categories. Because of their length, they will be available only upon request.

List of Appendix Tables

Appendix Table A-1 provides the calculation of inpatient costs for each of the acute care hospitals in Manitoba, for 1991/92. Further information about this calculation and the allocation methodology can be found in Appendix G.

1. Total Cost - this is the total operating expense from the HS-1 form.

2. Imputed Costs - this is the estimated costs for LIS and therapy costs.

3. Revised Total Costs - the imputed costs have been added in, and the amounts for purchased service contracts for these services have been removed.

4. Excluded Costs - the costs excluded here were medical remuneration, direct teaching costs and other non-patient care activities such as research, heating costs for Cadham laboratory and the medical school, etc.

5. Direct Outpatient Costs - costs directly attributed to outpatient services.

6. Allocated Outpatient Overhead - the portion of overhead costs that was allocated to outpatient services.

7. Recoveries Adjustments - this refers to cafeteria income which was added in to result in net cafeteria costs.

8. Inpatient Case Costs - this was the value used for inpatient care costs for other calculations in this study. It was calculated by subtracting columns 4 to 7 from column 3.

Table A-1

Calculation of Manitoba Hospital Acute Inpatient Costs, 1991/92

Hospital Code	Total Cost	Imputed Costs	Revised Total Costs*	Excluded Costs	Direct Outpatient Costs	Allocated Outpatient Overhead	Recoveries Adjustments	Inpatient Care Costs
TA	173,453,010	0	173,453,010	29,172,255	19,000,848	13,280,434	1,427,760	110,571,713
TB	287,578,425	0	287,578,425	66,746,964	37,743,585	22,828,434	2,569,425	157,690,016
Teaching Subtotal	**461,031,435**	**0**	**461,031,435**	95,919,219	**56,744,433**	**36,108,869**	**3,997,185**	**268,261,729**
UCA	46,825,772	0	48,309,232	5,636,259	4,814,295	2,817,665	679,226	34,361,787
UCB	46,682,229	0	46,682,229	6,277,099	4,479,222	2,872,240	278,595	32,775,072
UCC	54,370,048	0	54,370,048	8,634,025	3,350,276	2,260,550	321,132	39,804,066
UCD	38,390,076	0	38,390,076	5,161,724	3,569,943	2,964,728	412,322	26,281,359
UCE	23,508,761	0	23,513,195	3,530,474	3,216,348	2,453,430	201,742	14,111,202
UCF	48,551,222	0	48,551,222	7,208,893	4,992,235	3,748,594	827,823	31,773,677
Urban Community Subtotal	**258,328,108**	**0**	**259,816,002**	**36,448,474**	**24,422,319**	**17,117,207**	**2,720,840**	**179,107,162**
MRA	4,846,624	638,175	5,053,412	61,218	796,525	245,877	32,575	3,917,217
MRB	7,791,660	775,289	8,102,765	1,293,532	1,359,651	588,645	77,492	4,783,446
MRC	14,949,394	1,571,553	15,022,288	3,115,739	1,922,011	568,153	119806	9,296,579
MRD	10,335,664	1,085,548	10,451,651	195,560	1,571,812	694,350	68915	7,921,015
MRE	6,504,624	974,065	6,956,526	299,836	1,258,266	326,892	29899	5,041,633

Hospital Code	Total Cost	Imputed Costs	Revised Total Costs*	Excluded Costs	Direct Outpatient Costs	Allocated Outpatient Overhead	Recoveries Adjustments	Inpatient Care Costs
MRF	10,228,888	1,142,116	10,303,889	477,181	1,514,927	406,502	79580	7,825,699
MRG	11,372,596	1,354,727	11,479,557	870,878	2,171,464	1,112,826	99,475	7,224,913
MRH	10,248,276	1,273,233	10,805,769	2,427,716	1,808,288	751,919	56,765	5,761,081
MRI	7,029,066	658,024	7,018,249	113,661	877,399	291,447	68,827	5,666,915
MRJ	13,312,375	0	13,593,536	1,170,797	1,668,134	816,207	133,556	9,804,842
Major Rural Subtotal	**96,619,167**	**9,472,731**	**98,787,641**	**10,026,118**	**14,948,476**	**5,802,817**	**766,890**	**67,243,340**
IA	2,057,243	254,640	2,113,689	122,901	352,253	115,767	25,309	1,497,459
IB	2,256,244	267,137	2,293,271	93,523	304,362	92,432	21,394	1,781,560
IC	2,995,124	272,778	2,974,530	442,429	399,273	165,957	18,914	1,947,958
ID	4,599,759	289,620	4,619,740	159,455	854,752	1,006,677	125,803	2,473,053
IE	2,530,664	385,273	2,452,785	91,013	478,504	154,454	20,897	1,707,917
IF	2,868,846	273,427	2,909,876	296,397	388,663	171,382	31,451	2,021,983
IG	3,019,102	576,293	3,318,877	333,707	685,053	186,440	15,020	2,098,656
IH	4,176,741	304,328	4,061,954	188,174	398,195	109,372	26,034	3,340,179
II	2,407,395	265,864	2,389,301	35,119	392,389	209,987	23,668	1,728,138
IJ	3,097,975	372,669	3,108,516	831,750	447,915	130,183	11,519	1,687,148

* Revised Total Costs - once the removal of purchased service contracts and the inclusion of the estimated rural imaging, laboratory and therapy costs where applicable.

Hospital Code	Total Cost	Imputed Costs	Revised Total Costs*	Excluded Costs	Direct Outpatient Costs	Allocated Outpatient Overhead	Recoveries Adjustments	Inpatient Care Costs
Intermediate Subtotal	**30,009,093**	**3,262,030**	**30,242,539**	**2,594,468**	**4,701,359**	**2,342,651**	**320,009**	**20,284,053**
SA	1,517,940	143,141	1,535,574	374,031	170,640	78,002	12,825	900,076
SB	934,473	58,117	943,320	54,198	151,466	69,256	500	667,900
SC	1,262,827	145,293	1,285,509	78,404	209,903	109,862	8,886	878,454
SD	1,274,525	66,495	1,233,761	48,847	110,693	41,656	6,571	1,025,994
SE	1,180,432	147,953	1,266,890	119,593	165,713	38,591	9,119	933,873
SF	1,455,694	233,899	1,491,527	71,704	326,018	102,385	5,055	986,365
SG	1,200,856	196,193	1,194,860	60,432	207,486	70,069	8,336	848,538
SH	1,052,467	144,408	1,081,291	120,624	156,456	36,456	0	767,756
SI	989,175	87,429	1,026,241	115,836	138,310	55,521	5,996	710,578
SJ	1,121,000	99,861	1,169,085	297,243	113,342	23,756	1,843	732,902
SK	1,487,137	136,836	1,490,162	22,698	196,936	64,412	9,235	1,196,881
SL	1,952,822	206,593	2,014,470	268,432	215,326	99,306	19,407	1,411,999
SM	1,129,339	89,812	1,285,238	259,442	143,562	76,636	4,380	801,218
SN	1,746,214	106,576	1,718,245	613,757	113,798	24,688	6,794	959,208
SO	1,790,761	258,553	1,777,598	100,654	307,502	61,918	30,960	1,276,564
SP	1,859,105	274,613	1,933,665	255,688	306,516	64,064	15,931	1,291,466

* Revised Total Costs - once the removal of purchased service contracts and the inclusion of the estimated rural imaging, laboratory and therapy costs where applicable.

Hospital Code	Total Cost	Imputed Costs	Revised Total Costs*	Excluded Costs	Direct Outpatient Costs	Allocated Outpatient Overhead	Recoveries Adjustments	Inpatient Care Costs
SQ	1,585,324	286,834	1,572,852	38,349	305,743	64,032	0	1,164,728
SR	2,143,071	490,404	2,276,972	82,274	441,812	79,892	20,340	1,652,654
SS	1,019,426	70,037	1,006,014	78,402	89,870	21,156	6,191	810,394
ST	2,323,283	241,352	2,225,352	87,032	287,888	95,676	12,338	1,742,417
SU	1,457,936	74,990	1,477,670	322,986	89,798	26,609	5,138	845,867
SV	3,289,510	228,806	3,264,057	1,027,913	293,848	91,380	27,109	1,823,807
SW	1,149,499	125,489	1,132,065	26,596	156,649	64,479	4,292	880,049
SX	1,791,050	256,879	1,772,288	123,321	298,017	92,366	0	1,258,585
SY	1,133,689	149,805	1,096,259	64,052	168,373	45,858	16,788	801,188
SZ	2,206,061	322,809	2,298,151	93,287	346,506	90,321	6,678	1,761,359
SAA	1,374,334	154,326	1,326,926	89,637	188,392	66,218	5,690	976,988
SBB	1,328,078	149,833	1,307,951	35,939	158,660	38,582	7,716	1,067,054
SCC	1,568,991	262,622	1,633,473	52,152	380,029	134,804	20,098	1,046,390
SDD	1,156,655	152,731	1,142,151	134,508	233,968	107,471	7,964	658,239
SEE	2,070,628	189,055	2,110,291	335,307	305,428	122,633	3,831	1,343,091
SFF	1,252,191	123,862	1,292,003	407,656	258,926	108,306	11,921	505,194
SGG	957,242	67,578	978,070	93,096	118,882	34,673	9,228	722,191

* Revised Total Costs - once the removal of purchased service contracts and the inclusion of the estimated rural imaging, laboratory and therapy costs where applicable.

Hospital Code	Total Cost	Imputed Costs	Revised Total Costs*	Excluded Costs	Direct Outpatient Costs	Allocated Outpatient Overhead	Recoveries Adjustments	Inpatient Care Costs
SHH	1,339,717	142,975	1,345,231	73,412	133,826	16,581	7,423	1,113,989
SII	1,007,636	128,613	1,015,168	89,052	150,950	37,783	6,090	731,293
SJJ	821,853	87,022	838,324	12,752	109,622	35,014	3,867	677,069
SKK	2,446,220	6,908	2,329,030	164,453	145,911	149,982	0	1,868,684
Small Rural Subtotal	**55,377,161**	**6,108,701**	**55,887,732**	**6,293,759**	**7,696,764**	**2,540,395**	**328,540**	**38,841,001**
MUA	686,991	21,611	664,082	205,896	50,021	23,839	12,212	372,114
MUB	830,701	96,661	876,315	149,922	123,166	23,400	9,884	569,943
MUC	546,508	27,841	535,129	55,009	32,184	17,969	7,265	422,702
MUD	1,006,500	72,715	1,007,238	106,535	105,480	30,891	6,211	758,121
MUE	700,182	67,353	723,649	110,443	108,147	61,637	3,266	440,157
MUF	829,027	54,556	823,034	261,283	37,131	7,224	6,763	510,633
Multi-Use Subtotal	**4,599,909**	**340,736**	**4,629,447**	**889,088**	**456,128**	**164,960**	**45,601**	**3,073,670**
NIA	974,339	55,271	976,455	381,811	83,205	28,867	0	482,572
NIB	1,677,853	151,103	1,676,412	275,710	164,231	116,069	1,708	1,118,694
NIC	1,467,268	121,904	1,387,801	13,728	118,861	90,538	10,443	1,154,231
NID	918,906	86,183	936,510	43,425	167,440	56,550	2,979	666,116

* Revised Total Costs - once the removal of purchased service contracts and the inclusion of the estimated rural imaging, laboratory and therapy costs where applicable.

Hospital Code	Total Cost	Imputed Costs	Revised Total Costs*	Excluded Costs	Direct Outpatient Costs	Allocated Outpatient Overhead	Recoveries Adjustments	Inpatient Care Costs
NIE	2,632,814	0	2,646,037	0	360,687	244,450	0	2,040,900
Northern Isolated Subtotal	**7,671,180**	**414,462**	**7,623,216**	**714,674**	**894,424**	**536,474**	**15,130**	**5,462,514**
GRAND TOTAL	**913,636,053**	**19,598,660**	**918,018,012**	**152,885,800**	**110,051,174**	**64,613,374**	**8,194,195**	**582,273,469**

* Revised Total Costs - once the removal of purchased service contracts and the inclusion of the estimated rural imaging, laboratory and therapy costs where applicable.

Appendix Table A-2 gives the case cost parameters involved in the calculation of the cost per weighted case, by each hospital and each hospital type.

1. Total Cases - the total number of cases (both typical and atypical) including an adjustment for those cases in hospital during the 1991/92 fiscal year but not discharged from hospital by March 31, 1993.

2. Average RCW for Typicals only - average RCWs for typical patients only. Typical cases were assigned an RCW according to their RDRG category, regardless of where the case occurred (e.g., teaching or rural hospital) or how long their length of stay was. The RCWs for all typical cases were summed for each hospital and divided by the total number of typical cases. Case weight development is discussed in Section III-1 of the paper and in Appendix A.

3. Percent Typical Cases - the percentage of typical cases at each of the hospitals.

4. Average Relative Weight per Case for Typicals and Atypicals - the average relative weight per case with both typical and atypical cases included. Weighting formulas for the atypical cases are discussed in Section III-3 of the paper and in Appendices C, D and E.

5. Actual cost per case - represents the allocated inpatient costs divided by the total number of cases. The allocation methodology is discussed in Section III-2 of the paper and in Appendix G.

6. Average Cost per Weighted Case (CWC) for each hospital - calculated by taking the actual cost per case (column 5) and dividing it by the average relative weight per case for both typical and atypical cases (column 4).[1] Section III-4 and Appendix A provide more detail on the calculation of the CWC.

7. Hospital Average Cost per Weighted Case - Average CWC for all hospitals combined. Calculated by adding the CWC for each hospital and dividing by the number of hospitals.

8. Index Ratio of hospital CWC to the Provincial Average CWC - calculated by dividing column 7 by column 8. This indexed CWC represents the efficiency indicator and allows each hospital to be compared to others as well as to the provincial average of 1.00. 9. Rank
- Using the indexed CWCs from column 8 we ranked the hospitals from most to least expensive, and the rankings are found in the final column of this table.

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[1] The values that appear in this table have been rounded.

Table A-2

Hospital Case Cost Performance Indicators
by Hospital, 1991/92

Hospital Code	Total Cases*	Average RCW Typicals Only	% Typical Cases	Average Relative Wt/Case-Typicals & Atypicals	Actual Cost/Case	Hospital Cost/Weighted Case (CWC)	Hospital Average Cost/ Weighted Case	Index Ratio CWC/Hosp Avg CWC	Rank**
TA	25,650	1.07	83.05	1.63	4,311	2,646	2,021	1.31	9
TB	35,590	1.16	80.15	1.74	4,431	2,550	2,021	1.26	11
Teaching Subtotal	**61,240**	**1.12**	**81.37**	**1.69**	**4,371**	**2,598**	**2,021**	**1.29**	
UCA	10,574	1.04	73.96	1.45	3,250	2,242	2,021	1.11	19
UCB	10,695	1.10	86.69	1.81	3,065	1,691	2,021	0.84	41
UCC	10,712	1.08	84.55	1.85	3,716	2,012	2,021	1.00	29
UCD	9,411	1.01	89.57	1.47	2,793	1,902	2,021	0.94	32
UCE	4,136	1.30	79.57	2.09	3,412	1,633	2,021	0.81	52
UCF	6,756	1.23	76.35	2.29	4,703	2,051	2,021	1.01	28
Urban Community Subtotal	**52,284**	**1.10**	**82.30**	**2.14**	**3,490**	**1,922**	**2,021**	**0.95**	
MRA	1,494	0.91	81.79	1.44	2,622	1,819	2,021	0.90	34
MRB	2,624	0.74	79.00	1.23	1,823	1,488	2,021	0.74	57

* Includes adjustment for cases in hospital during 1991/92 fiscal year but not separated by March 31/93.
** Ranking 1 = most expensive

Hospital Code	Total Cases*	Average RCW Typicals Only	% Typical Cases	Average Relative Wt/Case-Typicals & Atypicals	Actual Cost/Case	Hospital Cost/Weighted Case (CWC)	Hospital Average Cost/ Weighted Case	Index Ratio CWC/Hosp Avg CWC	Rank**
MRC	3,141	0.89	80.93	1.45	2,960	2,045	2,021	1.01	27
MRD	2,849	0.72	87.43	1.15	2,780	2,410	2,021	1.19	17
MRE	1,910	0.79	74.08	1.27	2,640	2,076	2,021	1.03	24
MRF	4,366	0.81	82.62	1.20	1,792	1,498	2,021	0.74	54
MRG	3,281	0.73	88.39	0.87	2,202	2,518	2,021	1.25	13
MRH	2,248	0.92	81.41	1.31	2,563	1,952	2,021	0.97	30
MRI	3,179	0.77	83.42	1.18	1,783	1,515	2,021	0.75	53
MRJ	4,817	0.73	90.47	0.80	2,035	2,534	2,021	1.25	12
Major Rural Subtotal	**29,909**	**0.79**	**83.89**	**1.15**	**2,320**	**1,985**	**2,021**	**0.98**	
IA	663	0.85	76.02	1.59	2,259	1,424	2,021	0.70	64
IB	918	0.89	75.38	1.52	1,941	1,281	2,021	0.63	71
IC	976	0.89	81.45	1.36	1,996	1,471	2,021	0.73	59
ID	1,101	0.65	72.57	0.81	2,246	2,776	2,021	1.37	7
IE	969	0.80	83.18	1.23	1,763	1,433	2,021	0.71	62
IF	998	0.87	76.25	1.26	2,026	1,607	2,021	0.80	46

* Includes adjustment for cases in hospital during 1991/92 fiscal year but not separated by March 31/93.

** Ranking 1 = most expensive

Hospital Code	Total Cases*	Average RCW Typicals Only	% Typical Cases	Average Relative Wt/Case-Typicals & Atypicals	Actual Cost/Case	Hospital Cost/Weighted Case (CWC)	Hospital Average Cost/ Weighted Case	Index Ratio CWC/Hosp Avg CWC	Rank**
IG	1,395	0.86	80.22	1.16	1,504	1,299	2,021	0.64	69
IH	1,305	0.73	83.37	1.58	2,560	1,622	2,021	0.80	44
II	938	0.82	81.98	1.48	1,842	1,244	2,021	0.62	74
IJ	894	0.82	80.76	1.20	1,887	1,576	2,021	0.78	49
Intermediate Subtotal	**10,157**	**0.81**	**79.30**	**1.30**	**2,002**	**1,573**	**2,021**	**0.78**	
SA	447	0.83	82.33	1.15	2,014	1,750	2,021	0.87	35
SB	216	0.80	81.48	1.59	3,092	1,948	2,021	0.96	31
SC	383	0.92	79.37	1.34	2,294	1,717	2,021	0.85	38
SD	511	0.73	83.76	1.34	2,008	1,494	2,021	0.74	55
SE	452	0.79	76.11	1.24	2,066	1,669	2,021	0.83	42
SF	704	0.77	82.39	0.98	1,401	1,427	2,021	0.71	63
SG	461	0.77	78.31	1.33	1,841	1,382	2,021	0.68	67
SH	415	0.80	80.24	1.20	1,850	1,548	2,021	0.77	51
SI	339	0.82	73.45	1.55	2,096	1,352	2,021	0.67	68
SJ	214	0.83	76.64	1.36	3,425	2,509	2,021	1.24	14

* Includes adjustment for cases in hospital during 1991/92 fiscal year but not separated by March 31/93.
** Ranking 1 = most expensive

Hospital Code	Total Cases*	Average RCW Typicals Only	% Typical Cases	Average Relative Wt/Case-Typicals & Atypicals	Actual Cost/Case	Hospital Cost/Weighted Case (CWC)	Hospital Average Cost/ Weighted Case	Index Ratio CWC/Hosp Avg CWC	Rank**
SK	275	0.86	72.73	2.06	4,352	2,110	2,021	1.04	23
SL	375	0.86	76.53	1.64	3,765	2,298	2,021	1.14	18
SM	383	0.84	86.16	1.04	2,136	2,057	2,021	1.02	26
SN	462	0.76	78.35	1.21	2,076	1,713	2,021	0.85	39
SO	559	0.88	67.62	1.56	2,284	1,463	2,021	0.72	60
SP	626	0.78	82.43	1.38	2,063	1,490	2,021	0.74	56
SQ	935	0.76	90.48	0.88	1,246	1,408	2,021	0.70	65
SR	779	0.77	78.82	1.32	2,122	1,611	2,021	0.80	45
SS	155	1.00	68.39	2.54	5,228	2,061	2,021	1.02	25
ST	701	0.72	82.17	1.37	2,486	1,821	2,021	0.90	33
SU	275	0.76	72.73	1.19	3,076	2,594	2,021	1.28	10
SV	1,230	0.72	86.34	0.87	1,483	1,698	2,021	0.84	40
SW	512	0.78	85.55	1.16	1,719	1,487	2,021	0.74	58
SX	675	0.87	81.04	1.46	1,865	1,276	2,021	0.63	72
SY	338	0.78	78.40	1.83	2,370	1,298	2,021	0.64	70
SZ	1,355	0.76	87.31	0.94	1,300	1,389	2,021	0.69	66

* Includes adjustment for cases in hospital during 1991/92 fiscal year but not separated by March 31/93.
** Ranking 1 = most expensive

Hospital Code	Total Cases*	Average RCW Typicals Only	% Typical Cases	Average Relative Wt/Case-Typicals & Atypicals	Actual Cost/Case	Hospital Cost/Weighted Case (CWC)	Hospital Average Cost/ Weighted Case	Index Ratio CWC/Hosp Avg CWC	Rank**
SAA	675	0.71	83.11	0.93	1,447	1,549	2,021	0.77	50
SBB	398	0.88	78.14	1.53	2,681	1,750	2,021	0.87	36
SCC	564	0.86	80.50	1.49	1,855	1,244	2,021	0.62	73
SDD	564	0.69	83.16	0.94	1,167	1,241	2,021	0.61	75
SEE	785	0.90	83.82	1.19	1,711	1,440	2,021	0.71	61
SFF	368	1.01	75.54	1.58	1,373	871	2,021	0.43	76
SGG	163	0.86	82.21	1.62	4,431	2,727	2,021	1.35	8
SHH	272	0.75	65.81	2.47	4,096	1,659	2,021	0.82	43
SII	257	0.79	74.32	1.34	2,845	2,129	2,021	1.05	22
SJJ	225	0.74	74.22	1.35	3,009	2,235	2,021	1.11	20
SKK	1,074	0.68	91.99	0.70	1,740	2,472	2,021	1.22	15
Small Rural Subtotal	**19,122**	**0.79**	**81.62**	**1.24**	**2,379**	**1,727**	**2,021**	**0.85**	
MUA	138	0.92	75.36	1.71	2,696	1,579	2,021	0.78	48
MUB	169	0.78	82.25	1.10	3,372	3,076	2,021	1.52	6
MUC	92	0.73	59.78	1.87	4,595	2,453	2,021	1.21	16

* Includes adjustment for cases in hospital during 1991/92 fiscal year but not separated by March 31/93.
** Ranking 1 = most expensive

Hospital Code	Total Cases*	Average RCW Typicals Only	% Typical Cases	Average Relative Wt/Case-Typicals & Atypicals	Actual Cost/Case	Hospital Cost/Weighted Case (CWC)	Hospital Average Cost/ Weighted Case	Index Ratio CWC/Hosp Avg CWC	Rank**
MUD	207	0.80	62.32	2.09	3,662	1,749	2,021	0.87	37
MUE	254	0.81	81.89	1.08	1,733	1,599	2,021	0.79	47
MUF	176	0.92	83.52	1.31	2,901	2,218	2,021	1.10	21
Multi-Use Subtotal	**1,036**	**0.83**	**75.48**	**1.48**	**3,160**	**2,112**	**2,021**	**1.05**	
NIA	105	0.85	81.90	0.70	4,596	6,577	2,021	3.25	1
NIB	209	0.72	79.43	0.90	5,353	5,953	2,021	2.95	4
NIC	237	0.75	75.11	1.26	4,870	3,871	2,021	1.92	3
NID	158	0.74	86.08	0.93	4,216	4,511	2,021	2.23	5
NIE	747	0.67	86.75	0.72	2,732	3,820	2,021	1.89	2
Northern Isolated Subtotal	**1,456**	**0.71**	**83.38**	**1.02**	**4,353**	**4,946**	**2,021**	**2.45**	
GRAND TOTAL	**175,204**	**1**	**82**	**1.54**	**3,039**	**2,021**	**2,021**	**3,154**	

* Includes adjustment for cases in hospital during 1991/92 fiscal year but not separated by March 31/93.
** Ranking 1 = most expensive

Appendix Table A-3 provides a summary of the breakdown of case cost parameters by RDRG class for all hospitals combined. This table is a summary of Appendix Table A-9.

1. Number of Cases - cases that had days in 1991/92 but had not separated by March 31, 1993 are not included here.

2. Average Relative Weight per Case (including Atypical cases) - the average weights for all typical and atypical cases in each of the RDRG classes.

3. Provincial Average Cost per Weighted Case - this summary value of average cost per weighted case (CWC) differs from that in Table A-2 because here the average is taken for all cases, rather than by hospital.

4. Cost per Case - calculated by multiplying the average relative weight per case (column 2) by the provincial average CWC (column 3).

5. Total Manitoba Costs - calculated by multiplying the costs per case by the number of cases.

6. Percentage of Total Manitoba Costs - the percentage of the total Manitoba costs that each of the categories comprise.

The costs in this table are expected costs based on calculated case weights and the partitioning of actual costs.

Table A-3

Table 9 Summary Breakdown of Manitoba Weighted Cases and Costs by RDRG

RDRG Class	Number of Cases	Avg. Relative Wt/Case (incl. Atypicals)	Prov. Avg. Cost/Wt Case*	Cost/Case	Expected Total MB Costs	Expected % of Total MB Costs
Surgical Obstetrics	4,570	1.13	2,136	2,413	11,018,074	1.892
Medical Obstetrics	21,439	0.66	2,136	1,407	30,162,694	5.180
Surgical	41,874	2.35	2,136	5,024	210,395,361	36.132
Medical	81,872	1.53	2,136	3,271	267,822,854	45.995
Other	25,307	1.16	2,136	2,485	62,891,276	10.801
GRAND TOTAL	**175,062**	**1.56**	**2,136**	**3,326**	**582,290,259**	**100**

Appendix Table A-4a gives the numbers and percentages of death and transfer cases for each of the hospitals.

1. Total cases - these are the total cases for all the data (not including cases hospitalized in 1991/92 but not yet separated by March 31, 1993).

2. 1991/92 Total Days - days for cases in column 1.

3. Number of cases - number of cases categorized as deaths - does not include medical deaths occurring within 48 hours (see footnote 35 in the paper).

4. 1991/92 days - days for cases in column 3.

5. Percent cases - the percentage of all cases that were categorized as deaths.

6. Percent Days - days for cases in column 5.

7. Percent Total Hospital Case Weight - this represents the percentage of the total hospital case weight that is attributable to deaths.

8. Number of cases - number of cases categorized as transfers, not including cases that were also categorized as death.

9. 1991/92 Days - days for cases in column 8.

10. Percent Cases - the percentage of all cases that were categorized as transfers (not including those also categorized as deaths).

11. Percent Days - the days for cases in column 10.

12. Percent Weights - this represents the percentage of the total hospital case weight that is attributable to transfers.

Table A-4 a

Atypical Cases by Hospital - Deaths, Transfers, 1991/92

			Atypical Cases									
	All Data*		Deaths					Transfers (excluding deaths)				
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Total Hospital Case Wt	No. of Cases	1991/92 Days	% Cases	% Days	% Wts
TA	25,631	242,197	796	23,839	3.1	9.8	7.9	1,631	26,877	6.4	11.1	11.8
TB	35,590	324,503	888	21,415	2.5	6.6	7.1	3,315	54,419	9.3	16.8	16.4
Teaching Subtotal	**61,221**	**566,700**	**1,684**	**45,254**	**2.8**	**8.0**	**7.4**	**4,946**	**81,296**	**8.1**	**14.3**	**14.5**
UCA	10,574	98,078	305	7,402	2.9	7.5	5.8	1,390	15,830	13.1	16.1	16.5
UCB	10,675	104,250	395	10,294	3.7	9.9	10.9	429	8,919	4.0	8.6	8.0
UCC	10,712	114,403	392	10,915	3.7	9.5	10.7	299	6,999	2.8	6.1	6.1
UCD	9,401	74,396	277	6,847	2.9	9.2	9.3	299	5,723	3.2	7.7	7.3
UCE	4,129	48,540	242	6,820	5.9	14.1	13.6	231	6,953	5.6	14.3	12.9
UCF	6,737	103,239	374	13,381	5.6	13.0	13.5	268	6,660	4.0	6.5	5.7
Urban Community Subtotal	**52,228**	**542,906**	**1,985**	**55,659**	**3.8**	**10.3**	**10.5**	**2,916**	**51,084**	**5.6**	**9.4**	**9.0**
MRA	1,494	12,814	48	1,335	3.2	10.4	10.6	143	2,007	9.6	15.7	16.1
MRB	2,623	21,732	60	2,054	2.3	9.5	10.6	222	3,757	8.5	17.3	12.0

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases									
	All Data*		Deaths					Transfers (excluding deaths)				
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Total Hospital Case Wt	No. of Cases	1991/92 Days	% Cases	% Days	% Wts
MRC	3,139	29,257	126	3,231	4.0	11.0	11.3	225	2,423	7.2	8.3	7.9
MRD	2,836	20,035	45	2,764	1.6	13.8	14.0	81	983	2.9	4.9	4.6
MRE	1,908	16,714	54	1,189	2.8	7.1	9.2	148	2,871	7.8	17.2	10.8
MRF	4,364	32,660	109	2,709	2.5	8.3	8.3	324	2,643	7.4	8.1	7.5
MRG	3,281	15,437	27	292	0.8	1.9	2.1	194	1,200	5.9	7.8	6.6
MRH	2,248	18,002	108	2,212	4.8	12.3	14.0	146	1,585	6.5	8.8	8.5
MRI	3,177	24,714	74	2,020	2.3	8.2	9.3	152	2,978	4.8	12.0	8.6
MRJ	4,816	21,626	23	444	0.5	2.1	2.1	233	1,789	4.8	8.3	7.9
Major Rural Subtotal	**29,886**	**212,991**	**674**	**18,250**	**2.3**	**8.6**	**9.0**	**1,868**	**22,236**	**6.3**	**10.4**	**8.6**
IA	661	6,012	37	588	5.6	9.8	11.8	87	1,253	13.2	20.8	18.5
IB	918	8,886	37	976	4.0	11.0	13.1	131	2,209	14.3	24.9	21.4
IC	976	7,905	35	849	3.6	10.7	11.9	66	716	6.8	9.1	9.3
ID	1,098	4,828	4	767	0.4	15.9	13.8	264	1,101	24.0	22.8	20.7
IE	969	7,204	35	892	3.6	12.4	15.2	92	1,239	9.5	17.2	15.7
IF	998	7,306	40	733	4.0	10.0	10.6	146	1,135	14.6	15.5	14.4

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases									
	All Data*		Deaths					Transfers (excluding deaths)				
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Total Hospital Case Wt	No. of Cases	1991/92 Days	% Cases	% Days	% Wts
IG	1,395	9,153	41	899	2.9	9.8	9.0	149	1,375	10.7	15.0	14.0
IH	1,298	11,492	33	2,464	2.5	21.4	21.6	95	893	7.3	7.8	7.5
II	938	8,175	38	1,045	4.1	12.8	14.6	67	1,396	7.1	17.1	15.2
IJ	894	6,184	35	927	3.9	15.0	14.0	103	1,170	11.5	18.9	15.6
Intermediate Subtotal	**10,145**	**77,145**	**335**	**10,140**	**3.3**	**13.1**	**13.8**	**1,200**	**12,487**	**11.8**	**16.2**	**14.6**
SA	446	3,128	26	411	5.8	13.1	16.3	39	346	8.7	11.1	9.6
SB	215	2,321	8	189	3.7	8.1	9.9	12	189	5.6	8.1	8.5
SC	383	2,909	16	491	4.2	16.9	16.8	48	451	12.5	15.5	13.5
SD	511	4,919	8	280	1.6	5.7	7.4	15	151	2.9	3.1	3.3
SE	452	3,707	11	181	2.4	4.9	6.7	68	1,146	15.0	30.9	23.6
SF	704	3,978	29	351	4.1	8.8	10.3	67	733	9.5	18.4	15.5
SG	461	4,282	12	191	2.6	4.5	5.9	39	770	8.5	18.0	16.7
SH	406	3,083	10	277	2.5	9.0	9.7	34	468	8.4	15.2	14.6
SI	339	3,627	16	406	4.7	11.2	11.4	48	685	14.2	18.9	18.6

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases									
	All Data*		Deaths					Transfers (excluding deaths)				
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Total Hospital Case Wt	No. of Cases	1991/92 Days	% Cases	% Days	% Wts
SJ	214	2,122	4	53	1.9	2.5	3.4	37	1,097	17.3	51.7	45.6
SK	273	3,657	19	573	7.0	15.7	17.7	33	498	12.1	13.6	13.1
SL	375	4,327	19	789	5.1	18.2	16.2	54	682	14.4	15.8	14.7
SM	383	2,199	6	28	1.6	1.3	3.0	34	308	8.9	14.0	10.9
SN	462	3,772	27	677	5.8	17.9	19.1	62	857	13.4	22.7	19.1
SO	559	5,990	23	515	4.1	8.6	11.1	88	1,050	15.7	17.5	18.8
SP	626	5,038	16	559	2.6	11.1	12.1	55	740	8.8	14.7	13.4
SQ	935	5,197	18	290	1.9	5.6	6.9	36	272	3.9	5.2	4.8
SR	779	6,851	28	913	3.6	13.3	14.7	100	1,645	12.8	24.0	21.7
SS	154	2,706	8	429	5.2	15.9	16.8	24	571	15.6	21.1	20.4
ST	699	6,022	16	497	2.3	8.3	9.4	53	266	7.6	4.4	4.5
SU	275	2,169	11	189	4.0	8.7	10.0	42	268	15.3	12.4	12.6
SV	1,230	6,276	15	197	1.2	3.1	3.7	91	644	7.4	10.3	9.5
SW	511	3,066	17	317	3.3	10.3	10.1	41	802	8.0	26.2	20.9
SX	674	6,403	32	528	4.7	8.2	9.9	46	420	6.8	6.6	6.3

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases									
	All Data*		Deaths					Transfers (excluding deaths)				
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Total Hospital Case Wt	No. of Cases	1991/92 Days	% Cases	% Days	% Wts
SY	335	4,161	8	491	2.4	11.8	14.5	37	700	11.0	16.8	15.8
SZ	1,355	8,265	31	575	2.3	7.0	8.4	60	393	4.4	4.8	4.9
SAA	674	3,920	11	430	1.6	11.0	11.5	74	664	11.0	16.9	14.7
SBB	398	3,977	19	226	4.8	5.7	7.7	49	1,421	12.3	35.7	27.4
SCC	564	5,443	26	559	4.6	10.3	11.3	43	739	7.6	13.6	12.0
SDD	564	2,987	16	381	2.8	12.8	12.3	66	385	11.7	12.9	10.2
SEE	785	6,075	27	367	3.4	6.0	8.3	56	754	7.1	12.4	12.7
SFF	362	3,392	15	218	4.1	6.4	8.3	42	620	11.6	18.3	17.7
SGG	163	1,857	9	172	5.5	9.3	12.0	11	240	6.7	12.9	10.6
SHH	272	4,907	19	635	7.0	12.9	17.0	32	709	11.8	14.4	15.5
SII	256	2,606	8	75	3.1	2.9	3.9	39	904	15.2	34.7	33.0
SJJ	225	2,072	8	169	3.6	8.2	10.6	28	327	12.4	15.8	15.4
SKK	1,074	3,245	13	109	1.2	3.4	3.9	65	250	6.1	7.7	5.2
Small Rural Subtotal	**19,093**	**150,656**	**605**	**13,738**	**3.2**	**9.1**	**10.4**	**1,768**	**23,165**	**9.3**	**15.4**	**13.8**
MUA	138	1,349	7	94	5.1	7.0	9.4	15	324	10.9	24.0	22.4

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases									
	All Data*		Deaths					Transfers (excluding deaths)				
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Total Hospital Case Wt	No. of Cases	1991/92 Days	% Cases	% Days	% Wts
MUB	169	1,239	8	115	4.7	9.3	9.1	7	109	4.1	8.8	7.2
MUC	92	1,133	10	236	10.9	20.8	24.5	8	143	8.7	12.6	10.1
MUD	206	3,472	9	482	4.4	13.9	16.9	37	944	18.0	27.2	27.6
MUE	254	1,621	7	68	2.8	4.2	4.8	26	244	10.2	15.1	11.6
MUF	176	1,467	9	191	5.1	13.0	16.5	5	34	2.8	2.3	2.3
Multi-Use Subtotal	**1,035**	**10,281**	**50**	**1,186**	**4.8**	**11.5**	**13.4**	**98**	**1,798**	**9.5**	**17.5**	**16.2**
NIA	105	369	1	3	1.0	0.8	0.7	14	100	13.3	27.1	16.3
NIB	209	1,083	2	34	1.0	3.1	4.3	20	612	9.6	56.5	29.9
NIC	236	2,142	3	8	1.3	0.4	0.5	15	529	6.4	24.7	23.4
NID	157	819	2	319	1.3	38.9	19.3	14	21	8.9	2.6	2.9
NIE	747	2,336	12	69	1.6	3.0	3.3	80	254	10.7	10.9	8.2
Northern Isolated Subtotal	**1,454**	**6,749**	**20**	**433**	**1.4**	**6.4**	**4.3**	**143**	**1,516**	**9.9**	**22.5**	**15.3**
GRAND TOTAL	**175,062**	**1,567,428**	**5,353**	**144,660**	**3.1**	**9.2**	**9.3**	**12,939**	**193,582**	**7.4**	**12.4**	**11.9**

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

Appendix Table A-4b is a continuation of Table A-4a and gives the numbers and percentages of outlier cases and days for each of the hospitals.

1. Total Cases - as in A-4a

2. 1991/92 Total Days - as in A-4a

3. Number of cases - the number of cases that were categorized as outliers, not including cases that were also categorized as deaths and/or transfers.

4. 1991/92 days - days for cases in column 3.

5. Percent cases - the percentage of all cases that were categorized as outliers (not including those also categorized as deaths and/or transfers).

6. Percent days - days for cases in column 5.

7. Percent Days greater than the Trim - the percent of the outlier days that were beyond the trim point. Differs from column 6 which includes all days for cases categorized as outliers.

8. Percent Total Hospital Case Weights - this represents the percentage of the total hospital case weight that is attributable to outliers.

Table A-4 b

Atypical Cases by Hospital - Outliers, 1991/92

			Atypical Cases					
	All Data*		Outliers (excluding deaths & transfers)					
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Days > Trim	% Total Hospital Case Wts
TA	25,631	242,197	1,666	79,125	6.5	32.7	20.5	24.3
TB	35,590	324,503	2,201	86,569	6.2	26.7	14.7	21.3
Teaching Subtotal	**61,221**	**566,700**	**3,867**	**165,694**	**6.3**	**29.2**	**17.2**	**22.5**
UCA	10,574	98,078	657	30,089	6.2	30.7	20.9	22.4
UCB	10,675	104,250	641	32,677	6.0	31.3	18.1	26.3
UCC	10,712	114,403	1,039	45,022	9.7	39.4	23.8	34.0
UCD	9,401	74,396	453	19,942	4.8	26.8	16.4	20.6
UCE	4,129	48,540	265	13,316	6.4	27.4	15.9	22.8
UCF	6,737	103,239	749	47,485	11.1	46.0	31.4	37.4
Urban Community Subtotal	**52,228**	**542,906**	**3,804**	**188,531**	**7.3**	**34.7**	**21.9**	**28.0**
MRA	1,494	12,814	89	3,457	6.0	27.0	18.6	21.7
MRB	2,623	21,732	220	6,961	8.4	32.0	20.5	27.8

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases					
	All Data*		Outliers (excluding deaths & transfers)					
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Days > Trim	% Total Hospital Case Wts
MRC	3,139	29,257	223	11,547	7.1	39.5	25.8	29.5
MRD	2,836	20,035	230	6,398	8.1	31.9	19.4	29.2
MRE	1,908	16,714	161	4,880	8.4	29.2	14.0	26.0
MRF	4,364	32,660	237	11,814	5.4	36.2	24.5	25.3
MRG	3,281	15,437	175	2,988	5.3	19.4	10.2	17.7
MRH	2,248	18,002	177	4,580	7.9	25.4	12.5	23.6
MRI	3,177	24,714	237	7,522	7.5	30.4	18.3	25.2
MRJ	4,816	21,626	214	2,637	4.4	12.2	5.1	11.2
Major Rural Subtotal	**29,886**	**212,991**	**1,963**	**62,784**	**6.6**	**29.5**	**17.9**	**23.8**
IA	661	6,012	46	1,812	7.0	30.1	14.5	26.8
IB	918	8,886	64	2,117	7.0	23.8	14.5	21.7
IC	976	7,905	86	2,349	8.8	29.7	16.8	27.7
ID	1,098	4,828	32	335	2.9	6.9	1.9	6.3
IE	969	7,204	43	1,416	4.4	19.7	12.9	15.2

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases					
	All Data*		Outliers (excluding deaths & transfers)					
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Days > Trim	% Total Hospital Case Wts
IF	998	7,306	55	2,003	5.5	27.4	16.5	22.9
IG	1,395	9,153	95	1,759	6.8	19.2	7.6	17.8
IH	1,298	11,492	84	3,766	6.5	32.8	20.6	29.5
II	938	8,175	71	2,441	7.6	29.9	17.2	24.7
IJ	894	6,184	41	1,130	4.6	18.3	8.1	15.7
Intermediate Subtotal	**10,145**	**77,145**	**617**	**19,128**	**6.1**	**24.8**	**13.9**	**21.7**
SA	446	3,128	23	538	5.2	17.2	7.4	15.0
SB	215	2,321	20	1,042	9.3	44.9	35.5	40.4
SC	383	2,909	19	650	5.0	22.3	11.6	19.1
SD	511	4,919	61	2,321	11.9	47.2	32.3	44.1
SE	452	3,707	29	866	6.4	23.4	12.5	21.1
SF	704	3,978	37	675	5.3	17.0	7.0	14.8
SG	461	4,282	49	1,446	10.6	33.8	19.5	32.2
SH	406	3,083	30	969	7.4	31.4	18.7	27.0

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases					
	All Data*		Outliers (excluding deaths & transfers)					
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Days > Trim	% Total Hospital Case Wts
SI	339	3,627	26	1,293	7.7	35.6	24.4	31.2
SJ	214	2,122	10	287	4.7	13.5	4.2	12.2
SK	273	3,657	28	1,518	10.3	41.5	27.1	41.1
SL	375	4,327	21	1,772	5.6	41.0	32.6	29.5
SM	383	2,199	16	441	4.2	20.1	9.5	16.8
SN	462	3,772	18	791	3.9	21.0	14.2	19.2
SO	559	5,990	65	1,993	11.6	33.3	19.5	31.5
SP	626	5,038	41	1,566	6.5	31.1	20.4	28.2
SQ	935	5,197	43	841	4.6	16.2	8.2	15.7
SR	779	6,851	40	1,667	5.1	24.3	15.8	21.9
SS	154	2,706	18	1,165	11.7	43.1	30.3	39.4
ST	699	6,022	59	3,149	8.4	52.3	32.9	46.1
SU	275	2,169	24	735	8.7	33.9	14.8	33.9
SV	1,230	6,276	66	1,051	5.4	16.7	6.3	16.0
SW	511	3,066	20	542	3.9	17.7	9.3	13.7

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases					
	All Data*		Outliers (excluding deaths & transfers)					
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Days > Trim	% Total Hospital Case Wts
SX	674	6,403	47	2,769	7.0	43.2	29.6	39.9
SY	335	4,161	29	1,757	8.7	42.2	29.9	39.5
SZ	1,355	8,265	76	1,684	5.6	20.4	9.4	20.2
SAA	674	3,920	26	558	3.9	14.2	7.1	12.6
SBB	398	3,977	23	903	5.8	22.7	13.4	20.3
SCC	564	5,443	41	2,310	7.3	42.4	28.1	35.9
SDD	564	2,987	19	814	3.4	27.3	16.9	21.6
SEE	785	6,075	48	1,296	6.1	21.3	8.9	19.9
SFF	362	3,392	29	979	8.0	28.9	13.5	24.2
SGG	163	1,857	9	624	5.5	33.6	26.1	33.6
SHH	272	4,907	45	2,486	16.5	50.7	37.8	47.8
SII	256	2,606	19	620	7.4	23.8	13.2	24.8
SJJ	225	2,072	23	784	10.2	37.8	21.1	36.2
SKK	1,074	3,245	14	337	1.3	10.4	5.0	6.8
Small Rural Subtotal	**19,093**	**150,656**	**1,211**	**45,239**	**6.3**	**30.0**	**18.5**	**26.6**

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

			Atypical Cases					
	All Data*		Outliers (excluding deaths & transfers)					
Hospital Number	Total Cases	1991/92 Total Days	No. of Cases	1991/92 Days	% Cases	% Days	% Days > Trim	% Total Hospital Case Wts
MUA	138	1,349	14	497	10.1	36.8	16.8	28.1
MUB	169	1,239	15	390	8.9	31.5	19.4	25.4
MUC	92	1,133	17	483	18.5	42.6	24.2	41.4
MUD	206	3,472	31	1,231	15.0	35.5	21.1	35.5
MUE	254	1,621	13	582	5.1	35.9	23.6	29.2
MUF	176	1,467	15	323	8.5	22.0	7.6	22.7
Multi-Use Subtotal	**1,035**	**10,281**	**105**	**3,506**	**10.1**	**34.1**	**19.2**	**31.0**
NIA	105	369	4	39	3.8	10.6	3.8	7.3
NIB	209	1,083	1	21	0.5	1.9	0.1	1.5
NIC	236	2,142	24	688	10.2	32.1	18.0	29.8
NID	157	819	5	55	3.2	6.7	1.3	6.4
NIE	747	2,336	14	291	1.9	12.5	5.4	7.9
Northern Isolated Subtotal	**1,454**	**6,749**	**48**	**1,094**	**3.3**	**16.2**	**8.2**	**12.4**
GRAND TOTAL	**175,062**	**1,567,428**	**11,615**	**485,976**	**6.6**	**31.0**	**18.9**	**24.9**

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

Appendix Table A-5 gives the numbers and percentages of non-acute cases and days for each of the hospitals.

1. Cases - total cases, as in column 1 of Table A-4a

2. 1991/92 Days - as in column 2 of Table A-4a

3. Number of Cases - number of cases that were categorized as non-acute - reported for the "good coding" hospitals only.

4. 1991/92 Non-Acute Days - days for cases categorized as non-acute using subservice codes for the "good coding" hospitals and using information reported to Manitoba health for the "poor coding" hospitals.

5. Percent Non-Acute Days - the percentage of all days that were categorized as non-acute.

6. Poor Coding Hospital - indicates whether the hospital used specific service and subservice codes to identify non-acute cases and days.

7. Percent Non-Acute Case Weights - this represents the percentage of the total hospital case weight that is attributable to non-acute cases. It captures the whole non-acute case weight. - available only for "good coding" hospitals.

8. Percent Only Non-Acute Day Weights - this represents the percentage of the total hospital case weight that is attributable to non-acute days. It is attached only to the non-acute days, rather than the entire stay for the non-acute case.

Table A-5

Atypical Cases - Non-Acute

	All Data*		Non-Acute					
Hospital Number	**Cases**	**1991/92 Days**	**No. of Cases ****	**1991/92 Non-Acute Days*****	**% Non-Acute Days**	**Poor Coding Hospital**	**% Non-Acute Case Wts****	**% Only Non-Acute Day Wts*****
TA	25,631	242,197	1238	70,536	29.1	no	18.19	13.38
TB	35,590	324,503	1603	53,951	16.6	no	11.48	6.52
Teaching Subtotal	**61,221**	**566,700**		**124,487**	**22.0**			**9.29**
UCA	10,574	98,078	1031	35,842	36.5	no	23.09	17.93
UCB	10,675	104,250	123	7,275	7.0	no	7.23	3.04
UCC	10,712	114,403	164	12,975	11.3	no	13.64	5.35
UCD	9,401	74,396	117	10,273	13.8	no	10.44	6.29
UCE	4,129	48,540	213	8,059	16.6	no	15.28	7.42
UCF	6,737	103,239	620	38,412	37.2	no	28.54	19.93
Urban Community Subtotal	**52,228**	**542,906**		**112,836**	**20.8**			**9.73**
MRA	1,494	12,814	25	1,816	14.2	no	10.81	6.95
MRB	2,623	21,732	182	7,231	33.3	no	23.50	17.29
MRC	3,139	29,257	208	10,527	36.0	no	29.07	18.66
MRD	2,836	20,035		6,670	33.3	yes		17.25
MRE	1,908	16,714	298	6,759	40.4	no	32.07	20.00
MRF	4,364	32,660	297	11,428	35.0	no	26.46	17.37
MRG	3,281	15,437	0	0	0.0	no	0.00	0.00
MRH	2,248	18,002		538	3.0	yes		1.55
MRI	3,177	24,714	150	7,154	28.9	no	18.18	15.33
MRJ	4,816	21,626		700	3.2	yes		1.54
Major Rural Subtotal	**29,886**	**212,991**		**52,823**	**24.8**			**12.23**
IA	661	6,012	6	331	5.5	no	8.49	2.68

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

** Cases only reported for "good coding hospitals".

*** These are days classified as non-acute either using the subservice codes (good coding hospitals) or non-acute days as reported to Manitoba Health (poor coding hospitals).

	All Data*		Non-Acute					
Hospital Number	Cases	1991/92 Days	No. of Cases **	1991/92 Non-Acute Days***	% Non-Acute Days	Poor Coding Hospital	% Non-Acute Case Wts**	% Only Non-Acute Day Wts***
IB	918	8,886	18	1,170	13.2	no	16.83	6.96
IC	976	7,905		690	8.7	yes		4.43
ID	1,098	4,828		1,216	25.2	yes		11.6
IE	969	7,204	23	840	11.7	no	14.65	5.96
IF	998	7,306	15	520	7.1	no	13.15	3.40
IG	1,395	9,153	10	366	4.0	no	5.02	1.88
IH	1,298	11,492		5,819	50.6	yes		24.01
II	938	8,175	15	486	5.9	no	13.53	2.97
IJ	894	6,184	15	623	10.1	no	7.41	4.90
Intermediate Subtotal	**10,145**	**77,145**		**12,061**	**15.6**			**7.70**
SA	446	3,128	6	138	4.4	no	10.02	2.28
SB	215	2,321	4	364	15.7	no	19.27	9.03
SC	383	2,909		196	6.7	yes		3.26
SD	511	4,919	4	933	19.0	no	17.99	7.87
SE	452	3,707	12	787	21.2	no	14.49	11.58
SF	704	3,978		187	4.7	yes		2.30
SG	461	4,282	13	833	19.5	no	21.57	11.23
SH	406	3,083		689	22.3	yes		11.81
SI	339	3,627	11	754	20.8	no	20.48	12.18
SJ	214	2,122		695	32.8	yes		20.23
SK	273	3,657		1,069	29.2	yes		16.02
SL	375	4,327	14	2,122	49.0	no	33.52	29.20
SM	383	2,199	2	61	2.8	no	7.11	1.30
SN	462	3,772		886	23.5	yes		13.45
SO	559	5,990	15	541	9.0	no	5.44	4.91
SP	626	5,038	7	0	0.0	no	16.45	0.00
SQ	935	5,197		56	1.1	yes		.58

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

** Cases only reported for "good coding hospitals".

*** These are days classified as non-acute either using the subservice codes (good coding hospitals) or non-acute days as reported to Manitoba Health (poor coding hospitals).

	All Data*		Non-Acute					
Hospital Number	Cases	1991/92 Days	No. of Cases **	1991/92 Non-Acute Days***	% Non-Acute Days	Poor Coding Hospital	% Non-Acute Case Wts**	% Only Non-Acute Day Wts***
SR	779	6,851		982	14.3	yes		8.14
SS	154	2,706		1,142	42.2	yes		24.69
ST	699	6,022		1,449	24.1	yes		12.87
SU	275	2,169		96	4.4	yes		2.5
SV	1,230	6,276	2	234	3.7	no	1.89	1.85
SW	511	3,066		412	13.4	yes		5.92
SX	674	6,403		1,576	24.6	yes		13.58
SY	335	4,161		1,351	32.5	yes		18.61
SZ	1,355	8,265		461	5.6	yes		3.09
SAA	674	3,920		463	11.8	yes		6.24
SBB	398	3,977	9	946	23.8	no	20.03	13.02
SCC	564	5,443		1,203	22.1	yes		12.16
SDD	564	2,987		322	10.8	yes		5.16
SEE	785	6,075		197	3.2	yes		1.79
SFF	362	3,392	6	292	8.6	no	5.61	4.28
SGG	163	1,857	4	386	20.8	no	14.44	12.14
SHH	272	4,907	5	998	20.3	no	12.74	12.64
SII	256	2,606		1,154	44.3	yes		28.55
SJJ	225	2,072		123	5.9	yes		1.14
SKK	1,074	3,245		0	0.0	yes		0.00
Small Rural Subtotal	**19,093**	**150,656**		**24,098**	**16**			**5.44**
MUA	138	1,349	5	133	9.9	no	14.77	4.73
MUB	169	1,239	5	269	21.7	no	17.04	11.88
MUC	92	1,133	7	128	11.3	no	8.85	6.10
MUD	206	3,472		1,390	40.0	yes		27.26
MUE	254	1,621		422	26.0	yes		13.03
MUF	176	1,467	0	0	0.0	no	0.00	0.00

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

** Cases only reported for "good coding hospitals".

*** These are days classified as non-acute either using the subservice codes (good coding hospitals) or non-acute days as reported to Manitoba Health (poor coding hospitals).

	All Data*		Non-Acute					
Hospital Number	**Cases**	**1991/92 Days**	**No. of Cases ****	**1991/92 Non-Acute Days*****	**% Non-Acute Days**	**Poor Coding Hospital**	**% Non-Acute Case Wts****	**% Only Non-Acute Day Wts*****
Multi-Use Subtotal	**1,035**	**10,281**		**2,342**	**228**			**12.90**
NIA	105	369		19	5.1	yes		2.2
NIB	209	1,083	24	605	55.9	no	27.78	27.49
NIC	236	2,142		922	43.0	yes		26.28
NID	157	819	2	319	38.9	no	18.47	18.36
NIE	747	2,336	0	0	0.0	no	0.00	0.00
Northern Isolated Subtotal	**1,454**	**6,749**		1,865	27.6			12.79
GRAND TOTAL	**175,062**	**1,567,428**		330,512	21.1			9.25

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

** Cases only reported for "good coding hospitals".

*** These are days classified as non-acute either using the subservice codes (good coding hospitals) or non-acute days as reported to Manitoba Health (poor coding hospitals).

Appendix Table A-6 gives the breakdown of case types (by RDRG class) for each of the hospitals.

1. Total Cases - the total cases not including those hospitalized in 1991/92 but not yet separated by March 31, 1993.

2. Surgical Obstetrics - percentage of cases that were categorized in surgical obstetric RDRGs.

3. Medical Obstetrics - percentage of cases that were categorized in medical obstetric RDRGs.

4. Surgical - percentage of cases categorized in surgical RDRGs.

5. Medical - percentage of cases categorized in medical RDRGs.

6. Other - percentage of cases that were categorized in RDRGs not falling into any of the above categories.

Table A-6

Percent Type of Case by Hospital, 1991/92

		Case Type (in Percent)				
Hospital Number	**Total Cases***	**Surg Obstetrics**	**Med Obstetrics**	**Surgical**	**Medical**	**Other**
TA	25,631	4.3	22.7	26.0	26.8	20.2
TB	35,590	3.7	12.6	31.0	35.4	17.3
Teaching Subtotal	**61,221**	**3.9**	**16.9**	**28.9**	**31.8**	**18.5**
UCA	10,574	3.1	11.9	29.0	42.1	13.9
UCB	10,675	2.8	14.4	27.7	36.6	18.6
UCC	10,712	2.1	9.8	44.7	31.9	11.4
UCD	9,401	2.7	17.4	29.9	30.3	19.6
UCE	4,129	0.5	0.2	44.2	54.0	1.1
UCF	6,737	0.3	0.4	41.2	50.5	7.7
Urban Community Subtotal	**52,228**	**2.2**	**10.6**	**34.9**	**38.8**	**13.56**
MRA	1,494	4.6	10.4	28.5	42.0	14.4
MRB	2,623	1.3	10.9	14.4	61.3	12.1
MRC	3,139	3.4	8.2	17.8	59.4	11.1

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

		Case Type (in Percent)				
Hospital Number	**Total Cases***	**Surg Obstetrics**	**Med Obstetrics**	**Surgical**	**Medical**	**Other**
MRD	2,836	3.5	10.7	15.1	57.0	13.8
MRE	1,908	3.4	11.3	17.3	51.6	16.4
MRF	4,364	3.1	11.1	13.8	60.0	12.0
MRG	3,281	3.0	14.2	10.8	58.5	13.6
MRH	2,248	1.5	8.9	19.5	60.5	9.7
MRI	3,177	2.3	9.4	6.6	71.4	10.3
MRJ	4,816	3.3	20.6	13.1	44.6	18.4
Major Rural Subtotal	**29,886**	**2.9**	**12.2**	**14.6**	**56.9**	**13.3**
IA	661	0.0	9.8	10.3	67.5	12.4
IB	918	0.5	3.1	8.0	81.5	7.0
IC	976	2.5	8.2	28.7	50.1	10.6
ID	1,098	1.0	18.8	5.3	59.7	15.2
IE	969	0.1	6.3	1.8	82.0	9.8
IF	998	1.7	5.7	12.0	69.1	11.4
IG	1,395	1.0	6.7	15.5	66.5	10.4
IH	1,298	0.1	5.9	1.0	83.7	9.3
II	938	1.5	5.1	17.5	67.2	8.7

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

		Case Type (in Percent)				
Hospital Number	Total Cases*	Surg Obstetrics	Med Obstetrics	Surgical	Medical	Other
IJ	894	1.2	8.5	11.0	70.6	8.7
Intermediate Rural Subtotal	**10,145**	**1.0**	**7.8**	**10.9**	**70.0**	**10.4**
SA	446	0.9	10.8	0.2	76.9	11.2
SB	215	0.0	0.0	0.9	93.5	5.6
SC	383	0.0	0.3	0.8	95.3	3.7
SD	511	0.0	1.0	0.6	96.1	2.3
SE	452	0.2	4.0	1.3	85.2	9.3
SF	704	0.9	3.3	10.4	78.1	7.4
SG	461	0.2	2.2	1.1	89.2	7.4
SH	406	0.0	2.0	0.2	91.1	6.7
SI	339	0.0	1.2	2.7	92.0	4.1
SJ	214	0.0	1.9	0.0	86.9	11.2
SK	273	0.7	6.6	6.2	70.0	16.5
SL	375	0.0	1.6	0.5	92.5	5.3
SM	383	0.0	3.1	0.3	88.8	7.8
SN	462	0.0	3.7	0.0	85.7	10.6

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

		Case Type (in Percent)				
Hospital Number	Total Cases*	Surg Obstetrics	Med Obstetrics	Surgical	Medical	Other
SO	559	0.0	6.1	2.9	76.9	14.1
SP	626	0.0	4.6	1.6	85.8	8.0
SQ	935	0.4	7.5	2.6	78.7	10.8
SR	779	0.5	8.3	3.5	79.2	8.5
SS	154	0.0	0.6	0.6	90.3	8.4
ST	699	0.0	5.3	0.0	81.1	13.6
SU	275	0.0	17.1	0.0	66.9	16.0
SV	1,230	0.1	8.1	3.5	81.8	6.5
SW	511	0.4	5.5	3.5	83.6	7.0
SX	674	0.0	0.9	0.3	95.3	3.6
SY	335	0.0	2.7	0.0	91.6	5.7
SZ	1,355	0.0	3.8	0.2	89.9	6.1
SAA	674	0.0	3.3	0.0	91.8	4.9
SBB	398	0.0	0.0	0.0	93.5	6.5
SCC	564	0.7	2.7	14.0	75.2	7.4
SDD	564	0.0	11.9	0.0	74.6	13.5
SEE	785	1.4	14.5	12.9	55.8	15.4

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

		Case Type (in Percent)				
Hospital Number	**Total Cases***	**Surg Obstetrics**	**Med Obstetrics**	**Surgical**	**Medical**	**Other**
SFF	362	0.0	0.6	0.0	94.5	5.0
SGG	163	0.0	5.5	0.0	85.9	8.6
SHH	272	1.1	7.0	4.4	75.4	12.1
SII	256	0.0	8.2	3.9	77.3	10.5
SJJ	225	0.4	4.4	4.0	80.9	10.2
SKK	1,074	0.0	7.4	0.0	84.0	8.7
Small Rural Subtotal	**19,093**	**0.2**	**5.3**	**2.5**	**83.5**	**8.5**
MUA	138	0.0	0.0	0.7	89.1	10.1
MUB	169	0.0	1.8	0.0	92.9	5.3
MUC	92	0.0	0.0	0.0	95.7	4.3
MUD	206	0.0	4.9	1.5	87.9	5.8
MUE	254	0.0	7.1	0.8	78.7	13.4
MUF	176	0.0	0.6	0.6	98.3	0.6
Multi Use Subtotal	**1,035**	**0.0**	**3.1**	**0.7**	**84.1**	**7.1**
NIA	105	0.0	2.9	0.0	89.5	7.6
NIB	209	0.0	4.3	1.0	90.4	4.3

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

		Case Type (in Percent)				
Hospital Number	Total Cases*	Surg Obstetrics	Med Obstetrics	Surgical	Medical	Other
NIC	236	0.8	9.3	2.1	71.2	16.5
NID	157	0.0	3.8	0.0	84.7	11.5
NIE	747	0.0	9.5	0.5	78.6	11.4
Northern Isolated Subtotal	**1,454**	**0.1**	**7.6**	**0.8**	**80.5**	**10.9**
GRAND TOTAL	**175,062**	**2.6**	**12.2**	**23.9**	**46.8**	**14.5**

* Does not include cases which were hospitalized in 1991/92 and have not yet separated by March 31/93.

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