ASSESSING HOSPITAL UTILIZATION:

IMPLICATIONS OF COST CONTAINMENT FOR HEALTH CARE

BY

RUTH BOND (BRAZAUSKAS)

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ABSTRACT

Cost-containment measures such as bed closures have generated a great deal of concern regarding their potential impact on the quality of care. This study used two conceptual frameworks to assess hospital care prior to and during the ongoing health reform in Manitoba. It was hypothesized that for hospital utilization deemed "necessary", little variation would occur over time (discretionary model). "Potentially reducible" hospital utilization, on the other hand, was expected to decline during the period of reform (access model).

All inpatient hospital utilization (including surgical outpatient contacts) from fiscal 1990/91 through 1994/95 was examined for residents of Manitoba registered with Manitoba Health. Manitoba Health hospital discharge abstracts were extracted using the medical conditions defined in the two conceptual models: 1) low/moderate-variation conditions in the discretionary model and 2) ambulatory care sensitive conditions in the access model. Two study periods were defined: pre-reform (1990/91 and 1991/92) and reform (1992/93 to 1994/95). Subgroups of the population at high risk of hospitalization for these conditions were also identified.

Using discharges as a hospital utilization measure, rates for both models remained stable over the five-year period. Using length of stay, rates of hospital days declined for the discretionary model but remained fairly stable for the access model. In the access model, low-income rural area residents were hospitalized increasingly more often by 1994/95 while rates of hospital days for high-income urban residents dropped substantially over the reform period. Individuals age 65 and over, residents of rural areas, females, Treaty Indians, and residents in lowest income quintile neighbourhoods were all overrepresented by up to three times their proportions in the Manitoba population. About 20%of hospital days for access conditions might be eliminated if utilization rates of this high-risk group matched those of the lowest risk group.

According to the discretionary model, the pattern of utilization for low-variation conditions suggests that quality of care has not changed for conditions where hospitalization is regarded as necessary. On the other hand, hospital use for access model conditions showed minimal change, although the model suggests it is precisely such hospital utilization that might be reduced without adversely affecting quality of care.

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CHAPTER 1. INTRODUCTION

Health care delivery in Canada has been subjected to increasing public scrutiny as the costs of care continue to rise. At the same time, federal transfer payments, relied upon by provincial governments to subsidize the costs of health care, are expected to disappear by the end of the century (Blomqvist, 1994a). Attempts to contain costs have become the impetus for sweeping reforms in health care delivery.

Many of the proposed cost-cutting measures have elicited great concern from both health care users and providers about potential adverse consequences to the quality of health care. The ultimate fear generally expressed by these groups is the loss of Medicare, Canada's highly-valued national health insurance plan (Deber and Vayda, 1992), considered to be one of the best in the world.

Population health, however, does not necessarily improve with the amount spent on health care. Using infant mortality and life expectancy as indicators of population health, Japan, for example, has achieved better health than Canada at less expense. Life expectancy in 1987 was 78.9 years in Japan compared with Canada's 76.8 years, and the infant mortality rate was 5.0 per 1,000 compared with Canada's rate of 7.3 per 1,000. For the same year, Canada spent $1,483 per capita on health care expenditures, over 50% more than Japan's per capita expenditure of $915 (Manitoba Health, 1992). Such incongruities raise doubts as to the effectiveness and efficiency of the Canadian health care system; as Woodward and

Stoddart (1990:284) point out, "the increase in use of health care has not resulted in a dramatic positive change in the health status of the Canadian population".

In Canada, health care spending as a percentage of the Gross Domestic Product (GDP) has gradually increased, from 7.5% in 1980 to 9.7% by 1994, although the latter represents a decline from the peak level of 10.1% in both 1992 and 1993 (Health Canada, 1996; Tholl, 1994). Canadian health care costs make up over 30% of most provincial budgets, with Manitoba the highest at 36.9% (Deber and Vayda, 1992; Tholl, 1994). Canada "has emerged as the world's second highest spender on health care, with real per capita expenditures significantly in excess of that of other countries" (Tholl, 1994:53). The estimated cost of health care delivery in 1994 was $72.5 billion, or $2,478 per capita for both public and private sectors ($1,451 per capita for the public sector alone) (Health Canada, 1996). Health care spending has increased faster than the growth in Canada's GDP (Kierans, 1994); this means that less of the GDP is available to go toward investment in other endeavours (Tholl, 1994).

In Manitoba, approximately $1.84 billion was spent in fiscal 1994/95 on insured health services (Manitoba Health, 1995). The primary target for reducing health care costs has been the hospital services sector, representing the greatest consumer of the health care dollar. The 1994/95 Annual Report from Manitoba Health (1995) showed hospital spending increasing over a five-year period, from $908,013,000 in fiscal 1990/91 to $977,211,000 for fiscal 1994/95. Adjusting for inflation, however, hospital spending has actually declined almost 8% over the

same five-year period. Even so, the hospital spending portion has remained at approximately 62% of the total health care expenses covered by Manitoba Health Services Insurance.

In response to declines in available funds for health care, a major restructuring of the hospital system was included as one of several "Priority Actions" in a comprehensive "Action Plan" developed by the Manitoba government (Manitoba Health, 1992). The government proposed closing hospital beds, as well as reallocating others, in order to shift funds from "high-cost institutional settings to lower cost and more appropriate prevention, support and home care services" (Manitoba Health, 1992:16). Three hundred and six Winnipeg acute care beds were closed following hospital budget reductions of 1% in 1991 and 1992 (Roos and Shapiro, 1994). This represented 8.4% of the total Manitoba bed supply, although 75 non-acute beds and 54 personal care home beds were added to the overall bed supply that same year (Roos and Shapiro, 1994). Since 1992, the hospital budget has declined about 2%, while the overall health care budget has decreased about 2.8% (Government of Manitoba, 1992-1996; Marian Shanahan, personal communication). Total acute beds (numbers for set-up beds taken at the start of the fiscal year), according to the Manitoba Health Bed Map, have declined over the five year period since 1990 by 17.9% (Brownell and Roos, 1996).

In Manitoba, $75 million has been targeted for elimination from the $1.8 billion health care budget in order to contend with a $147 million cut in federal

transfer payments. As a result, the reform process is expected to accelerate in 1996, leading to concerns about the likelihood of "massive bed closings, higher fees, fewer free services, job losses, labour strife - even death certificates for some hospitals" (Samyn, 1996b). This accelerated plan could see as many as 1,700 hospital beds closed over the next two years (Krueger, 1995). At the same time, headlines refer to long waits for surgery ("Wait for joint replacement longest in Manitoba"; "Cardiac patients on hold"), leading groups such as the Manitoba Nurses Union to question reports of the health care system being as healthy as ever, despite bed closures over the last five years (Paul, 1995; Ward, 1994; Krueger, 1996b). The public has rallied to protest against the proposed closing of Misericordia and Seven Oaks hospitals as acute care facilities as well as the closing of entire hospitals in rural Manitoba (Paul, 1996c; 1996e). Not only is hospital care generally regarded as sacrosanct, the perception is that we need more of it. Given such concern, should hospitals be singled out in this manner?

When waiting lists are proferred as evidence of insufficient hospital resources, the underlying assumption is that all hospital utilization is entirely determined by need, or illness status. Naylor (1991), however, counters that lack of queues instead implies excess capacity, pointing out that in Ontario, dramatically decreased waiting times were achieved using efficiency-enhancing maneuvers without affecting quality of care. Spot funding was used to address specific bottlenecks while surgeons tightened case selection criteria and changed booking practices to hold additional slots open for the more urgent cases.

It has been demonstrated that not all hospital utilization is necessary. An Appropriateness Evaluation Protocol, used on Health Insurance Experiment data collected by Rand for six American sites, found 23% of hospital admissions for non-elderly adults to be inappropriate and an additional 17% to be avoidable because ambulatory surgery services could have been used instead (Siu et al., 1986). They also found roughly a third of hospital days to be inappropriate. In addition, highest use hospitals did not necessarily have the highest rate of inappropriate use. A recently-completed retrospective chart review found that up to 50% of adult medical patients in acute care Manitoba hospitals could be more effectively and appropriately cared for in alternative settings such as personal care homes (DeCoster et al., 1996).

The substantial variation in rates of surgery and hospitalization demonstrated across countries and small areas within countries (Andersen and Mooney, 1990; Wennberg et al., 1987; Roos et al., 1988; Roos, 1992) also provides strong support for the view that not all utilization is needs-based. International comparisons, for example, have found substantially greater utilization (both in numbers of hospital discharges and hospital days) for selected Canadian hospitals - especially for long-stay patients - than comparable hospitals in the U.S. (Zwanziger et al., 1993; Newhouse et al., 1988). Variation can also be found among hospitals within the same city, as Brownell and Roos (1992) found in a study of Winnipeg hospitals. Controlling for such factors as age, sex, and illness severity,

regression analysis showed hospital of admission had a significant impact on length of stay in 12 of 14 diagnostic categories.

If not all hospital care is needs-based, reductions in beds should be possible without harming quality of care. Information to assist physicians in safely changing practices to lower admissions and/or lengths of stay has not routinely been made available, although this situation is beginning to change as reports are generated, for example, on hospital utilization patterns (Brownell and Roos, 1996) and patient outcomes (Roos et al., 1996). Health care utilization information is critical for assessing the impact of changes in practice; such information is valuable for guiding both clinical and policy decision-making in evaluating the impact of health care reform.

This thesis uses two conceptual frameworks to evaluate hospital utilization in Manitoba both prior to and during the period of ongoing health reform. The discretionary model (low-variation/high-variation conditions) uses physician practice style to explain variation in health care utilization. The access model (ambulatory care sensitive conditions) explains variation using socio-demographic characteristics. The nature of the illness, or the condition(s) for which a person is hospitalized, in each model is used to explore the issues of necessity and quality of care. The Manitoba Health administrative data base provides a unique opportunity to address the following questions on a population-based level:

1. How might hospitalization be identified as necessary or unnecessary?

2. Have changes occurred in hospital utilization with the implementation of reform for:
    a) conditions where hospital utilization is classified as necessary?
    b) conditions where hospital utilization may be considered potentially unnecessary?
3. To what extent might hospital utilization classified as potentially unnecessary be reduced?
4. Who would be most affected by reductions in hospital utilization; that is, are certain subgroups of the population at greater risk than other groups? Is there an alternative to hospitalization for such groups?

Such information can assist physicians, hospital administrators, and policy makers in identifying when hospital beds are being used appropriately (or possibly unnecessarily). The following chapter reviews the context in which cost containment takes place; trends in hospital utilization are presented, followed by an overview of Medicare and the role of the hospital and a discussion of cost containment policies and alternative health care. A literature review on the use of population-based models to evaluate health care is presented in the subsequent chapter, focusing on the two models used for this study, and concluding with the study hypotheses. The methodology chapter outlines the research design, including how each of the concepts was operationalized for analysis. Results of five years of data analysis are then presented for both conceptual frameworks, with an examination of Manitoba hospital utilization both prior to and during

reform. The last chapter summarizes the study findings and their policy implications, the strengths and limitations of the study, and future research directions.

CHAPTER 2: COST CONTAINMENT IN HEALTH CARE DELIVERY

Health care in Canada is currently a right rather than a privilege, making Medicare one of Canada's most valued institutions. Its programs have become an important symbol of "national identity, unity, and pride" (Tholl, 1994:55), and governments "must be careful not to be perceived as threatening it" (Deber and Vayda, 1992:14). On the other hand, inflation and federal cutbacks have placed the basic, taken-for-granted, principles of Medicare under close scrutiny, forcing the provinces to examine various options for containing the burgeoning costs of health care. As Deber et al. (1994) point out, further increases in public monies through taxation to cover increasing costs is no longer a readily available option.

This chapter focuses on several commonly-proposed approaches to cost containment, following a description of the context in which such reforms take place. Trends in hospital utilization are first presented, followed by an overview of Medicare and the role of the hospital in health care and concluding with a discussion of cost containment policies and alternatives to traditional forms of health care.

A. TRENDS IN HOSPITAL UTILIZATION

Many comparative studies have shown that Canadians have one of the highest rates of hospital use among Western countries, whether measured by length of stay or by numbers of people hospitalized (Eglinton, 1989). A 1987

comparison of acute care hospital use showed Canada to be substantially higher than the U.S. with 1,590 inpatient days per 1,000, compared with 929 days per 1,000 in the U.S. In addition, admission rates were higher at 142 admissions per 1,000 versus the U.S. at 129 per 1,000 and mean length of stay was greater at 11.2 days, compared with the U.S. at 7.2 days. (Expenditures per capita, however, were appreciably less for Canada at $492 per capita, compared with the U.S. at $621 per capita. This has been attributed to higher administrative costs in the U.S. and greater centralization of equipment and personnel in Canada (Redelmeier and Fuchs, 1993).)

Manitoba Health annually reports utilization for individuals registered with the Manitoba Health Services Insurance Plan, including rates of inpatient cases, hospital days, and average length of stay (Manitoba Health Annual Reports, 1991-1994). In the following table, data for fiscal 1994/95 were received in a personal communication from Fred Toll, consultant to Manitoba Centre for Health Policy and Evaluation (MCHPE).

Table 1. Manitoba Hospital Utilization Rates per 1,000 by Fiscal Year

	1990/91	1991/92	1992/93	1993/94	1994/95
Inpatient cases	131	136	133	130	129
Total hospital days	1,459	1,481	1,460	1,373	1,260
Average length of stay	11.1	10.9	11.0	10.6	9.8

Table 1 shows an overall decline in hospital utilization in Manitoba over the last five years on all three measures. The number of hospital discharges per

1,000, although increasing slightly in 1991/92 and 1992/93, has decreased marginally (1.5%) from 131 in 1990/91 to 129 per 1,000 for 1994/95. The total hospital days per 1,000 used by these cases showed a similar trend of a slight increase in 1991/92 and 1992/93, but decreased substantially (13.6%), from 1,459 days per 1,000 in 1990/91 to 1,260 days in 1994/95. Average length of stay also showed a large overall decrease (11.7%), from 11.1 days in 1990/91 to 9.8 days in 1994/95.

The Manitoba Centre for Health Policy and Evaluation regularly generates reports which examine health care utilization by Manitobans in more detail. Although overall rates of discharges changed very little over a four-year period examined by Brownell and Roos (1996) for adult residents of Winnipeg, changes were evident in the nature of care (Table 2).

Table 2. Manitoba Adult Winnipeg Residents: Utilization by Fiscal Year

	1990/91	1991/92	1992/93	1993/94
Days per 1,000 residents	[N=1,493]	[N=1,485]	[N=1,474]	[N=1,343]
* Short (<60 days)	712	721	674	626
* Long (60+ days)	585	532	554	475
* Long-term care hospital	196	232	246	242
Discharges per 1,000	[114.38]	[119.42]	[117.72]	[117.24]
* Surgical inpatient	28.68	29.69	28.38	26.51
* Surgical outpatient	25.11	28.22	29.46	31.09
* Medical	37.93	38.91	37.15	37.74
* Other	23.66	22.60	22.73	22.90

The rate of surgical inpatient discharges for Manitoba adult Winnipeg residents declined by 8% over the four-year period while outpatient surgery

increased by 24% over the same time. Average length of stay has also declined by 15% for surgical inpatients and by 3% for medical discharges over the same time period. A large overall drop in hospital days occurred for adult residents of Winnipeg, both for long- and short-stay cases, but there was an increase in hospital days for long-term care hospitals. If such trends persist, it is possible that Canadian utilization patterns might eventually approach the lower rates of the U.S. for acute care hospitals.

It is important to note, when examining trends in hospital utilization, that extremely long stays can occur in acute care hospitals. "Acute care" generally refers to shorter stays; care is provided for conditions which generally have "a short course which can usually be moderated or eliminated entirely through medical care of some type" (DeFriese and Earp, 1989:205). "Chronic care" usually refers to longer stays; such cases can have multiple diseases or can reflect the natural degeneration of the body through old age (Eglinton, 1989). Treatment for chronic care is usually custodial and, as the population ages, chronic cases increasingly occupy a larger proportion of hospital beds (Tholl, 1994).

Certain subgroups of the population are more likely to be hospitalized and to remain in hospital longer than other subgroups for the same illness; they are also more likely to contract illness in the first place. Individuals who are older, female, poor, resident in rural areas, and/or are aboriginal are in this higher risk, or more vulnerable (Aday, 1994), category. Trends in hospital utilization are described below for the demographic characteristics of age, sex, income, area of

residence, and aboriginal status, all important predictors of hospital utilization; such demographic data are also easily accessible for population-based analyses.

1. Age

The likelihood of getting sick increases with age, particularly for chronic diseases (e.g., diabetes) (Eglinton, 1989). Not only do the elderly use proportionately more hospital resources, the numbers of elderly as a group are increasing significantly as the population ages. The proportion age 65 and up currently comprise about 13% of the Manitoba population; this group is expected to constitute 18.2% of the Canadian population by the year 2051 (Eglinton, 1989:60). The "old old" elderly age group (85+), in particular, is increasing the most of any other age group (Cockerham, 1989).

* ***Hospitalizations.*** The age 65+ group has the highest rate of hospitalizations of any age group; for example, in 1980/81 there were 34,224 separations (or discharges) per 100,000 population for this group, with the next highest rate half that: 16,397 for the age group 45-64 (Eglinton, 1989). In Manitoba, the age 70+ group had 410.06 separations per 1,000 in fiscal 1993/94, compared with the under age 70 group at almost a quarter of that rate, 107.24 separations per 1,000 (Manitoba Health, 1994).

* ***Hospital days.*** In Canada, the age 65+ group had the longest average length of stay in 1980/81 with 25.8 days; the next highest was for the 45 to 64 age group at 12.4 days (Eglinton, 1989). In Manitoba, this age group utilizes more than half of all hospital days in the province. Those aged 70 and over, for example,

used 883,163 hospital days during fiscal 1993/94, or 55% of the total 1,602,424 hospital days for that year and stayed an average of 20.37 days in hospital (Manitoba Health, 1994).

2. Gender

Women generally suffer from more frequent illnesses and disability, acute illnesses such as infectious diseases, and chronic non life-threatening conditions when compared with men, who experience more of the life-threatening chronic health problems. Women also tend to make greater use of health services (both physician visits and hospital discharges) than men, even when excluding rates of utilization for maternity services (Cockerham, 1989). Their greater utilization is compounded by the fact that women live longer than men and are thus more likely to experience morbidity related to aging (Eglinton, 1989).

* ***Hospitalizations.*** Although women comprised 50.66% of the Manitoba population for fiscal 1993/94, they had a much higher rate of hospitalizations per 1,000 than men: 167 separations versus 121 separations per 1,000 for men. This relationship reversed, however, for older women (age 55+), with fewer separations occurring for women than for men (Manitoba Health, 1994).

* ***Hospital days.*** Women use more hospital days per 1,000 Manitoba population than men; in fiscal 1993/94, for example, they used 1,612 hospital days per 1,000 versus the 1,240 hospital days per 1,000 used by men. This relationship reversed once again for older age groups, where women 55+ used less days per 10,000 than men. Average length of stay for women as a group was also slightly

lower than for men, 9.7 days per 1,000 versus 10.2 days per 1,000, respectively (Manitoba Health, 1994).

3. Area of Residence

Residents of small, remote, rural communities and low-income residents of inner cities have always had difficulty in gaining timely access to appropriate health care services (DeFriese and Earp, 1989). Rural residents, however, tend to use hospital resources more than urban residents, particularly the teaching hospitals, for obtaining tertiary care and for much of their surgery (Roos and Shapiro, 1994).

* ***Hospitalizations.*** In Manitoba, a comparison of all hospital use by residential area for fiscal 1991/92 showed that Winnipeg residents had 135 hospitalizations per 1,000, compared with 196 per 1,000 for non-Winnipeg residents. This relationship held for short-stay inpatient care (length of stay of less than 60 days) where Winnipeg residents had 101 separations per 1,000 compared with 168 separations per 1,000 for non-Winnipeg residents. For long-stay cases, Winnipeg residents had a slightly higher separation rate when compared with non-Winnipeg residents (4 separations per 1,000 versus 3 per 1,000) (Black et al., 1993a; 1993b).

* ***Hospital days.*** In Manitoba, Winnipeg residents used 1,461 days per 1,000 in fiscal 1991/92, slightly more than non-Winnipeg residents, with a rate of 1,415 days per 1,000. Average length of stay, however, was quite a bit longer for non-Winnipeg residents: 13.7 days versus the average 8.5 days that non-Winnipeg

residents stayed in hospitals. For short-stay cases, non-Winnipeg residents had a substantially higher rate of 1,016 hospital days per 1,000, compared with 743 days per 1,000 for Winnipeg residents. The relationship reverses for long-stay cases, with Winnipeg residents using 719 days per 1,000 compared with the non-Winnipeg rate of 402 days per 1,000 (Black et al., 1993a). Average length of stay was higher for Winnipeg residents, both short-stay cases (7.3 days compared with 6.1 days for non-Winnipeg residents) and long-stay cases (195 days on average, compared with 159 days for non-Winnipeg residents) (Black et al., 1993a).

4. Income

The poor have fewer resources, both material and nonmaterial: "to be poor is by definition to have less of the things (including health care) produced by society" (Cockerham, 1989:58). It has been shown repeatedly that the poor have a higher reported prevalence of most health problems than any other income group (Eglinton, 1989). This is largely due to their greater exposure to "physical (dust, extreme temperatures), chemical and biochemical (diet, pollution, smoking, alcohol and drug abuse), biological (bacteria, viruses), and psychological (stress) risk factors that produce ill health" (Cockerham, 1989:60). Hospital use and health status are directly associated with income - the lower the income, the greater the risk of both hospitalization and of illness (Hulka and Wheat, 1985; Terris, 1990; Frohlich and Mustard, 1994).

* ***Hospitalizations.*** In Manitoba, Brownell and Roos (1996) found that the lower the neighbourhood income, the higher the rate of hospital admissions. For

Winnipeg residents in fiscal 1993/94, the poorest income quintile showed a rate of separations of 168 per 1,000, with a steady downward gradient to a rate of 114 per 1,000 for the wealthiest income quintile.

* ***Hospital days.*** A similar pattern was found for hospital days. Winnipeg residents in the poorest income quintile utilized 910 hospital days per 1,000 in fiscal 1993/94. A steady downward gradient occurred once again to a rate of 485 days per 1,000 for Winnipeg residents in the wealthiest income quintile (Brownell and Roos, 1996). Average length of stay also increased for Manitobans as neighbourhood income declined (Roos and Shapiro, 1994).

5. Treaty Indian

The aboriginal population, regardless of the utilization measure, typically has the poorest health compared to other subgroups of the population. Although some diseases may indeed have a genetic basis, race is significant because of the experience of discrimination and because of the factors typically associated with poverty. Disorders such as alcoholism, drug addiction, suicide, lead poisoning, influenza, pneumonia, and tuberculosis are more common among the poor and hence, among the aboriginal population (Cockerham, 1989; Eglinton, 1989).

* ***Hospitalizations.*** In Canada, hospitalization rates for the aboriginal population are more than twice the national average (Eglinton, 1989). Exploratory analyses for utilization by Treaty Indians residing in Winnipeg showed a hospitalization rate almost three times that of other Winnipeg residents for fiscal 1991/92: 288.01 versus 98.59 per 1,000 (personal communication, Charles Burchill).

* ***Hospital days.*** The same exploratory analyses showed the rate of hospital days for this group to be twice that of the remaining Winnipeg population for fiscal 1991/92 (3,087.41 versus 1,452.87 days per 1,000). This group stayed in hospital, however, on average, approximately half the number of days as the remaining population: 7.10 days, compared with 14.57 days for other Winnipeg residents (personal communication, Charles Burchill).

Summary of Trends in Hospital Utilization

It should be noted that although point-in-time snapshots were used to describe hospital utilization, trends for the demographic variables are consistent over time in Manitoba. Individuals aged 65 and over, female, poor, resident in rural areas, and/or aboriginal are hospitalized at rates greater than the remaining population and tend to use more hospital days.

Manitoba trends are similar to those of Canada, which has among the highest hospital utilization in the world, without any noticeable difference in population health. The assumption is that utilization is excessive, and that this excess represents unnecessary hospital use. Policy makers have used this information to suggest ways of streamlining our system to be both more efficient and effective. Policy choices for containing costs ultimately depend upon the factors perceived as contributing to inefficiencies in the health care system. This has generally meant changing the role that the hospital currently occupies as the central institution in the provision of health care services, with implications for the availability of Medicare funding.

B. OVERVIEW: MEDICARE AND THE ROLE OF THE HOSPITAL

The public sector currently pays for over 90% of the costs of hospital and physician services, primarily through taxation, with private health insurance such as Blue Cross covering supplemental benefits and services such as long-term care, drugs, and dental care (Deber and Vayda, 1992). Hospital services have historically occupied a central place in the community, providing a varying array of services at different historical periods in time. An emphasis on coverage of hospital services by policy makers has contributed to the large proportion of health care funding currently allocated for this sector. This section provides a brief historical overview of the process by which this occurred.

1. The Role of the Hospital

As of 1991, Canada had 1,240 hospitals, with almost all of them being operated on a non-profit basis by a board of directors comprising administrators, physicians, and members of the community (Eglinton, 1989; Tholl, 1994). They are owned by the province, municipalities, religious orders or voluntary organizations, and are funded largely through prospective global budgets negotiated with or imposed by provincial governments (Tholl, 1994; Blomqvist, 1994b; Eglinton, 1989). This contrasts with the U.S. where only a little over half of all hospitals are nonprofit, with the rest being proprietary or government, and where hospitals use a fee-for-service system, submitting bills for services rendered (Cockerham, 1989; Blomqvist, 1994b).

Cockerham (1989) has described how hospitals have passed through four distinct chronological phases of development - as centres of religious practice, to poorhouses, to deathhouses and, finally, to their current status as centres of medical technology.

1) **Centres of religious practice.** The origin of the hospital has been associated with the rise of Christianity and a theology emphasizing that "human beings were duty bound to provide assistance to the sick and needy; this belief was reinforced by the notion that spiritual salvation could be obtained by whoever provided such a service" (Cockerham, 1989:230). Founded by clergy and secular benefactors, a network of hospitals under the centralized authority of the Church existed by the end of the 15th century throughout Western Europe, with medical care supervised and largely performed by clergy and nuns. In addition to religious exercises and a rudimentary form of nursing care, the medieval hospital provided charity and welfare services (food and shelter) to the lower classes, both the sick and the able-bodied.

2) **Poorhouses.** By the 1500s, with decentralization and a shift in control to secular authorities (frequently municipal governments), many hospitals were forced to close because of lack of funds. Not only had the religious character of the hospitals begun to disappear, facilities became neglected, funds were misappropriated, and standards of patient care care lowered. The remaining hospitals had to limit their services to the sick who could be cured; the able-bodied and incurably ill were relegated to the streets or to poorhouses. Many vagrants

throughout Europe, because of unemployment, higher prices, and the loss of land, claimed to be sick or crippled in order to obtain food and shelter from the hospitals. Hospitals had to be reopened and once again essentially provided welfare services for the poor, warehousing them and removing them from the mainstream of society.

3) **Deathhouses**. Physicians had begun to associate themselves with hospitals in the 14th century, and by the 17th century had acquired a virtual monopoly over the medical knowledge acquired to date. They advised on patient care and eventually directed all care within the hospital, but the level of treatment was so primitive (e.g., unsanitary conditions) that few patients survived. Hospitals had become "places where the poor went to die" (Cockerham, 1989:232). The rich and the middle classes were able to receive care at home or at the doctor's office (Torrance, 1987; Eglinton, 1989).

4) **Centres of Medical Technology.** Over the last century, medical knowledge evolved, antiseptic measures were introduced, and the quality of hospital personnel improved significantly. The hospitals of today are institutions for medical care, research, and education and are funded by Medicare in their role as centres of medical technology.

2. Medicare

Each province is responsible for administering the programs of Medicare using a combination of provincial funding and transfer payments from the federal government. Four basic requirements must be followed to qualify for federal-

provincial cost-sharing for both hospital and medical services, and they have formed the foundation of all Canadian health policy since their inception (Deber and Vayda, 1992:4; Deber et al., 1994):

1) Coverage must be universal and accessible, ensuring "reasonable access to insured services by insured persons" without charge.

2) Coverage must be comprehensive; all "medically necessary" services must be insured.

3) Coverage must be portable; all individuals are covered wherever they travel in Canada.

4) The insurance program must be publicly administered, operating on a nonprofit basis.

With the BNA Act of 1867, which established Canada as a confederation of ten provinces and two territories, the provinces were given authority over the "Establishment, Maintenance and Management of Hospitals, Asylums, Charities, and Eleemosynary Institutions". Hospitals and hospital care in Canada were financed by municipal governments, religious groups, voluntary insurance programs and patient payments (Deber and Vayda, 1992:3).

The concept of federal-provincial cost-sharing for health services was first introduced at a federal-provincial conference convened in 1945 to consider programs for social reform. With the passage of the Hospital Insurance and Diagnostic Services Act in 1957, hospital services became eligible for fifty percent federal cost-sharing. The Medical Care Act of 1968 continued to entrench cost-

sharing of hospital services, but now added medical services to the agreement (Deber and Vayda, 1992).

Cost sharing later gave way to block funding. With cost-sharing, the funding formula for hospital inpatient services, for example, took into account per capita costs incurred by the province as well as the national average per capita costs. Wealthier provinces who spent more would thus receive less. Bill C-37 (including the Established Programs Financing (EPF) Act), however, replaced cost-sharing with a mix of block funding and tax points, and effectively shifted the responsibility for cost control to the provinces. The formula has been altered in subsequent federal budgets to the extent that federal cash payments are expected eventually to disappear. The EPF Act also meant that health care now had to compete for dollars with other provincially funded programs (Deber and Vayda, 1992).

Summary of Medicare and Hospital Funding

Health care provided by hospitals consumes the largest proportion of health care funding, and this pattern - of the hospital as central institution in the provision of health care services - has become entrenched in Medicare. As Deber and Vayda (1992:4) point out, the Hospital Insurance and Diagnostic Services Act, ensuring 50% cost sharing with the federal government for hospital care, provided no incentive to use less expensive sites; consequently, 'hospital-based patterns of practice were solidified, leading to some of the current financial problems".

Policy makers are examining various options for reducing the current levels of funding of hospital care without harming the quality of care. A variety of cost-containment measures have been proposed, not all of them directed at hospitals, but all invariably engendering strong opposition not only from stakeholders in organized medicine but also from members of the general public.

C. COST CONTAINMENT POLICIES

Ideally, individuals would only be hospitalized because of illness or disease, the latter defined as "a structural disorder of an individual's tissues and organs that gives rise to symptoms of ill health" (Eglinton, 1989:15). In this model, rates of hospitalization would vary for a particular disease because the prevalence of that disease varies among population groups. Indeed, the sicker the person, the more likely he or she is to be hospitalized. Roos and Shapiro (1994) found that sicker persons were more likely to be admitted in a three-year comparison of Manitoba hospital utilization data. Sicker people often have more than one illness present on admission (e.g., an individual with diabetes being admitted for influenza). Such comorbidity, or several different illnesses occurring at the same time, is directly related to risk of readmission to hospital (and mortality) (Roos et al., 1989; Romano et al., 1993).

A body of evidence suggests, however, that for about a third of most populations, "need" (measured by the extent of disability or self-reported symptoms) is not the most important determinant of acute health services (Billings

et al., 1993; Wennberg et al., 1987; Roos, 1992; DeFriese and Earp, 1989). Population surveys of prevalence so far have not confirmed that the prevalence of disease rates explains differences in hospitalization rates (Health Services Research Group, 1992). A number of other factors can determine both whether or not a person is admitted to hospital and how long that person stays in the institution; such factors have influenced proposals for containing health care costs.

The direction of public policy depends on how the problem is defined, its goals, and the instruments used to carry it out (Pal, 1987). Until Medicare was introduced in 1968, the major health care problem was differential access to care (based on income). Today, the problem has been redefined to one of preserving national health insurance in the face of health care cutbacks. A shift has occurred in health policy debates from an emphasis on access to services to one of delivery system cost control (Carrothers et al., 1991).

Policies to contain costs can be grouped into those that target Medicare itself or those that target the user (demand) or the provider (supply) of health services. This section describes the goals of each type of policy, including examples of cost-containment measures that reflect these goals and their implications for the provision of care.

1. Medicare-Targeted Policy

Of the four founding principles of Medicare, portability across provinces and universality (all individuals are eligible) have remained relatively untouched. On the other hand, certain types of policies threaten both the principles of coverage

of "medically necessary" services (all services are covered) and public administration on a nonprofit basis.

The definition of medical necessity is made by physicians, and Medicare critics have stated that too many behaviours are being defined as medical problems or illnesses, which then require that "medically necessary" services be provided. There is little doubt that few areas of daily life remain untouched by a medical opinion and, consequently, a medical diagnosis. Sexual harassment, substance abuse, hyperactive behaviour at school, childbirth, and domestic violence have all been defined as medical problems (Eglinton,1989; Hurowitz, 1993; Cockerham, 1989). On the other hand, strong objections are raised when governments remove from coverage certain services that are perceived by many to be medically necessary.

In the 1996 Manitoba budget, the provincial government, like Alberta, Nova Scotia, and Quebec, delisted eye examinations from Medicare for people aged 19-64, hoping to save about $7 million (Paul, 1996a). This means that individuals will have to pay an average of $49 for routine eye examinations. The president of the Manitoba Association of Optometrists warned that people may balk at paying this amount, with the result that good vision may not be as well-maintained and that other health problems will go undetected (Samyn, 1996a). Indeed, eye examinations fall into the area of preventive medicine, an area that the Manitoba government previously indicated that it would like to encourage (Manitoba Health, 1992).

Policy initiatives targeting the medical necessity of services generally focus on deinsuring currently insured services, a measure that results in a shift in costs to the individual. Tholl (1994:61) indicates that although per capita health spending is increasing, public sector health spending has remained relatively stable because of a process of "privatization by default", or passive privatization, whereby "cost containment strategies in the public sector were countered by rising private sector spending with a national trend to deinsure certain services".

Although privatization goes against the grain of Canadian history and values (Eglinton, 1989), it is increasingly believed that privatization will be more efficient and save taxpayers money. The recent Manitoba government decision to privatize home care reflects this belief. The work is to be contracted out to private and non-profit nursing companies. Health Minister Jim McCrae has said that core services would remain funded by government but that clients would have to pay additional direct fees for extra unspecified services, this move being a result of current fragmentation of home care services and cuts in federal funding (Paul, 1996b). Critics of this plan are concerned about thousands of people being thrown out of work and patients having to pay for home care services out of their own pockets. The long-term implication for health care delivery in the move to privatize services, of course, is the development of a two-tiered system of medical care, creating limitations in access to services for the poor. As of 1994, public sector expenditures represented 71.8% of total health expenditures in Canada, steadily declining over the past twenty years from 76.4% (Health Canada, 1996).

2. User-Targeted Policy

Policy that targets the user of the health care system places the onus on the user to reduce his/her demand for health care services. The assumption underlying such policy is that individuals either do not know how to use the system or they are abusing it (e.g., contracting diseases directly related to their lifestyles). Support has been increasing for the view that individuals should take more responsibility for their own health (82% of Canadians in a 1993 Focus Canada poll). The 1993 Focus Canada poll showed 52% of Canadians held patients primarily responsible for health care costs and only 28% placed responsibility for such costs with physicians (Deber et al., 1994).

There is no doubt that many illnesses are preventable. It has been estimated, for example, that 30% to 40% of deaths from cancer could be prevented by better diet (Eglinton, 1989) and that the average lifetime care costs can be up to a third higher for those who smoke (Decter, 1994). The Addiction Research Foundation of Ontario estimates that 30% of Ontario's $17 billion health care budget for 1994 will be spent on "excess expenses generated by legal or illegal alcohol and drug abuse" (Decter, 1994:147).

Education of the user of the system is frequently regarded as one of the solutions to reducing demand for health services. If reports were issued to patients of costs for hospital services, they would "gain greater insight into more appropriate use of hospital services" (Decter, 1994:178). Another example is teaching people such skills as "how to treat common colds, how to manage chronic

illness, and when it is necessary to visit an emergency room" (Deber et al., 1994:116). Decter (1994) refers to a "refreshingly straight-forward and sensible" list of the top ten ways to stay healthy.

Policy solutions focusing on educating the user, however, are overly simplistic unless they address the question of motivation. Why should the user stay healthy or use the system more responsibly? It is not surprising that a greater sense of responsibility is associated with people of higher socioeconomic status (Cockerham, 1989); poor people are more likely to feel alienated, with less of a future, so that keeping healthy "may therefore have little meaning for them" (Eglinton, 1989:20). It has been pointed out that "many health professionals assume that the poor (like themselves) have regular meals, lead regular lives, try to support families, keep healthy, and plan for the future" (Cockerham, 1989:59). The problem needs to be redefined to one of accessibility to health; how accessible to the poor are the basics of food and shelter (Eglinton, 1989)?

Although income is strongly associated with taking responsibility for one's health, some policy analysts have counter-intuitively proposed user fees as a solution to make people "more prudent" in their use of health care (DeFriese and Earp, 1989). User fees can take the form of a flat fee, co-payments (also called co-insurance, "when consumers agree to pay a specified percentage of unsured expenses"), or deductibles ("when consumers' health benefits do not take effect until their accumulated health expenditures exceed a specified amount within a year") (DeFriese and Earp, 1989:220).

Critics respond, however, that user fees do not get at the root of the problem. They indicate that such fees are "fundamentally a revenue-raising device which conceals rather than addresses the key issues about health care use" (Woodward and Stoddart, 1990:288). Indeed, evidence suggests that it is nearly impossible to reduce utilization in this way while still maintaining equitable access to health care resources (DeFriese and Earp, 1989). Ultimately, user fees may even increase health care costs. Roos et al. (1988) point out that in the Rand Health Insurance Experiment, where individuals had to cost-share, all types of medical utilization were reduced, not just care classified as unnecessary. The administrative costs alone would outweigh a low enough user fee that would permit access, while a higher user fee would shift costs to private sources (insurance companies, charities), leaving some groups of individuals without care (Deber et al., 1994).

3. Provider-Targeted Policy

Although this study focuses on hospital utilization, it is important to note the strong relationship between physician visits and hospital utilization: the greater the number of visits to a physician, the greater the likelihood that an individual will be admitted to hospital (Franks et al., 1992). Health care policy has targeted physician providers by attempting to control the supply of physicians and to regulate how they are paid. New high technology, although intermittently targeted, is not often amenable to control. Bed closures, targeting hospital

providers, appear to be one of the most frequently applied, as well as the most controversial, cost containment measures.

*** Physician Supply**

The greater the supply of physicians, the greater the likelihood of service utilization increasing as a result of physician-related factors such as the fee-for-service mechanism for payment. A comparison of physician supply between Canada and the U.S. using 1987 data shows that Canada has a greater per capita supply of physicians (2.14 per 1,000) than does the U.S (1.86 per 1,000) (Redelmeier and Fuchs, 1993). It is generally agreed that Canada has too many physicians, a situation that occurred because projected physician requirements, based upon projected population estimates, were inflated when population growth was overestimated (Decter, 1994). Manitoba in fiscal 1993/94 had 1,436 physicians, representing one physician for every 792 Manitobans (Manitoba Health, 1994) (or 1.8 physicians per 1,000 - actually similar to the U.S. ratio of 1987). A recently released report suggests Manitoba has a surplus of 64 to 98 physicians, which cost the province about $8 million per year (Roos et al., 1996).

Curbs have been proposed on the number of physicians by increasing the scrutiny of entry requirements and by cutting medical school enrollment. These efforts are being coupled with attempts to ensure appropriate distribution of physician supply, particularly in rural areas. Both New Brunswick and Quebec have incentive payment programs which pay above the fee schedule for rural areas of practice and below the fee schedule for overserviced areas (Deber et al., 1994).

*** Fee-for-Service Payment Method**

Most physicians in Canada (over 90%) are self-employed fee-for-service practitioners, billing the government for each service performed. Their fee schedule is negotiated annually for each province between their professional association and the provincial government (Decter, 1994; Deber and Vayda, 1992). Advocates of the fee-for-service system claim that "the profit motive leads to enhanced efficiency in providing services, increased incentive for research and development, and greater responsiveness to patients...<and>...that the best physicians should be paid the most and that specialists should demand higher fee schedules" (Eglinton, 1989:124).

Fee-for-service, however, can also act as an economic incentive to drive up utilization, because the more patients that physicians see, the more money they can make (Eglinton, 1989). As Woodward and Stoddart (1990:285) put it, the fee-for-service method "does not reward physicians for talking patients out of services". Increasing the number of patients seen inevitably reduces the time spent with each patient; less time spent with the patient affects quality of care by increasing reliance on "quick remedies, especially drugs, while ignoring the time-consuming aspects of patient education" (Eglinton, 1989:125). Opponents of fee-for-service argue that the present system should be changed because the profit motive "discriminates against the poor, fosters the unnecessary duplication of services (thereby increasing costs), and introduces a dehumanizing connotation to a service intended to relieve human suffering" (Cockerham, 1989:195).

Prior to 1984, under varying conditions across the provinces, a physician could bill a patient above the provincial fee schedule. The Canada Health Act of 1984 attempted to put a stop to this practice by allowing the federal government to "impose financial penalties on any provinces permitting extra-billing (by physicians) or user charges (by institutions) for insured services" (Deber and Vayda, 1992:6). Manitoba, for example, stands to lose about $400,000 in transfer payments because certain Manitoba clinics are charging facility fees for performing such procedures as cataract removal (McKie, 1995).

Eglinton (1989:121) indicates that many provincial governments will offer physicians fee increases to keep them from extra-billing. Attempting to control costs by reducing billable costs of services simply leads to an increase in numbers of services billed (Eglinton, 1989, Terris, 1991). As Terris (1991:64) points out, "from 1972 to 1984, the provinces cut fees by 18% in real terms, but by an amazing coincidence, doctors' total billing claims rose by 17%".

Governments are increasingly trying to bring physicians' fees within some sort of global budget, such as capitation (capping earnings) or placing physicians under salary (Deber et al., 1994; Tholl, 1994). Health Service Organizations (HSOs) (also called HMOs in the U.S.) have used such alternative forms of payment successfully to reduce significantly the rate of hospitalization for their clients. With capitation, the health organization receives monthly payments from the government for each patient and the physician receives a set fee regardless of the

service(s) provided. (Alternatively, the health organization receives a lump sum regardless of the number of patients seen, and the physician receives a salary.)

*** High Technology**

Much of the new high technology, both diagnostic and therapeutic, is designed to be used in a hospital setting. New technology, even though its assessment may be incomplete or ambiguous, is consistently adopted and used even after evaluation indicates it to be ineffective or unsafe; in addition, it tends to supplement rather than replace old technology, thereby increasing the potential for overuse (or misuse) (Evans and Stoddart, 1990; Franks et al., 1992; Aaron and Schwartz, 1990; Ost and Antweiler, 1986; Bell, 1989). Increased use of high technology contributes to the high cost of hospitalization; for example, the use of CT scanners in addition to, instead of replacing, use of X-ray machines, specialized training, and a physician fee schedule which can encourage the use of more complex technology (Eglinton, 1989; Cockerham, 1989). Eglinton (1989), however, points out that although provinces differ considerably in their use of high technology, there are no noticeable differences in diagnostic ability or health levels.

Minimally invasive therapy, which includes laparoscopic techniques, is an example of new technology that promises to reduce hospital stays, although not necessarily the number of admissions. It uses very small incisions and new techniques like fiber-optics (Decter, 1994). Cholecystectomies using laparoscopic techniques reduce length of stay from 5 to 7 days to an overnight stay in hospital, with greatly reduced recovery time: 7 to 10 days versus the six weeks following

conventional gall bladder removal. The frequency with which cholecystectomies are performed, however, has been increasing with the use of this new technology. This increase has been explained by a broadening of the indications for performing this procedure, not by an increase in gall bladder disease.

A study of elderly Medicare beneficiaries in Pennsylvania showed rates of cholecystectomies were stable until the introduction of the laparoscopic procedure in 1989 but the annual rate subsequently increased 22% by 1993 (Escarce et al., 1995). The procedure was being performed increasingly as an elective procedure and was done more often on patients with uncomplicated gallstone disease. Ransohoff and McSherry (1995:1622) have cautioned against performing surgery just because "the surgery now seems easier and because the patient has symptoms that 'might be related' to gallstones".

*** Bed Supply**

It has been shown repeatedly that the greater the number of beds, the more likely they are to be used (Wennberg et al., 1987; Wennberg and Gittelsohn, 1982). In a comparative study of Boston and New Haven (two demographically similar areas), Wennberg et al. (1987) found striking differences in hospital utilization rates for certain medical conditions and surgical procedures (Wennberg et al., 1989). Boston showed a higher rate of utilization for the same conditions and procedures, but also had a substantially higher number of beds (with almost double the costs). Quality of care, as measured by mortality rates, however, did not differ; the lower

rate of hospital use in New Haven was not associated with greater overall mortality rates (Wennberg et al., 1989).

A comparison of 1987 data on acute care hospital use between Canada and the U.S. showed Canada to have a higher ratio of beds per capita: 5.43 per 1,000 population versus 3.90 beds per 1,000 in the U.S. Overall bed supply in Canada has decreased, however, since fiscal 1984/85 from 7.0 per 1,000 population to 6.5 beds per 1,000 population (3 per 1,000 being short-stay beds) by fiscal 1990/91 (Tholl, 1994). Table 3 shows Manitoba's per capita bed supply for acute-care stays gradually decreasing over a five-year period from 4.9 beds per 1,000 in 1990/91 to 4.0 beds per 1,000 in 1994/95 (Manitoba Health, 1991-1994; Fred Toll, personal communication). On the other hand, chronic care bed supply has not changed at all over the same period and personal care home beds have increased only marginally.

Table 3. Province of Manitoba: Bed Supply by Fiscal Year

Beds per 1,000	1990/91	1991/92	1992/93	1993/94	1994/95
Acute care beds	4.9	4.8	4.8	4.1	4.0
Rehabilitation/chronic care	0.8	0.8	0.8	0.8	0.8
Personal care home beds	7.4	7.6	7.7	7.8	7.8
Total Set-Up Beds	<not reported>		5,846	5,576	5,439

Not only beds, but entire hospitals are being closed or consolidated into fewer facilities in Canada (Decter, 1994). The Urban Health Planning Partnership Committee has proposed closing two Winnipeg community hospitals in their capacity as acute-care hospitals and cutting a total of 543 hospital beds (Paul,

1996d), although a great deal of opposition has been encountered from physicians (Krueger, 1996a) and the public (Mitchell, 1996). In Saskatchewan small community hospitals have already been converted from acute care to chronic care or community health centres (Decter, 1994). Decter (1994) feels that Canada could reach U.S. levels of efficiency by closing 30 to 40% of our existing hospital beds and by shifting resources to day surgery, outpatient, and community care. Just because beds are closed, however, does not mean that hospitals are used any less often: "hospitals can respond to bed closures by increasing occupancy rates, by shortening lengths of stay, or by increasing rates of outpatient surgery" (Roos and Shapiro, 1994:7). Deber et al. (1994) maintain, however, that overall, this process appears to generate net savings.

Summary of Cost Containment Policies

Several typical approaches to cost containment have been presented here, all of which generate vociferous opposition from various interest groups. Policies targeting Medicare, such as delisting services and privatization, although hotly debated, appear with increasing frequency and are being pushed through with increasing success. User fees, on the other hand, have met with little success to date in Manitoba. Of the provider-targeted measures, those focusing on hospitals have been among the most controversial as well as the most clearly-defined. Given that some hospital use is regarded as unnecessary, the logic of closing hospital beds (or the hospitals themselves) has an appeal: close some beds, and both unnecessary utilization and excess costs will decrease. While this does occur to a

certain extent, this type of logic not only ignores the possibility that necessary use may decrease too, it keeps the focus of reform within the traditional health care structure. Various alternatives exist to the currently entrenched systems of health care delivery, but their serious consideration will require a major shift in focus for policy-makers.

D. ALTERNATIVE HEALTH CARE

Alternative care can include institutional alternatives such as the hospice, community alternatives such as home care, and provider alternatives such as midwifery. Health care systems can be rationalized by shifting emphasis from institutional to community care, from physician to non-physician providers, and from higher-cost to lower-cost institutions (Deber et al., 1994). This section provides a brief overview of alternative care approaches.

1. Institutional Alternatives

Eglinton (1989) has described four institutional alternatives to traditional hospitalization for chronic care cases. One is the chronic care hospital, similar to the traditional hospital, but admitting only the chronically ill. A second is the day hospital, an extended care facility where patients receive hospital treatment but return to their homes each night (this, of course, assumes the individual has a family who can provide the required emotional, economic, and social support; it would not be of benefit to those who live alone or who are poor). A third

alternative is the nursing home, but they are regarded as "socially useless, as ghettos for the elderly with chronic problems" (Eglinton, 1989:164).

The last alternative, the hospice, is perceived as a more rational and humane institution for the chronically, terminally, ill, providing professional care within an holistic environment of caring and support. Jocelyn House in Winnipeg, for example, established by a voluntary women's organization for terminally ill cancer patients, provides privacy, a tranquil home atmosphere, and medical help when required for one-quarter of the cost of treating cancer patients in hospital (Eglinton, 1994).

Traditional institutional providers have also implemented services such as 24-hour access by phone to health information as well as shifting the provision of some care from physicians to nurse practitioners. The "Ask-A-Nurse" service used by 195 hospitals in the U.S. has specially trained registered nurse counsellors providing information to callers about whether and how to select the most appropriate care (Decter, 1994). The Hospital for Sick Children in Toronto has been operating such a service since 1977, handling 65,000 calls in 1993 - an estimated cost of $7 per contact versus the $100 it would cost the system for an Emergency Room visit (Decter, 1994).

Nurse practitioners can perform many of the primary and routine tasks of patient care normally handled by the physician, such as "giving physical examinations, taking medical histories, ordering laboratory tests and X-rays, providing health education to patients and their families and making the decision

as to whether or not the patient needs to consult with a physician" (Cockerham, 1989:225). Physicians, however, have been less than supportive of proposed programs that encourage nurses to perform such work, threatening at one time to lodge malpractice complaints against Manitoba's new community nurse resource centres (Samyn, 1994) and going to court to launch challenges against the nurse practitioners' plan in Ontario (Blackwell, 1995).

2. Community Alternatives

Community alternatives include community health centres, walk-in clinics and home care. Several community health centres were established in Winnipeg in 1983-84: Women's Health Clinic, Village Clinic, Youville Clinic, and Hope Centre, all of which arose through the activities of special interest groups and/or were supported by religious affiliations (Carrothers et al., 1991). While walk-in clinics provide quick, convenient service in several health specialties, this convenience can create a greater demand for services. Many are referred to their physicians or hospital emergency departments, thus causing an "over-servicing" of the patient (Eglinton, 1989). Home care, on the other hand, can function to prevent hospitalization or to provide follow-up to early discharge from a hospital, and hospitals have begun to develop outreach or ambulatory care services (Eglinton, 1989).

3. Provider Alternatives

Alternative providers which still fall within the medical model include midwifery and chiropracty. Other health care alternatives outside the medical

model have gained popularity in reaction to traditional medicine's focus on the patient as object. Such alternative approaches to health as meditation, massage, acupuncture, and yoga stress the "wholeness and integration of mind, body and environment" and are becoming more attractive to the general populace as modern medicine reaches the limit of what it can do for chronic and lifestyle illnesses. Unfortunately, only those who can afford to pay for such services are able to take advantage of their benefits (Eglinton, 1989).

The established medical community has been less than supportive of certain alternative providers, such as acupuncturists and chiropractors. Acupuncture, according to Wolpe (1987:592), was discredited by the American Medical Association who claimed jurisdiction over the therapy and then severely circumscribed its claims: "since there was too much evidence that acupuncture does work, it has been restricted on the basis that Western research has not been able to make it work on its own terms". Chiropracty has also faced strong opposition from traditional medicine in its efforts to attain legitimacy. Cockerham (1989:133), for example, points out that in 1987, "a federal court ruled that the American Medical Association had conspired to destroy chiropractic medicine in violation of antitrust statutes". In Manitoba, the College of Physician and Surgeons was one of the last holdouts in Canada in supporting the move to include chiropractors as health care professionals to whom physicians can make referrals without risking professional misconduct charges (Paul, 1994).

On the other hand, the Committee on Medicine and Religion of the American Medical Association encouraged Granger Westberg, a minister, to set up a model wholistic health clinic in Ohio in 1970. The wholistic health model involves a church-based practice with "an interdisciplinary team of physicians, nurses, religious counselors, and volunteer laypersons who work together to treat all aspects of a person's health needs" (Cockerham, 1989:143). The support of the AMA reflects a recognition of the gradually mounting evidence for the relationship between religious belief and coping with health problems. Idler (1987), for example, found among a sample of elderly persons in Connecticut that "those persons with the highest levels of religious involvement showed the least depression and physical disability" (Cockerham, 1989:143).)

Summary of Alternative Care

While it is encouraging that shifts are occurring to less expensive and perhaps more effective forms of health care, this process is slow. Much of health policy implementation still takes place within the medical model, primarily because of entrenched interests. Such factors must be taken into account to gauge the extent to which proposed policy changes will be successful. Cockerham (1989), for example, attributes the success in obtaining financial support for wholistic centres in the U.S. partly to the fact that the originator, Westberg, was careful to work closely with members of the medical profession.

E. POLICY IMPLEMENTATION

Medical care and health services are acts of political philosophy; as such, a country's historical experience, culture, economy, social organization, and political ideology underly the choices made and the levels of funding provided (Light, 1986; Cockerham, 1989). Canadian values of "peace, order and good government" underly our health policy, while American policy embodies the values of "life, liberty and the pursuit of happiness" (Decter, 1994:11). According to Deber and Vayda (1992:14), the political culture in Canada "has traditionally been strongly deferential to authority and accepting of government activity and intervention in the economy". A majority government, for example, "can be considered to have the two years following its election generally free from electoral constraints <and> policy initiatives can be manipulated accordingly. Tough measures may be taken early in the term to be followed by potentially vote-winning policies in the later years" (Deber and Vayda, 1992:13).

Advocacy groups such as the Coalition to Keep Medicare Healthy, the Health Action Lobby (HEAL), and the Manitoba Medicare Alert Coalition can be a strong lobby against government efforts to reduce health care programs. Governments have responded by increasingly asking local bodies to make the tough decisions through a process of regionalization (Deber et al., 1994). With regionalization of health care, decisions about resource use are delegated to a local body who receives funding determined in advance based on the population of that region (essentially the number of residents, although adjustments may be made

for age and density). All care must then be paid out of this budget (Blomqvist, 1994b).

"Health care" and "medical care" are often regarded as synonymous in the literature on health care reform, with the result that health care reform is viewed primarily in medical terms (Hurowitz, 1993). Health care, however, includes "social elements such as good housing and sanitation, a safe work environment, stable interpersonal relationships, sufficient income, and education", while medical care is only one aspect of health care, centering on "the diagnosis and treatment of disease after it has developed" (Hurowitz, 1993:130). If they are not distinguished - if social problems are regarded as medical problems - then reform of the medical care system is perceived as the best way to improve health. At the same time, it is important to recognize the link between social and medical factors: for example, not only will the length and severity of a disease influence an individual's social relationships, but the social relationships in turn can influence the length and severity of a disease (Eglinton, 1989).

Policy Implementation in Manitoba

The relationship between the Manitoba Centre for Health Policy and Evaluation (MCHPE) and the provincial Department of Health illustrates how health services research has been used to shape public health policy in Manitoba. This relationship stipulates that MCHPE produce deliverables on health care utilization in Manitoba in areas of policy interest to the government on a regular basis. The agenda for deliverables is a joint decision between the Director of the

MCHPE and the Deputy Minister of Health, using the criteria of "relevance, feasibility and broad applicability to the health care system" (DeCoster, 1995:4).

One of the more controversial deliverables was the report produced by MCHPE on "efficiency" beds (Roos and Shapiro, 1994); this was used by the Manitoba government to support the closure of at least 200 Winnipeg hospital beds. MCHPE, commissioned by the Deputy Minister of Health, was asked to estimate "how many beds could be closed potentially if all urban hospitals discharged patients as efficiently as the shortest-stay hospital" (Roos and Brownell, 1994:48). Feedback was obtained from various key stakeholder groups (e.g., the Urban Hospital Council); the six-month period prior to delivery of the report was valuable for "improving the quality and credibility of the report, for making the substance of the report available as part of the policy process, and for preparing stakeholders for criticisms they could expect" (Roos and Brownell, 1994:49).

Although the MCHPE report emphasized that efficiency in hospital operations could be improved and that every bed closed need not be replaced, this was qualified by mention of the difficulty in targeting numbers because they included beds scattered throughout the system. They also cautioned that "there was no guarantee that if beds were closed in one part of the system, the rest of the system would become more efficient and accommodate more admissions smoothly" (Roos and Brownell, 1994:50). Unexpected and inintended consequences of the report, however, included a) the province's decision to "repatriate" Winnipeg hospital cases to rural hospitals where patients might be

more appropriately treated with less expense and b) the decision to label 200 planned bed closures as "efficiency" beds.

The policy implementation process, therefore, can be fraught with unexpected results. It is interesting to note that reports similar to that of MCHPE had been previously produced, but few people were aware they existed. Timing of the report and the political situation can thus be just as critical as the content of a report, and Roos and Brownell (1994:50) remind us that the health policy process "is basically political and must be understood this way". Given that policy decision-making is shaped by many apparently extraneous, but nonetheless powerful, factors, the monitoring of health care is critical for determining the impact of changes in health care policy.

CHAPTER 3. EVALUATING HOSPITAL UTILIZATION

The previous chapter has shown how policy makers have targeted both users and providers of the health care system, as well as the Medicare system itself, to reduce hospital utilization in their efforts to decrease the costs of health care. Two health care evaluation models designed to monitor utilization are reviewed in this chapter, one explaining variation by provider characteristics, the other by user characteristics. In the former model (physician discretion), physician decision-making has been targeted by policy makers because of the variation from physician to physician in the decision to hospitalize for certain conditions, or differences in physician practice style. The access model for evaluating hospital utilization shifts the focus to the individual being hospitalized and the social structure within which the individual operates. Much of the variation in hospital utilization patterns in this model is explained by income: individuals in low-income groups are more likely to be hospitalized than those with higher income.

This chapter provides a brief overview of population-based approaches to evaluating hospital utilization. A literature review is then presented for each of the two models used in the study including their development, findings, and policy implications. The chapter concludes with the study hypotheses for this thesis.

A. POPULATION-BASED EVALUATION MODELS

Health services researchers are increasingly focusing their efforts on entire populations, although the American health community was initially slow to accept such studies. Caper (1993) suggests this might have been due to an initial reluctance in accepting the notion of societal responsibility for population health care. Interest in population-based studies has now accelerated both because of increasing concern over rising health care costs and because of the increasing availability of population-based data, particularly routinely-collected administrative health insurance billing data bases (Caper, 1993).

Population-based information assists investigators in evaluating health care services for a given population by identifying the population at risk for any given event, or by assessing the probability that this event will occur (Caper, 1991). Such rates of occurrence for a given event in the population are often age- and sex-adjusted because differences in age and sex in the populations frequently explain some of the variation in rates (e.g., hip fractures are more likely to occur in an elderly population) (Health Services Research Group, 1992).

Population-based studies, in addition to being comprehensive and highly efficient and providing a common language for dialogue, have certain advantages over other types of health care monitoring; according to Caper (1991) they permit monitoring and evaluation of:

* medical practice variations

* access to medical care

* resource planning

* population morbidity levels

* patient education

Small-area research focuses on how the occurrence of events varies across geographic areas for a defined population (Health Services Research Group, 1992). Events of interest to evaluators of health care delivery are often selected on the basis of a "sentinel" or "red flag" approach; that is, investigators use rates of hospitalization or outcomes for selected medical conditions and/or procedures to determine whether problems exist in the quality or organization of health care (Weisman et al., 1992; Rutstein et al., 1976).

Where rates of surgical or medical hospital admissions for a given area are very high, it has been argued that people who live in that area are more likely to be undergoing unnecessary treatment. Very low rates in an area, on the other hand, might be interpreted as underutilization - residents of such an area may be experiencing problems in accessing medical care. No one can agree, however, on a "correct" rate of occurrence for any medical or surgical hospitalization for a given area (Health Services Research Group, 1992). While overuse might be confirmed through hospital chart reviews, it is more difficult to detect underuse, or a failure to provide services (Siu et al., 1991). Wennberg (1987) cautions against assuming that the lowest rate of utilization for a given condition is the "right" rate, because this could lead to serious limitations on essential health care resources.

Population-based models for assessing health care utilization have been developed to identify potentially unnecessary hospital care; that is, hospitalizations that need not have occurred, or that might be reduced in terms of length of stay. Most health services research for the past twenty years has focused on provider characteristics (both institutions and physicians), frequently using physician practice style as a model for explaining variation. Less attention has been given to the impact of differences in access to appropriate health care services, often directly associated with socioeconomic status (Billings et al, 1993; Caper, 1991). A review follows of both health care evaluation paradigms: the physician discretion model (based on physician practice style) and the patient access model (based on the income level of hospitalized individuals).

1. Discretionary Model (Physician Practice Style)

Discretionary model-based analyses of health care explain variation in hospitalization rates for certain conditions as a consequence of variation in physician practice style. For conditions where rates are fairly stable, hospitalization is generally regarded as necessary. Conditions where hospitalization rates can vary widely reflect the potential for reducing rates of hospitalization and/or lengths of stay by modifying physician practice style.

Development of Discretionary Models

Physicians have often been described as "gatekeepers" to the health care system since most health care resources cannot be accessed without their

authorization (Cockerham, 1989). No one can be admitted to a hospital without the authorization of a physician, a treatment decision which may not always be agreed upon among physicians for a set of similar presenting complaints. The term "physician practice style" has been coined to reflect the discretionary nature of physician decision-making (Wennberg, 1989; Roos, 1992). In addition to evaluation of the care received (outcome), physician practice style encompasses the processes of assessment (diagnosis) and intervention (treatment) (Eglinton, 1989).

Diagnosis has been called "the most interpretive part of medical practice, and the reason why many physicians call medicine an 'art'" (Eglinton, 1989:11). The evaluation of disease and illness by a physician is "interpreted within the context of existing medical knowledge and the physician's experience" (Cockerham, 1989:149). Aside from issues of defining what is "normal" and "abnormal", errors can occur in diagnosis in both directions - missing a disease that is present, or diagnosing a disease that does not exist (Eddy, 1984). Because it is frequently the case that no definitive diagnostic test is available, the physician will often rely upon varied decision rules and an array of testing procedures (Coyote, 1994). Many follow the medical decision rule (Scheff, 1966), that it is "better to impute illness to their patients than to deny it and risk overlooking or missing it"; this practice can lead to overutilization such as overprescription of drugs and unnecessary surgery (Cockerham, 1989:156).

The variation in physician practice style has also been largely attributed to a lack of professional consensus in treatment standards (Wennberg, 1989).

Physicians might have differing opinions, for example, on whether or not to perform surgery on an elective basis. Should surgery be done before the individual becomes older and sicker (and therefore at greater risk of complications or death) or should a watchful waiting approach be adopted, given that elective surgery can carry significant risks in itself as well as the fact that surgery may never become necessary (Wennberg, 1989)?

In addition to uncertainty regarding whether to operate, there are potentially dozens of procedures that can be ordered, in any combination, at any time; the choice and value of the procedure will depend on "who performs it, on whom it is performed, and the circumstances of performance" (Eddy, 1984:9). Discretion can also be involved in deciding upon the setting of treatment (inpatient versus outpatient) or on the optimal time to discharge a patient from hospital (Roos et al., 1988). Roos et al. (1988) point out that there is virtually no research in such areas, and that few guidelines are available in medical textbooks.

A low-variation/high-variation framework has been developed to identify both medical conditions and surgical procedures for which hospital utilization rates would be fairly stable across small areas ("low-variation") and for which they can vary a great deal across small areas ("high-variation"), as well as other related categories (e.g., "moderate-variation", "very-high variation") (Wennberg et al., 1984). Rates of hospitalization for high-variation conditions such as pneumonia tend to reflect both physician decision-making differences in treatment options and

the influence of factors other than illness status. High-variation conditions thus serve as indicators, or "red flags" for potentially reducible rates of hospitalization.

On the other hand, rates of hospitalization for low-variation conditions tend to reflect the incidence/prevalence of such conditions in the population (Black et al., 1993b; Caper, 1991; Roos et al., 1988), and can serve as indicators of necessary hospitalizations. The stability of rates for low-variation conditions such as hip fracture has been attributed to "the more narrowly defined criteria for diagnosing the condition requiring surgery and to the high degree of professional consensus concerning the treatment of choice" (Wennberg et al., 1984).

Wennberg and Gittelsohn (1982) found the overall rate of surgery to vary more than twofold in a study of 193 small areas in six New England states. For the most populous areas, they found, for example, the highest rates of hysterectomy and prostatectomy to be four times the lowest rate. Wennberg et al. (1984) later ranked all nonobstetrical medical and surgical causes of admission for 30 hospital market areas in Maine by incidence of hospitalization into high-variation or low-variation categories, measuring variation using the systematic component of variation (SCV).

Wennberg's model has been validated in subsequent studies. Roos et al. (1988) also used admission rates to rank the conditions and procedures. The range of variation in admission rates across hospital areas in Roos et al.'s (1988) study (also measured using the SCV) was tenfold for the very high variation categories of tonsillectomy and atherosclerosis. Surveys conducted in 300 households in six

different market areas in the U.S. with widely differing hospitalization rates found individuals remarkably similar in contacting their physician for illness on a number of different variables such as income, health insurance, and access to a physician (Wennberg and Gittelsohn, 1982). The researchers suggest that utilization differences thus result from decisions made by physicians after being contacted by their patients, not by differences among the individuals participating in the study.

Findings of Discretionary Models

Wennberg et al. (1987) applied the low-variation/high variation model to 1982 hospital discharge data from two demographically similar cities in New England: Boston and New Haven. Hospitalization rates were virtually the same in both cities for low-variation medical conditions, but varied widely between the cities for high-variation medical conditions. Overall hospital days were 74% higher and admission rates for high-variation conditions were up to 56% higher in Boston; for low-variation conditions, Boston's admission rate was only 6% higher. Boston coincidentally also has 55% more beds per capita.

Wennberg et al. (1989) later applied the model to 1985 Boston and New Haven data. For high-variation medical conditions, rates of discharge were 62% higher in Boston and total hospital days were 95% higher, contrasting once again with rates for low-variation conditions, which were almost identical for the two cities (although Boston's lengths of stay were 13% longer). Wennberg et al. (1989)

also found that population-based mortality rates were nearly identical for the two cities, suggesting, at least on one measure, no difference in quality of care.

In Manitoba, Black et al. (1993b) reported on hospital utilization for low- and high-variation conditions across eight regions. In fiscal 1991/92, rates of hospital days for low-variation conditions showed the smallest differences across regions (a ratio of 1.4), while rates of hospital days for high-variation medical conditions showed a highest-to-lowest ratio of 2.3.

Billings et al. (1993), in their New York study, examined the relationship between certain low-variation conditions (what they call "marker conditions") and income. They found no significant differences in hospitalization rates between low- and high-income areas for "marker conditions", which include the low-variation condition, acute myocardial infarction.

Blais (1993) looked at the relationship between type of hospital and variation in procedure rates. Rates of surgical procedures exhibited greater differences across nonteaching hospitals when compared with teaching hospitals, especially those in rural regions. Blais (1993) attributes the lower variation (and hence, greater physician consensus) among teaching hospitals to their greater access to the most recent scientific knowledge, while the delay in such knowledge reaching rural hospitals leaves more room for differing medical opinions.

Much research has also been conducted on the appropriateness of certain high-variation conditions/procedures in the model, such as coronary angiography (Chassin et al.,1987), cardiac pacemaker implantation (Greenspan et al., 1988),

carotid endarterectomy (Park et al., 1989; Winslow et al., 1988b) and coronary artery bypass surgery (Winslow et al., 1988a). A 1988 Rand Corporation study, for example, found the rate of CABG surgery was five times higher in the U.S. than the rate in the United Kingdom. (Caper, 1991). Two panels of doctors, one from each country, rated the appropriateness of the indications for surgery; the U.S. panel judged 13% of the CABG operations to be inappropriate while the U.K. panel found 35% to be inappropriate (Brook et al., 1988). Caper (1991) speculates that different availability of resources in the two countries might be influencing medical practice standards.

Policy Implications of Discretionary Models

Because discretionary models view a lack of professional consensus in treatment standards as the primary source of variation in rates of hospitalization for many conditions, improvement and dissemination of the knowledge base of medical practice to reduce the ambiguity is often seen as a solution to reduce the variation (Blais, 1993). The medical practice knowledge base includes outcome studies, clinical guidelines development, continuing medical education, peer review, and care maps (Blais, 1993; DeCoster, 1995).

Low-variation conditions can be used to evaluate quality of care after an intervention: a change in health care policy such as bed closures should have little impact on rates of utilization for such conditions. High-variation conditions are more frequently in the policy limelight because of the potential for reducing

unnecessary utilization. Several policy implications suggested by the high-variation component of the model include:

* ***Setting priorities for outcomes research.*** Roos et al. (1988) indicate that most of the differences in per capita costs and utilization across small areas are accounted for by fewer than 40 causes of medical admission. They recommend that such conditions should have priority in any research agenda, including clinical trials, cohort studies, and decision analyses.

* ***Development of clinical practice guidelines and care maps.*** Clinical practice guidelines (CPGs) are "systematically developed statements to help practitioner and patient decisions about appropriate health care for specific clinical circumstances" (Canadian Medical Association, 1996:6). A directory of over 900 CPGs has been developed by the CMA, and this will soon be available on the Internet. CPGS can be integrated into care maps, which define "the optimal sequence and timing of interventions for patients with certain diagnoses and conditions, or patients who may require a specific procedure" (Canadian Medical Association, 1996:6).

* ***Physician monitoring of utilization patterns.*** In Maine, results of a study finding a 250% difference in rates of hospitalization for four common medical causes of admission (eg. pneumonia, gastroenteritis) were posted and listed for each physician in the physicians' lounge of each study hospital; admissions in the high-rate area fell by 47% over a 3-year period. When feedback stopped, rates rose again until posting was reinstituted (Caper, 1991).

* ***Second opinion, or surgical pre-screening programs***: These are often required by insurance plans in the U.S. for procedures where physician discretion and clinical uncertainty are greatest, but such programs are generally not well-evaluated (DeFriese and Earp, 1989). Wennberg and Gittelsohn (1982) describe how physicians reduced utilization through such a program with regard to the high-variation procedure, tonsillectomy, in Vermont. The Vermont Medical Society instituted the requirement for physicians that a second opinion be obtained before performing a tonsillectomy. With this requirement, the probability that a child would have this procedure before the age of 20 declined from 60% to less than 10%.

* ***Peer review.*** Professional Standards Review Organizations (PSROs) were established in the U.S. to review and evaluate medical care given to Medicare and Medicaid patients; they determine "if the services rendered are medically necessary, meet professional standards of quality, and are provided as efficiently and effectively as possible" (Cockerham, 1989:200). Physicians are not often critical of other physicians, however, and mistakes or errors in medical practice can sometimes be defended as a "difference of opinion" (Cockerham, 1989).

* ***Estimating feasible reductions in bed supply.*** Fisher et al. (1992) analyzed 1988 Oregon hospital utilization data using Wennberg et al.'s (1984) high-variation medical conditions framework to calculate patient-day rates for 33 hospital service areas. They estimated that if patient-day rates were limited to Salem's rate of 218

days per 1000, "238 beds could be closed in 20 hospital service areas, for an estimated cost savings of $47.3 million" (Fisher et al., 1992:1925).

* ***Involving the patient in the decision-making process***: Interactive video disks are being used to provide additional information to patients about treatment options for certain conditions. This development has actually reduced the number of times that surgery is chosen as an option, for example, for prostate conditions (it has also been used as part of informed consent, i.e., legal protection for the physician) (Decter, 1994). If a procedure is recommended, Eddy (1984:88) suggests that the patient ask "why, what might be found, with what probability, what difference will it make, and so forth", warning that many physicians "will be uneasy, and some even angry, when asked questions of this type because they may not know the answers".

Policy implementation to improve health care delivery using such discretionary model-based measures as those described above does not necessarily contain health care costs. Ambiguity in clinical decision-making has meant an increased demand for high-cost high technology using diagnostic techniques that might provide more exact information about a patient's condition (Eglinton, 1989). It is also often not enough to simply provide evidence suggesting unnecessary utilization. As Decter (1994:173) says, "producing evidence of inappropriate or unnecessary procedures does not, in and of itself, determine any reduction of such activity or change its pattern". Strategies are needed to ensure that clinical guidelines will actually be used, in addition to being updated and evaluated

(Deber et al., 1994). Eddy (1993:525) points out that "practitioners can be provided incentives, sent reminders, and given feedback, but in the end no one can force them to apply a particular treatment".

Policy implementation based on the discretionary model must also take into account that factors such as new treatment technologies keep the model in flux. Low-variation conditions might exhibit some of the characteristics of high-variation conditions if not all areas have access to similar technology, for example, enabling a shorter length of stay. Policy makers must therefore interpret with caution shifts in utilization for low- and high-variation conditions.

2. Patient Access Models

Analyses of health care utilization using an access model focus on whether individuals are able to obtain timely, appropriate health care services. Variation in hospitalization rates is explained by differences in access to care prior to the hospitalization; these differences are associated with socioeconomic status. Some hospital use in this model is regarded as "preventable" or "avoidable", and points to deficiencies in ambulatory or outpatient care.

Development of Access Models

Researchers have developed several sets of medical conditions to identify hospitalizations that might be avoided if appropriate care were received prior to the hospitalization. Weissman et al. (1992) provide an outline of the criteria they used to develop a model of 12 avoidable hospital conditions (AHCs):

1) Consensus - Have other published studies used similar indicators?

2) Importance - Is the condition an important health problem and is hospitalization recommended for the condition?

3) Clinical face validity - Does it make clinical sense to relate the condition to potential problems in outpatient care rather than to other factors such as disease prevalence or physician practice style?

4) Data clarity - Is the condition clearly coded in an available large-population data base?

Billings et al. (1993), with the assistance of an American medical advisory panel of six internists and pediatricians, used a modified Delphi approach to develop a set of 28 medical conditions for which they agreed risk of hospitalization might be reduced by appropriate non-inpatient care. Timely and effective outpatient care for these 28 ambulatory care sensitive (ACS) conditions could: 1) prevent the onset of an illness or condition, 2) control an acute episodic illness or condition, or 3) manage a chronic disease or condition (Billings et al., 1993). With access to such care, individuals should not need to be hospitalized, for example, for nutritional deficiencies or hypertension.

The process of identifying conditions signaling an avoidable hospitalization, however, is fraught with the same ambiguities inherent in physician treatment decisions. The 28 ACS conditions identified by Billings et al. (1993) do not include all 12 of the AHC conditions identified by Weissman et al. (1992). Weissman et al. (1992), for example, excluded tuberculosis (one of the ACS conditions) because the link between effective outpatient care and avoidable hospitalization was thought

to be tenuous. On the other hand, Weissman et al. (1992) included conditions such as ruptured appendix, gangrene, and hypokalemia (none of which were part of the list of 28 ACS conditions). Weissman et al. (1992:2393) acknowledge that "just as our list of AHCs includes conditions that reflect a spectrum of avoidability, the list of non-AHCs may contain selected conditions that many practitioners would consider to be at least partially avoidable".

Although many studies have been done on the conditions listed in both models (e.g., diabetes, asthma), few studies have incorporated them into a framework for assessing the necessity of hospital utilization. Of those who have, Billings et al.'s (1993) work has received the most attention.

Findings of Access Models

Billings et al. (1993) found age/sex-adjusted rates of admission for all ACS conditions combined to be four times higher for the poor, with almost 70% of the variation explained by area income. They used 1983 New York City discharge abstract data and focused on people under age 65, calculating rates at the ZIP code level (164 residential ZIP codes, or small areas). Low-income areas were defined as ZIP codes that had more than 60% of households with incomes below $15,000, and high-income areas were defined as ZIP codes having less than 17.5% of households with incomes below $15,000. Bindman et al. (1995) examined utilization for five of the 28 ACS conditions within 41 clusters of ZIP code areas (median population of 52,000) and found a positive relationship between area income and hospitalization rates using 1990 California data. The Codman Research Group's findings, as well,

are consistent with Billings et al. (1993), showing a direct relationship between rates of admission for ACS conditions and poverty (annual median household income less than $14,999) for all ages and in 15 states (Caper, 1993).

On the other hand, Casanova and Starfield (1995) found no relationship between hospitalizations for ACS conditions and social class (an index representing education, employment, and income for each area of residence) for children under the age of 16 years in Spain. They used a case-control approach on residents of a health district served by one hospital in Valencia, using two years of data (1989 and 1990) and ACS conditions from the Ambulatory Care Access Project (Billings and Hasselblad, 1989) (from the 28 ACS conditions identified by Billings et al. (1993)). Of their sample of hospitalizations, 25% were for ACS conditions, comparable with U.S. data for children aged 0 to 15 showing 27.7% of total hospitalizations to be for ACS conditions. The rate of hospitalizations for ACS diagnoses in the Spanish study, however, was a little over half that of the U.S. data (8.2 per 1,000 vs 13.6 per 1,000).

According to Casanova and Starfield (1995), the lower rates for ACS conditions in Spain, compared with the U.S., may be the result both of the consistent nature of the source of care and greater access to services in general. The absence of any relationship between hospitalization for ACS conditions and social class is attributed to the "universal provision of financial and geographic access to primary health care services" in Spain (Casanova and Starfield, 1995:291). It is important to note, however, that age may also explain the disparity of their

findings with the results of other studies given that only those aged 15 and under were included in their study.

In a forthcoming paper, Billings et al. (1996) looked at seven of the 28 ACS conditions in both American and Canadian data. Although they lowered the percentages of low-income households that qualify for low- and high-income categories so that a lower proportion were now classified as poor, their findings supported the earlier study (Billings et al., 1993). Billings et al. (1996) found a strong association between admission rates (age- and sex-adjusted) for ACS conditions and the percentage of low-income residents in American urban areas. This time, low-income areas were defined as areas where 40% of households had incomes below $15,000 ($20,000 CDN); areas where only 10% of households had incomes below this figure were classified as high-income.

Billings et al. (1996) explored the New York ACS data in more detail regarding readmissions and utilization patterns over time. For 1986, for example, 13.1% of admissions were readmissions for the same ACS condition while 16.8% were readmissions for any ACS condition. Multiple admissions, however, did not explain any of the variation in rates between the low- and higher-income areas. Over an 11-year period (1982-1992), admission rates for any reason declined 7.6%, but for ACS conditions increased 10.6%, with low-income areas increasing more (33.7%) than higher-income areas (7.4%).

Billings et al. (1996) also looked at ACS hospitalization rates in Toronto, using 1991 CIHI (Canadian Institute for Health Information) data. They found a

very weak relationship with income (R^2 of 0.09 and rates of admission in low-income areas only 39% higher than those for higher-income areas). The lack of association for Toronto continued when the seven ACS conditions were examined individually. Income areas were defined using 1991 Census data, which were aggregated to the forward sortation area (average population 18,000) and categorized similarly to the U.S. data. Billings et al. (1996) calls the contrast with the U.S. data remarkable even when taking into account the more even distribution of low-income residents throughout the Toronto area, along with fewer pockets of extreme poverty.

Other Canadian data, however, confirm the direct relationship between income and hospitalizations for ACS conditions. Researchers at the Manitoba Centre for Health Policy and Evaluation have used the set of 28 ACS conditions as one of several health status indicators in making regional Manitoba comparisons. They found the highest rates of hospitalization for all health status indicators (including ACS conditions) in the poorer regions: Thompson region, followed by the primarily rural areas of Norman and Parkland (Cohen and MacWilliam, 1994).

The relationship between length of stay and timing of hospitalization was examined by other investigators for 14 diseases, some of them ACS conditions, in two U.S. hospitals for fiscal 1984 (Gonella et al., 1990). They found significantly less hospital resources were used if an individual was hospitalized in a timely fashion; that is, at "the earliest detectable stage at which the probability of disease progression can be significantly reduced through use of resources available only in

a hospital setting". About 20% of admissions at the two hospitals were judged to occur later than desirable. For these admissions, the mean length of stay for individuals hospitalized late in the disease process was longer by 11.1 days at one hospital and by 7.5 days at the other ($p<=.01$) compared with the timely hospitalizations. Longer stays are also associated with lower income. Weissman et al. (1991), in previous work, found hospital stays to be 3-30% longer for patients in the lowest socioeconomic positions.

Other Explanations for Differences in Hospitalization Rates

The direct relationship between income area and avoidable hospitalizations has been fairly consistent, and researchers have investigated and pretty much ruled out other plausible explanations for the association:

1. Disease prevalence: the poor are more likely to experience disease in general. Billings et al. (1993), however, found hospitalization rates for two high-volume ACS conditions (asthma and diabetes) were 11.90 to 13.88 times higher for the poor for certain age groups, while reported disease prevalence showed low-income populations having rates only 1.15 to 2.96 times higher than non-poor income groups in the U.S.

2. Substance abuse: the poor are at greater risk of serious alcohol and substance problems, which in turn places them at greater risk of developing certain acute conditions (e.g., pneumonia) or of having greater difficulty in managing chronic conditions (e.g., diabetes). In the Billings et al. (1993) study, 18.2% of low-income people had a secondary diagnosis of alcohol/drug dependence, compared

with 4.3% in the high-income areas. This peak, however, was limited to certain acute conditions and to the age group 24 to 44, so differences still remain after accounting for the impact of this variable (Billings et al., 1993).

3. Physician practice style: physicians are more likely to admit less severely ill patients in the low-income group than in the high-income group because of access considerations (Billings et al., 1993). That is, physicians may take into account the fact that the poor have less resources available to them or that ambulatory care may be less than adequate. The low-income group, however, was found to have higher levels of severity, leading Billings et al. (1993) to suggest that the admission threshold instead may have been stricter for low-income patients. Bindman et al. (1995), in the physician survey portion of their urban California ACS study, obtained decision-to-hospitalize information by having physicians complete five clinical vignettes portraying three of the study conditions in increasing levels of clinical severity. No association was found between hospitalization rates and the clinical admission/social admission score assigned to their completed surveys.

Care Received Prior to Hospitalization

Not only are the poor more likely to be hospitalized for ACS conditions, they are less likely to have received appropriate ambulatory care prior to their hospitalization. Data from the National Center for Health Statistics (1983) show that the poor are more likely to contact emergency rooms and hospital outpatient clinics for their ambulatory care and are less likely to visit physicians' offices

(Cockerham, 1989). Fleming (1995) cited a Grumbach et al. (1993) study showing that of 700 patients waiting for emergency department care at a public hospital in the U.S., 45% reported that access to primary care was a problem.

Cockerham (1989) describes three explanations for the lower rate of physician visits by the poor; these were tested by Dutton (1978) and confirmed by Rundall and Wheeler (1979). The first one, financial cost explanations, did not apply since the poor are covered by Medicaid in the U.S. Several studies have shown that even after health insurance coverage is improved in order to reduce the economic barrier, inequities in health care utilization by socioeconomic status still persist (Weissman et al., 1991). Some support was shown for the second explanation - the culture of poverty. That is, certain social and psychological traits develop among those trapped in poverty: dependence, fatalism, inability to delay gratification, and a lower value placed on health because being sick is not especially unusual.

Even stronger support existed for the third explanation of systems barriers. Those with relatively low incomes were less likely to have a regular source of care, and thus were less likely to use preventive services. Patient self-report data in Bindman et al.'s California study (1995) showed a strong relationship between deficiencies in access and preventable hospitalization rates, even when controlling for other key variables. The definition of access, unfortunately, was rather broadly defined using only three items: health insurance status, whether the patient had a

regular source of care, and self-rated access to care (the latter being specified only as "medical care").

Systems barriers to a regular source of care can be economic (indirect costs), structural, or personal (Billings et al., 1993). Economic barriers can include getting off work, forgoing wages, arranging child care, and arranging transportation (Billings et al., 1993). Structural barriers can refer to how well community outreach programs are operating or to the extent that community-based clinics are integrated with hospitals (Billings et al., 1993). The treatment setting itself might represent an unpleasant experience (impersonal and alienating) (Cockerham, 1989).

Personal barriers can include deficits in family/social support, language (patients unable to communicate in the provider's language), and education/knowledge (patients non-compliant in managing such conditions as diabetes because patient education does not accommodate the special circumstances of the indigent) (Billings et al., 1993). Patients may also fail to recognize symptoms that indicate significant medical problems. In a 1987 study of nearly 12,000 patients in five Massachusetts hospitals, Weissman et al. (1991) found 16% of surveyed patients reporting delays in seeking care prior to hospitalization. The most frequent reason cited was "thought the problem would go away or was not serious enough" (63%), and this was related to low socioeconomic status of the patient (Weissman et al., 1991:328). Another significant finding was the

significantly longer hospital stay (about 9% longer) for those who reported delays (this finding, however, was not associated with income level).

Policy Implications of Access Models

Access models focus on the care provided to an individual prior to his/her hospitalization(s) for certain types of conditions. Delays in seeking that care are costly, both in terms of health and financially, and such costs may be reduced by improving access to ambulatory care services (Weissman et al., 1991). Some hospital admissions are clearly almost always avoidable, such as those for immunizable conditions (Weissman et al., 1992), while length of stay is reducible for others. On the other hand, because treatment for some conditions (e.g., congestive heart failure) can be quite complex, it may be more useful to assess rates of such conditions as avoidable when they deviate substantially from some prescribed norm (Weissman et al., 1992).

Differences in hospital utilization by income for ACS conditions suggest important differences in care-seeking and care-providing behaviour (Billings et al., 1993). The high rates of admission for poor people with these conditions indicate that low income, rather than acting as a barrier to obtaining care at a hospital, actually can precipitate hospitalization because of barriers to non-hospital resources. High rates of hospitalizations for ACS conditions thus reflect inadequacies in both health care and social systems (Bindman et al., 1995). Based on the increase over time in ACS admissions for low-income people, New York City in 1993/94 invested over $60 million to "improve primary care services in

high ACS rate areas, and there is some expectation that ACS rates may begin to fall in the short term in New York City" (Billings et al. 1996:10).

Policy makers need to look at the social, economic, and personal barriers to outpatient care delivery (Billings et al., 1993). It does not make sense, for example, to focus policy efforts on physician guidelines for decision-making or incentives to reduce discretion and uncertainty when the systems barrier explanation provides the strongest support for explaining variation in ACS hospitalization rates (Bindman et al., 1995). Billings et al. (1993) suggest that to the extent these differences in rates are attributable to access barriers, small-area analysis can be used as a planning and evaluation tool to:

1) make comparisons among communities, by "monitoring need, providing valuable information for establishing local health priorities, or allocating limited resources among communities" (Billings et al., 1993:170).

2) identify neighbourhoods with the greatest need. Given constrained resources, it is important to target interventions. Billings et al. (1993:170) found, for example, two zip codes with higher admission rates for ACS conditions than other zip codes with comparable demographic profiles; this happened to be where "the city's most notorious welfare hotels were then concentrated, indicating a failure to match resources with needs in those neighbourhoods".

3) evaluate interventions. As Billings et al. (1993:170) indicate, "one of the weakest links in many efforts to provide care for the indigent (and a factor that often generates resistance among otherwise sympathetic elected officials) is the

absence of any mechanism to evaluate the effectiveness of programs intended to improve access. Analysis of hospital use rates before and after implementation may provide a means to assess the impact of both major initiatives...and more targeted efforts".

Billings et al. (1993) acknowledge that substantial costs will likely be incurred by improving outpatient access, but point out that some of those costs could be made up through a decrease in hospital admissions for ACS conditions. As Billings et al. (1996:9) indicate, "there are relatively few opportunities in medicine where investment in more care can actually reduce costs, but this is one area where the savings are real and it can be pursued aggressively".

Policy implementation to improve health care delivery using such access-based measures as described above, however, does not necessarily reduce the costs required for good health. Although costs for hospitalizing patients would be reduced, the costs of improved ambulatory care access could be prohibitive, particularly if economic and structural barriers are to be eliminated. As well, good access to outpatient care does not necessarily mean a given condition requires such care. Weissman et al. (1991) acknowledge that most of the instances of patient delay in seeking care may precede ambulatory care that does not lead to hospitalization; some medical problems may resolve on their own.

B. STUDY HYPOTHESES

The goal of this study was to determine to what extent hospital utilization for certain conditions has changed during three years of reform relative to two years prior to the reform period. Two health care evaluation models were used to interpret the results. The low-variation conditions/procedures of the discretionary model defined necessary hospital utilization, that is, utilization largely attributable to illness. The moderate-variation conditions served as a validity check; that is, such conditions would exhibit greater variation than low-variation conditions. The ambulatory care sensitive (ACS) conditions in the access model were used to define potentially unnecessary hospital utilization. Specific subgroups of the Manitoba population were examined within the context of these frameworks.

Most of the ACS conditions in the access model are also high-variation conditions in the discretionary model. Rates of hospitalization for such conditions have been shown to vary widely by income and across small areas. Potentially unnecessary hospital utilization is suggested by both models for these overlapping conditions, albeit for different reasons, one explaining excessive utilization by physician practice style (discretionary model) and the other by socioeconomic status (access model).

The dependent variable - hospital utilization - was measured for the illnesses specified in the discretionary and access models using the indicators of rates of admissions, rates of hospital days, and average length of stay. Greater hospital utilization would be reflected in higher rates of admission, higher rates of

total hospital days, and/or longer lengths of stay. Types of resource use such as region of hospitalization were also examined for any shifts in patterns of utilization.

The independent variables consisted of the demographic characteristics of age, sex, income, residence, and Treaty Indian membership. They were selected on the basis of their impact on hospital utilization, while taking into account the availability of such information in the Manitoba Health data base. The members of this subgroup at high risk of hospitalization were individuals who were elderly, female, resident in rural Manitoba, poor, and/or were Treaty Indians.

Five years of Manitoba Health hospital discharge abstracts were selected to provide data for both pre-reform and reform periods. The pre-reform period was designated as fiscal 1990/91 and 1991/92 (the fiscal year beginning April 1 and ending March 31). Fiscal 1990/91 was included in order to provide additional information for the pre-reform period, since 1991/92 appears to represent an all-time high in hospital utilization. The reform period was designated as 1992/93 through 1994/95, since government-sanctioned bed closures began occuring in 1992/93.

Utilization data were generated for each of the five years for each of the two models, focusing on several subgroups of the Manitoba population. The null hypothesis was tested, that reform has not adversely affected hospital utilization for the specified conditions, if the following relationships were demonstrated over the five-year period, particularly in comparing pre-reform and reform periods:

1) Utilization does not vary over time for low-variation conditions in the discretionary (LMV) model, although it varies to a small degree for moderate-variation conditions.

2) Utilization decreases over time for ambulatory care sensitive conditions in the access (ACS) model.

In addition to change over time for each cohort as a whole, utilization was examined for subgroups of the population. The null hypothesis was tested for high-risk subgroups, with the expectation that there would be no change in demographic proportions of the study groups for each year relative to the population. For each year, it was also hypothesized that:

1) Hospital utilization for both models is more likely to occur for high-risk subgroups of the population.

2) For the access model, the greater the number of high-risk characteristics, the greater the possibility for reducing hospital use.

CHAPTER 4. METHODOLOGY

This chapter describes how the two population-based health care evaluation models - the access model and the discretionary model - were applied to the Manitoba Health hospital discharge abstract data. The Manitoba Health data for fiscal years 1990/91 through 1994/95 were accessed using resources provided by the Manitoba Centre for Health Policy and Evaluation. Also described in this section are the criteria used for selecting records for analysis and how each of the study variables were operationalized. This chapter concludes with a section on analysis and measurement techniques appropriate for use with population-based data.

A. OPERATIONALIZATION OF MODELS

Two different coding schemes were used to operationalize the conditions for which individuals were hospitalized in both models. All conditions in the discretionary model were defined using the DRG system, while almost all conditions in the access model were defined using the ICD-9-CM system. Most studies assessing hospital utilization typically use such systems when defining medical conditions and/or procedures for analysis.

Sixteen fields are available from the Manitoba Health hospital discharge abstracts to describe diagnoses and twelve fields to describe procedures (diagnostic and/or treatment). Both types of fields consist of codes assigned using the International Classification of Diagnoses, Clinical Modification, 9th Revision

(ICD-9-CM) classification system. The ICD-9-CM system was designed for "the classification of morbidity and mortality information for statistical purposes, and for the indexing of hospital records by diseases and operations, for data storage, and retrieval" (ICD-9-CM, 1993:vii). The ICD-9-CM classification is assigned by trained abstracters in hospital coding departments after the hospital discharge abstract is completed.

The other method for classifying records uses software to group records into Diagnosis Related Groups (DRGs), or categories that are similar both clinically and in terms of consumption of resources (DRGs, 1988). DRGs relate costs incurred by hospitals to case mix complexity (e.g., severity of illness, prognosis, treatment difficulty). (This scheme is the basis for the prospective payment system in the U.S.) Each hospital claim contains one field for DRG, which the Manitoba Centre for Health Policy and Evaluation routinely adds to Manitoba Health data.

1. Access Model: Ambulatory Care Sensitive (ACS) Conditions

Twenty-seven of the 28 ACS conditions in Billings et al.'s (1993) model were used for this study; congenital syphillis was not included because only one case was found in the entire five-year study period. Twenty-six of the 27 ACs conditions were selected using the ICD-9-CM system; only the condition "skin grafts with cellulitis" was selected using DRG codes (Appendix A). Of the 16 available diagnostic fields, the "most responsible diagnosis" field was used to flag

most ACS conditions; that is, "the one diagnosis which describes the most significant condition of a patient which causes his stay in hospital" (Manitoba Health Services Commission, 1987:17). For three of these conditions (dehydration, iron deficiency anemia, and nutritional deficiencies), following Billings et al. (1993), all 16 diagnosis fields were used. As outlined in Appendix A, some conditions were procedure- and/or age-dependent. Where procedure was a factor, all 12 procedure fields were used, and age refers to age at the time of admission to hospital.

2. Discretionary Model: Low/Moderate-Variation (LMV) Conditions

All low-variation and moderate-variation conditions (Roos et al., 1988) were included in this study except for cholecystectomy. Cholecystectomy was not included because the technology for removing gall bladders has changed dramatically over the last few years, leading to striking declines in length of stay (Decter, 1994). It would therefore have been difficult to separate the effects of a new technology from the effects of reform. All LMV conditions used in the study were defined using DRG codes (Appendix A).

B. THE DATA BASE

The Manitoba Centre for Health Policy and Evaluation (MCHPE) maintains a comprehensive, longitudinal, population-based administrative data base containing all health care transactions for all individuals registered with Medicare

(Roos et al., 1993). All patient contacts with physicians, hospitals, and nursing homes (except for some outpatient visits and home care) are recorded in the MCHPE data base, which contains all claims routinely submitted to Manitoba Health by physicians and health care facilities. (Roos et al, 1993; Roos et al., 1985).

All individuals who reside in Manitoba are eligible for Medicare; they are also covered to a certain extent while temporarily out of the province. New Manitobans arriving from another province are eligible after a three-month waiting period, while landed immigrants are immediately eligible. Those not covered include members of the armed forces and RCMP personnel as well as federal penitentiary inmates (Tataryn et al., 1994). Non-participation in Medicare is minimal because there are no premium payment requirements.

For this study, the MCHPE data base was used to extract all hospitalizations for the study conditions. They represent all hospital discharge abstracts submitted to Manitoba Health by hospitals upon discharge of a patient. Each year of hospital discharge abstracts contains approximately 250,000 records, including a small proportion of hospitalizations occurring outside the province for Manitoba for Manitoba residents and occurring within the province for non-Manitoba residents.

None of the MCHPE data bases contain any identifying information. Names and addresses have been removed by Manitoba Health, and the unique identifying number (Personal Health Identification Number, or PHIN) has been scrambled at Manitoba Health.

C. ELIGIBILITY CRITERIA

All hospital records were defined and excluded according to the standards used in the Population Health Information System (PHIS), a health information software system recently developed by MCHPE for the province of Manitoba. (PHIS can be applied to administrative data to provide "standardized data on the health status and health care use of populations by generating population-based rates of discrete events" (Black et al., 1995)). PHIS standard exclusions are based on period of study, patient residence, and patient status (inpatient/outpatient); records denoting newborns and brain deaths are also typically excluded.

Period of study

A hospital stay begins with an admission date and ends with a discharge date (also often called a separation date), either of which can occasionally fall outside the fiscal year period of April 1 through March 1. Discharge date is typically used to define a study period and, for this study, records with discharge dates occuring outside the fiscal years of the study period (April 1, 1990 to March 31, 1995) were removed.

Patient residence

Records for non-Manitoba residents are typically excluded using the postal code field of the claims data. For this study, all records with a postal code not beginning with "R" were removed.

Patient Status (Inpatient/Outpatient)

The hospital claims data base not only contains all claims for inpatient hospitalizations, but many outpatient claims as well, consisting of both surgical and non-surgical contacts with the hospital. Outpatient claims, however, are incomplete for non-surgical contacts on the hospital claims, and are typically excluded. This study thus contains all inpatient hospitalizations, but only the surgical contacts for outpatient claims.

Newborns and Brain Deaths

For the discretionary model (LMV conditions), both records denoting newborn and those denoting brain deaths were excluded. For the access model (ACS conditions), however, certain conditions applied to newborns and thus were not eliminated from the study.

D. OPERATIONALIZATION OF CONCEPTS

This section describes how the study variables were operationalized according to the standards used in the Population Health Information System (PHIS). Included here are the independent variables, or indicators of risk: age, sex, area of residence, income, and Treaty Indian membership. Also included are measures of the dependent variable: discharges, length of stay, and hospital days. This section concludes with a description of utilization classification variables.

1. Independent Variables: Indicators of Risk

Age and Gender

For the gender variable, checks were done to ensure that the appropriate gender was coded for any gender-specific diagnoses. Age for each record was defined to match that of the Manitoba Health registry in order to facilitate rates analyses which use registry information for the denominator. This meant that age for a given record was calculated as of December of the fiscal year.

Area of Residence

Most records can be assigned to an area of residence using municipal code; however, this approach is problematic for Treaty Indians. The residence which Manitoba Health assigns for such individuals is "First Nation of origin, usually a municipality denoted as an Indian reservation, instead of using actual residence information" (Black et al., 1993b:6). Postal code is thus used instead of municipal code to assign residence for records falling into this group. Rural residence was distinguished from urban residence based on Statistics Canada's definition, which was used to construct the income quintiles (Appendix B).

Income

Income data are available only at the aggregate level of enumeration area, the basic census data collection unit; each unit contains a minimum of 125 households in rural areas to a maximum of 375 in large urban areas (Statistics Canada, 1988). While census data have always been made available by Statistics

Canada, only recently has sufficient work been done at the small-area level for linkage of Manitoba Health data with census data. This linkage permits obtaining for each Manitoba Health registrant such informaton as the mean household income for the area in which he or she resides.

Income information obtained from enumeration areas can be assigned to geographic configurations such as forward sortation area (first three digits of the postal code), census division, municipal code, and postal code. For this study, hospital records were assigned to income quintiles based primarily on postal code, as developed by Dr. Cam Mustard et al., who ranked census enumeration areas by average household income into quintiles, with Q1 representing the lowest and Q5 the highest income quintile (Appendix B). The average household income for Q1 in 1992, for example, was $24,000 and, for Q5, was $70,600 (Erzen et al., unpublished).

Two sets of income quintiles were developed for Manitoba, one for urban areas, the other for rural areas, in an attempt to control for the differences in income pattern for these two populations (i.e., to account for the greater heterogeneity within rural areas). It should also be noted that age differences, while not controlled for in developing the income quintiles, can also be quite marked, especially for the elderly, who tend to reside in poor neighbourhoods. Dr. Cam Mustard (personal communication) has also stressed, when interpreting income quintile data, that census data are a measure of income, not necessarily of

wealth, and that data on which quintiles are based reflect household income at the neighbourhood level, not the individual level.

Treaty Indian

According to the 1991 census, the total aboriginal population of Manitoba included 117,455 aboriginal and/or Status Indians (Statistics Canada, personal communication). The Manitoba hospital discharge abstracts contain sufficient information to identify a subgroup of Treaty Indians, "a specific group of the aboriginal people population that has certain rights and privileges under the Indian Act of Canada" (Tataryn et al., 1994:7). This subgroup was captured with the municipal code field available on the hospital discharge abstract, that is, any municipal code beginning with the letter "A". From 1990 through 1994, the annual population of Treaty Indians, according to the Manitoba Health registry, ranged from 58,133 to 63,298 (Appendix E.6 and F.6), about half the total aboriginal population.

It should be noted that the Treaty Indian category may include a small number of non-aboriginal people; conversely, not all Treaty Indians may be registered. Updating of such information by Manitoba Health has been made more difficult with the transfer of all residence records on the Treaty Indian population to Ottawa. For example, thousands of female aboriginals were re-renfranchised several years ago, but since there was no incentive for the vast majority to inform Manitoba Health, their "A-code" is not known. Cam Mustard

has estimated that Manitoba Health's undercount of Treaty Indians might be between 11,000 and 15,000 (Fred Toll, personal communication).

2. Dependent Variables: Measures of Utilization

Hospital utilization is typically measured using discharges, hospital days, and/or average length of stay (Black et al., 1993b). Discharges are frequently referred to as separations or, in this paper, as hospitalizations. Hospital days are a summary measure of all the days used for all discharges for a given category. This study focused on both discharges and hospital days, as well as examining average length of stay.

Discharges (or separations)

Each hospital record represents one hospital discharge abstract that was filed by a hospital with Manitoba Health; it is the most commonly used measure of hospital utilization (Black et al., 1993b). An individual can have multiple hospitalizations in a given fiscal year, however, so that multiple hospital records are generated for such individuals. Much of the information presented in the findings is at the level of discharges. For analyses at the level of individuals, or one record per person, an index record must be selected so that the person is counted only once. Demographic tables for this study, for example, were based on data obtained from the most recently occurring hospitalization for each person.

Hospital days

Days spent in hospital can be summarized for each hospitalization of interest into a measure of total hospital days. This type of measure provides a useful estimate of the total resources required for inpatient hospital care (Black et al., 1993b). On the other hand, the most typically used measure of individual length of stay in hospital is the average length of stay, or the total number of hospital days divided by the total number of inpatient admissions (Brownell and Roos, 1992). Both measures are used here to assist in assessing hospital utilization.

3. Utilization Classification Variables

Several other variables were created from the hospital discharge abstract data to assess hospital utilization. Comorbidity and illness severity were used in the analyses calculating potentially unnecessary days. Region of hospitalization, type of hospital, and type of stay were used to assess resource use.

Comorbidity

Each hospital record was assigned a measure of comorbidity using the Charlson Comorbidity Index, based on conditions identified by Charlson et al. (1987). Comorbidity refers to "medical conditions that exist in addition to the main reason for hospitalization (usually recorded as 'the most responsible diagnosis' on hospital discharge abstracts). The type and number of comorbid conditions

provide an indication of the health status (and risk of death) of patients" (Black et al., 1993b:11).

Illness Severity

The RDRG (Refined Diagnosis Related Group) field on the hospital records, routinely added to the claims by MCHPE using RDRG software, was used to classify records into several levels of severity and complexity: low, moderate, and high. Low severity refers to those individuals where "comorbidity and complications were likely to have no or only minor impact on hospital resource use"; moderate severity where "comorbidity and complications were likely to have a moderate impact"; and high severity where "comorbidity and complications were likely to have a major impact" (Roos and Shapiro, 1994:44).

Region of Hospitalization

Region of hospitalization provides information about the dynamics of intraprovincial care, indicating whether individuals were hospitalized within their region of residence or outside their region of residence (Black et al., 1993b). Each record was categorized into one of the ten health regions that comprised the province of Manitoba during the period 1990/91 through 1994/95.

Type of Hospital

The type of hospital has implications for "the availability of specialized services, distance a patient must travel for care, and resource costs of providing care" (Black et al., 1993b:12). The approximately 100 hospitals in Manitoba range

from "small institutions, having less than 15 beds, to larger urban teaching hospitals with hundreds of beds and a capacity to provide very specialized services" (Black et al., 1993b:12). Manitoba hospitals for this study have been grouped into several institutional categories by location, size and level of specialization.

E. ANALYSIS AND MEASUREMENT

Population-based data do not require the use of inferential methodology since the findings are based on all people in the population and sampling is not an issue. This section describes the unit of analysis, rates methodology and some of the data quality issues inherent in using population-based administrative data.

1. Unit of Analysis

The unit of analysis was primarily the hospital discharge abstract, but shifted to the individual for demographic analyses since multiple hospitalizations can occur for an individual within a given year. Individuals hospitalized for an ACS condition were more likely to be hospitalized again within a given fiscal year for an ACS condition, compared with individuals hospitalized for an LMV condition. Almost 20% of such individuals were re-admitted during the year for ACS conditions, compared with about 5% of individuals with LMV conditions (Appendix C). This pattern reflects the nature of the illnesses in each model: LMV conditions tend to occur as acute episodes of illness while the chronic nature of

many ACS conditions is reflected in the higher proportion of repeat hospitalizations.

2. Rates Methodology

Analyses for this study were based primarily on rates of occurrence for a given event (numerator) in the population (denominator). The numerator comprised the hospital discharge records for the study conditions. Hospital discharge abstracts are submitted to Manitoba Health for all individuals resident in Manitoba so all hospital utilization in Manitoba is included in the numerator.

The denominator consisted of all individuals registered with Manitoba Health as of December of the relevant fiscal year, including those who had no contact with the health care system at all. The denominator represents almost the entire Manitoba population since the absence of health premiums (or other such associated costs) ensures a high rate of participation for insured benefits (Roos et al., 1993). For 1991, for example, the eligible Manitoba population according to Manitoba Health registry data as of December was within about 4% of the 1991 Census figure of 1,091,942 individuals resident in Manitoba (Statistics Canada, personal communication). Differences arise as a result of the purpose for which data are collected (enrollment versus census); for example, some reserves refused to participate in the census. A very small percentage of the Manitoba population not covered by health insurance (e.g., federal penitentiary inmates and members of

the armed forces and the RCMP) is excluded from the denominator; however, their utilization is captured in the numerator (J. Pat Nicol, personal communication).

Rates were adjusted for age and sex to remove their effects on hospital utilization; such factors contribute to different requirements for hospital resources and thus ultimately influence patterns of health care delivery (Roos and Shapiro, 1994). To permit multiple year comparisons, all rates were standardized to fiscal 1992/93 using the direct method (Mausner and Kramer, 1985). The directly standardized rate represents "what the crude rate would have been in the study population if that population had the same distribution as the standard population" (Last, 1988:124). Age in both numerator and denominator was grouped into 11 categories, the youngest age category having the greatest number of individual ages (0-14), with ten-year groupings from age 15 to age 74, and five-year groupings from age 75 and up. The smaller groupings were used for the latter group because of the greater variability in their utilization of health care resources.

For multiple year comparisons, overall trend P-values were calculated to determine if there were any significant differences across years within the five-year period. Each reform year (1992/93 to 1994/95) was also compared individually against the pre-reform period, using 1991/92 as the baseline year. The levels of significance are all indicated in the Appendix tables; either specific P-values are shown, or one of three levels are indicated: P<=.05, P<=.01, or P<=.001. Alongside

the overall P-value an adjusted P-value is also shown, which takes into account the multiple comparisons across years; this adjustment was done using the Bonferroni method (Brownell and Roos, 1996). Tests of trend over the five income quintile levels, both urban and rural, were also calculated and are displayed in the Appendix tables.

Brownell and Roos (1996) have suggested using a significance level of 1% with large data sets in order to maintain balance between type I and type II errors. While there is practically no chance of making a type II error with large data sets ("failing to reject a null hypothesis that is, in fact, false"), they recommend the 1% level to control for type I error ("the risk of erroneously rejecting a null hypothesis that is really true") (Brownell and Roos, 1996; Colton, 1974:120).

3. Data Quality

Administrative hospital data bases reflect only what is reported in the discharge abstract. The researcher is limited, for example, to the variables for which data are routinely collected (Roos et al., 1987). Roos et al. (1987) have also noted that the available data represent patient-initiated contact; thus, absence of data does not necessarily mean absence of disease. Many of the problems, however, are more related to existing structures and coding rules rather than being inherent to administrative data (Romano and Luft, 1992). Potential problems in reliability and validity can result from the following coding-related issues:

* **Ambiguity of ICD-9-CM codes.** When combined, for example, with the availability of general, nonspecific codes, this "allows unsophisticated or unmotivated coders to use general codes when more specific codes would be desirable" (Romano and Luft, 1992:59). Clinically dissimilar diagnoses and procedures are often not distinguished. Even if the coding is precise, the clinical meaning may not be clear, or misleading coding conventions may be applied. Patients admitted for "rule out acute myocardial infarction", for example, "may be coded as AMI even if AMI is ruled out by clinical criteria" (Romano and Luft, 1992:60).

* **Inaccurate, incomplete or unsupported diagnoses.** Such diagnoses may be listed by physicians; medical records clerks, in turn, can misinterpret the physician's notes, overlook diagnoses, or make keypunch errors (Romano and Luft, 1992).

* **Changes over time.** Coding changes, additions, and deletions can occur for specific diagnoses and procedures with each annual release of the ICD-9-CM coding manual.

* **Variation in coding by location.** Coding of diagnoses and procedures can vary to a certain degree with the hospital. Inferences about quality of care must thus be drawn with care when comparing hospitals or regions because variation may reflect differing coding practices.

Nonetheless, secondary data bases such as the Manitoba Health hospital discharge abstracts data base have certain advantages over other types of data collection (Roos et al., 1987):

* Data analysis can be repeated over time at any point in time.

* Data are population-based and quite complete; sampling is not required.

* Study costs can be much lower than for survey or chart abstraction data.

* No direct contact is required with individuals, eliminating problems with patient recall, participation and/or bias.

* Individual histories and comparison groups are easily generated.

Research that takes into account the limitations of administrative data can benefit from the strengths of such data bases. A number of studies have yielded useful information about the reliability and validity of the Manitoba health data base. Researchers should know, for example, that diagnoses on hospital records are probably more accurate than those on physician claims and that certain diagnoses can be cross-validated with associated tests and/or procedures (Roos et al., 1993). Comparisons between the 1986 national census (which collects primary data from all households) and the Manitoba Health registry showed less than a 2% difference in several age/sex categories (Roos et al., 1993). When hospital discharge abstract data were compared with physician claims for a number of surgical procedures, nearly 93% showed a "perfect" match on identifiers, operation date, and either procedure or surgeon, with diagnostic agreement averaging 75%

(Roos et al., 1989). This type of ongoing research explores ways of enhancing the reliability and validity of adminstrative claims data bases, making it possible to adopt innovative approaches to data analysis.

CHAPTER 5: FINDINGS

The data used for this study represent approximately 14% of all records constituting the Manitoba Health hospital records data base for each of the five study years. Ambulatory care sensitive (ACS) records in the access model represented about 10% of overall hospital utilization in Manitoba, a higher proportion than records characterized as low- and moderate-variation (LMV) in the discretionary model (about 4%) (Appendix D). Records were excluded for reasons of non-Manitoba residence, discharges occurring outside the fiscal year, and non-surgical day care. For each year, exclusions ranged from 15.4% to 17.4% of total ACS records and from 12.1% to 13.9% of total LMV records.

Certain postal codes were unassignable to an income quintile, making it necessary to exclude additional records for income and area analyses. Assignment problems occurred when: a) the postal code was out-of-province; b) the postal code represented a personal care home or other institution; c) income data were missing for the postal code or municipal code; or d) the postal code did not exist in the income quintile data. For ACS conditions, this meant a further 2.9% to 3.3% of ACS hospital records were removed, and for LMV conditions an additional 4.5% to 5.0% of LMV records were excluded (Appendix D).

In this chapter, data are presented from the Manitoba Health hospital discharge abstracts for each year of the five-year study period, divided into pre-reform (1990/91 and 1991/92) and reform periods (1992/93 to 1994/95). This distinction reflects overall patterns in bed supply and utilization over the same

five-year period. Although the number of total acute care beds was almost identical for 1990/91 and 1991/92, the overall supply decreased in 1992/93 by about 10% to 3,013 beds, with the downward trend continuing through the reform period for an overall decline of 17.9% to 2,498 beds by 1994/95 (Brownell and Roos, 1996; Marni Brownell, personal communication). A similar downward trend occurred for total set-up beds in Manitoba, or those that are staffed and in operation (Fred Toll, personal communication). By 1994/95 there were 5,439 total set-up beds in Manitoba, a 7% decrease from the 1992/93 figure of 5,846 beds (unfortunately, the figures for the two earlier years were not reported by Manitoba Health) (Manitoba Health, 1991-1994). The number of hospitalizations in 1994/95 (129 inpatient cases per 1,000) decreased each year, totalling a 5.1% decrease since 1991/92, although it should be noted that hospitalizations in 1991/92 increased 3.8% from 1990/91 (Table 1). The total hospital days used for these hospitalizations also decreased each year, declining a total of 14.9%, from 1,481 days in 1991/92 to 1,260 days per 1,000 by 1994/95 (with an increase of only 1.5% between 1990/91 and 1991/92) (Table 1).

The following questions are addressed using both discretionary and access models, with patterns of hospital utilization examined over the five-year study period:

1. How frequently do hospitalizations for the study conditions occur in the Manitoba population? (Rates of discharges per 10,000 Manitoba population.)

2. How many hospital days are used for the study conditions? (Rates of total hospital days per 10,000 Manitoba population; average length of stay)

3. What is the nature of hospital resource use for the study conditions? (Region of hospitalization, type of hospital, type of stay)

4. Who is most at risk of being hospitalized for the study conditions? (Demographic profile: age, sex, residence, income, Treaty Indian membership)

5. What proportion of hospital utilization might be potentially reducible if the high-risk group were hospitalized at the same rate as the low-risk group? (Level of illness for ACS conditions: comorbidity and severity; hospital days and risk index)

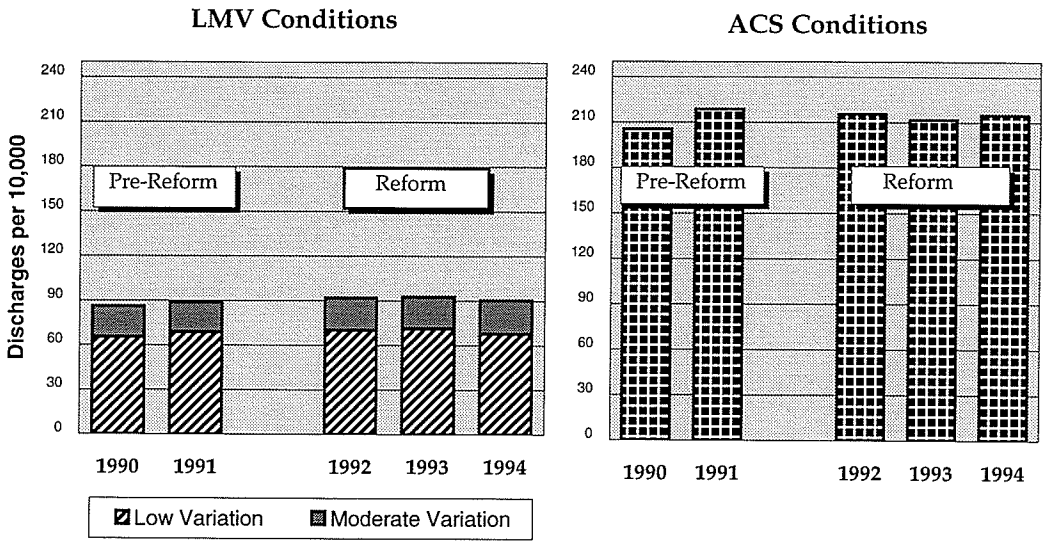
Statistically significant differences from 1990/91 are noted in comparing the pre-reform year 1991/92 with subsequent reform period data to provide context for any changes in utilization occurring with reform. For ease of reference, fiscal year will be denoted in calendar year form throughout this chapter (i.e., 1990/91 will be referred to as 1990, 1991/92 as 1991, and so on). It should be noted once again that while hospital utilization information is available for all residents of Manitoba, the denominator for rates analyses does not include the relatively few individuals not registered with Manitoba Health (such as members of the RCMP). This means that rates information, although standardized to a given population, may very slightly overestimate the rate of occurrence for a given event.

A. RATES OF HOSPITALIZATIONS

For the two-year pre-reform period, the overall rate of discharges for LMV conditions for 1991 rose 2.9% from 1990, from a rate of 86.12 discharges per 10,000 to 88.61 discharges per 10,000 (Appendix E.1). Overall LMV rates for the three-year reform period were slightly higher (90.27 to 92.76 hospitalizations per 10,000). Separating out low-variation (LV) from moderate-variation (MV) conditions showed little difference in hospitalization patterns among the two categories, although the last study year for MV conditions showed a slight increase over the pre-reform period.

For ACS conditions, the overall rate of discharges for the pre-reform period rose 6.5% over the two years, increasing from a rate of 205.40 discharges per 10,000 in 1990 to 218.72 per 10,000 in 1991 (Appendix F.1). Overall ACS rates declined over the reform period but were still slightly higher when compared with the earlier pre-reform year 1990 (211.52 to 215.37 discharges per 10,00).

Figure 1. Rates of Hospitalizations



Hospital utilization for ACS conditions, as measured by discharges, is more than double that for LMV conditions (Figure 1). Both models show a similar stability over time; however, the trends are interpreted in different ways. For LMV conditions, hospitalization for low-variation conditions is always considered necessary while some variation is expected for moderate-varation conditions. This overall stability over the five-year period, including a very slight increase between the pre-reform and reform period, suggests everyone is still being hospitalized for such conditions, that no one is being denied admission. According to the model, the implication is that reform cutbacks have not affected quality of care for LMV conditions. Support has been provided for the hypothesis that rates will not vary over time for hospital utilization classified as necessary.

Hospitalizations for ACS conditions, on the other hand, include potentially unnecessary care and might be expected to decline during the reform period as less resources become available. While rates did decline slightly over the reform

period for ACS conditions, they were still higher than the pre-reform year 1990. This suggests that the relatively high rate of 1991 was an anomaly that should not be used in isolation for baseline comparisons. The overall stability of rates of hospitalizations over time for ACS conditions, particularly over the reform period, suggests both hospital and ambulatory care resources are still being used ineffectively and inefficiently for such conditions, even with implementation of reform.

A closer examination follows of rates of hospitalization for selected conditions for each model. The influence of neighbourhood income on rates of hospitalization is also explored.

1. Discretionary Model: LMV Conditions

Looking at specific LMV conditions, hospitalizations occurred most frequently for hernia surgery for all study years except 1991 (ranging from 16.55 to 18.36 discharges per 10,000), while the lowest rate of discharges occurred for hip repair (7.75 to 8.23 discharges per 1,000) (Table 4). During the pre-reform period two low-variation rates rose significantly: AMI (P<=.001) and stroke (P<=.05), while one moderate-variation rate (appendectomy) was significantly lower in 1991 compared with the earlier year (P<=.05) (Appendix E.1). During each year of the reform period, hospitalizations for AMI and hip repair showed no significant difference from the pre-reform year of 1991. Except for the rate for bowel procedures, which was significantly lower in 1994, no other low-variation conditions were significantly different when compared to 1991. Both moderate-

conditions were significantly different when compared to 1991. Both moderate-variation conditions showed significant increases in rates of hospitalization for the final reform year when compared with pre-reform 1991 (appendectomy, however, was close to the 1990 rate, which was significantly higher than 1991).

The data thus support the expectation that utilization for low-variation conditions would vary less than for moderate-variation conditions. Decreases in hospitalization for LMV conditions represent an area of possible concern; however, while bowel procedures decreased significantly when compared with the pre-reform year 1991, it should be noted that rates for the other pre-reform year (1990) were slightly lower than 1991.

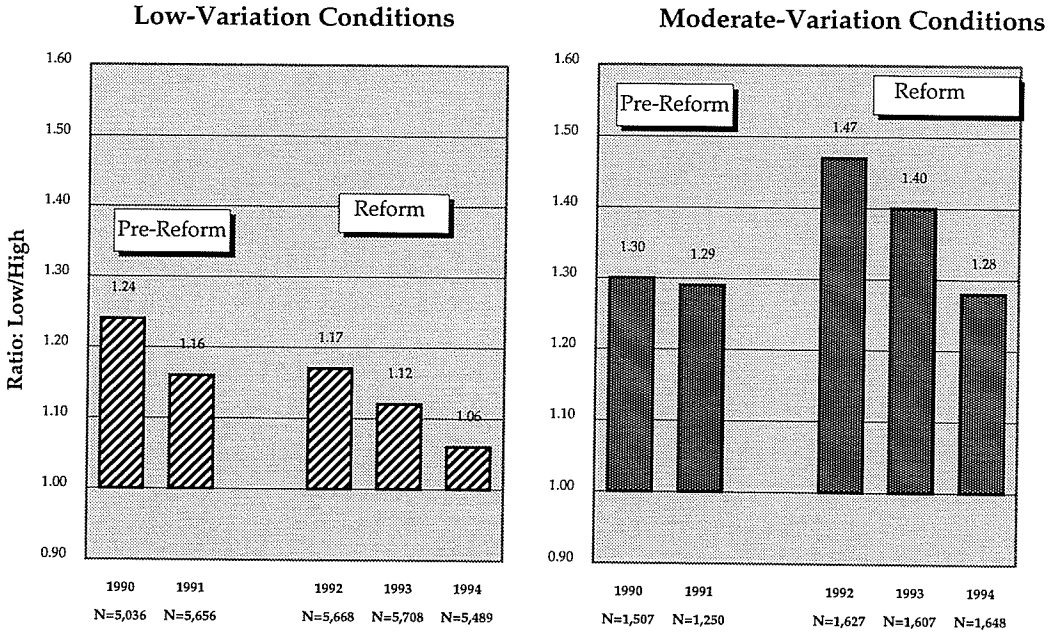
Table 4. Rates of Hospitalizations for LMV Conditions

	Direct Age- and Sex-Adjusted Rates of Discharges per 10,000 MB Population				
	Pre-Reform		Reform Period		
	1990	1991	1992	1993	1994
Total LMV discharges	9,562	9,979	10,437	10,622	10,441
Low Variation	65.35	68.53	69.92	71.01	67.56
AMI	16.11	17.48	17.42	17.51	16.64
Stroke	14.93	15.78	16.34	16.97	16.47
Hernia procedures	16.55	17.17	17.90	18.36	17.09
Bowel procedures	9.98	10.16	10.51	9.98	9.13
Hip repair	7.78	7.94	7.75	8.19	8.23
Moderate Variation	20.77	20.07	21.84	21.75	22.71
GI Bleeding	11.10	11.12	12.88	12.68	12.71
Appendectomy	9.67	8.95	8.96	9.08	10.00
TOTAL	86.12	88.61	91.76	92.76	90.27

2. Discretionary Model: Influence of Income

All hospital records were categorized into an urban or rural income quintile, developed by the Manitoba Centre for Health Policy and Evaluation and based on the Statistics Canada (1988) definition. For all five years, after exclusions, the majority of LMV discharges fell into the urban category (72% to 73%), with the rest being classified as rural (Appendix D1). Dividing the rate of discharge for the lowest income quintile by the rate for the highest income quintile yielded a simple ratio. Values greater than 1 represent the proportion by which hospitalizations occurring for the lowest income quintile exceeded the rate of hospitalizations for the highest income quintile. Data are presented first for urban areas of residence, followed by rural areas of residence. Note that rural area quintile results are difficult to interpret because of the lower numbers and greater heterogeneity in such areas, as indicated earlier in the chapter on Methodology.

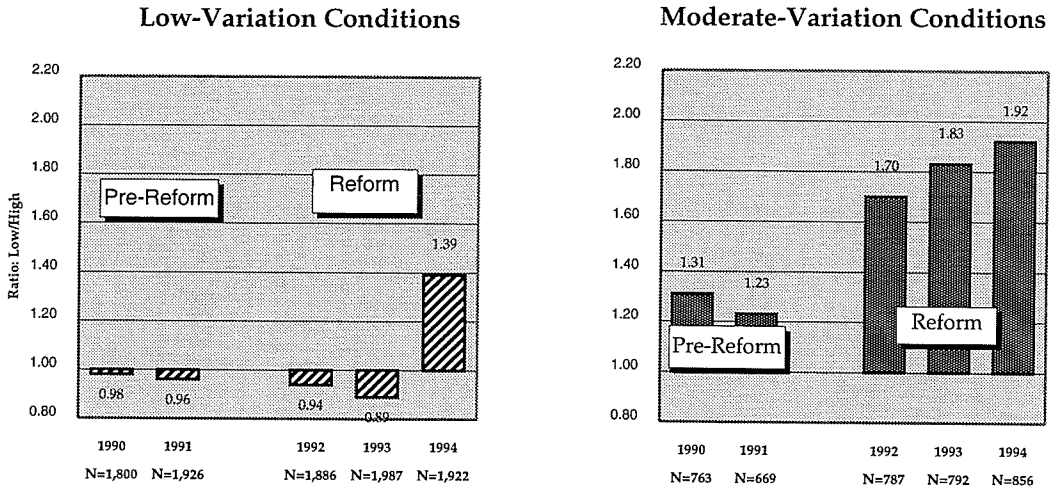
Figure 2a. Urban Ratio of Lowest/Highest Income Quintile for LMV Hospitalizations



Urban Residence. For urban areas, lowest income quintiles invariably showed higher rates of hospitalizations than highest income quintiles, both for low-variation conditions (ratios ranging from 1.06 to 1.24) and moderate-variation conditions (ratios of 1.28 to 1.47), although the gap was larger for moderate-variation conditions (Figure 2a). Low-variation conditions classified as urban showed a fairly steady decline over the five-year period of the study in the proportion of lowest to highest quintile rates of hospitalizations, from 1.24 in 1990 to 1.06 in 1994. Looking at specific low-variation conditions, hip repair had the highest ratio of lowest to highest income quintile for three of the five study years (1.31 to 2.18) while hernia showed the lowest ratio for all five years (0.66 to 1.01) (Appendix E.2a to 2e). The ratio for moderate-variation conditions, although

increasing to 1.47 at the beginning of the reform period from pre-reform ratios of 1.29 and 1.30, declined to pre-reform levels by 1994 (1.28).

Figure 2b. Rural Ratio of Lowest/Highest Income Quintile for LMV Hospitalizations



Rural Residence. For hospitalizations classified as rural, low-variation conditions showed a reverse relationship, where rates of hospitalizations were greater for the highest income quintile than for the lowest quintile for all five study years (ratios ranging from 0.89 to 0.98) except 1994, which showed a large jump in the opposite direction (ratio of 1.39) (Figure 2b). Hip repair had the highest ratio for two of the study years (1.56 and 2.92) and stroke for another two years (1.13 and 1.38) (Appendix E.2f to 2j). Hernia had the lowest ratios for four of the five years (0.59 to 0.85). Moderate-variation conditions showed a large increase from pre-reform ratios of 1.23 through 1.31 to reform period ratios of 1.70 through 1.92. GI bleeding showed the highest proportions of lowest to highest income quintiles (both urban and rural) for all five years.

Income and Rates of Hospitalizations for LMV Conditions. Ratios of lowest-to-highest income quintiles were lower overall for low-variation conditions than for moderate-variation conditions. This finding supports the expectation that low-variation conditions would show less variation in utilization than moderate-variation conditions. While income ratios for hospitalizations for urban residents decreased over time for both sets of conditions (dropping below pre-reform levels for all three reform years for low-variation conditions), rural ratios showed a marked increase during the reform period for moderate-variation conditions (no clear pattern was observed for rural low-variation conditions).

3. Access Model: ACS Conditions

Looking at specific ACS conditions, hospitalizations occurred most frequently for bacterial pneumonia for each study year: 33.02 to 37.98 discharges per 10,000 (Table 5). During the pre-reform period, rates of discharges rose significantly for five ACS conditions (P<=.001): bacterial pneumonia, asthma, skin grafts with cellulitis, kidney/urinary infections, and iron deficiency anemia (Appendix F.1).

Hospitalizations during the reform period years of 1993 and 1994 decreased significantly from pre-reform levels for severe ENT infections, asthma, gastroenteritis, dehydration, skin grafts with cellulitis, iron deficiency anemia, and dental conditions. During 1994, rates of discharges for asthma, congestive heart failure, diabetes "B", and hypoglycemia also decreased significantly from fiscal 1991. On the other hand, there were significant increases in 1994 for rates of

hospitalization for cellulitis, angina, immune-related and preventable conditions, and diabetes "C" when compared with 1991.

Certain ACS conditions satisfied the hypothesis that rates would decrease over time, while other ACS conditions showed significant increases between the pre-reform and reform periods. The latter finding suggests increasing potential problems in access to outpatient care for such conditions. On the other hand, a decrease in rates of hospitalization, according to the model, suggests improvements in outpatient access might have occurred over the course of the reform period for those conditions.

Table 5. Rates of Hospitalizations for ACS Conditions

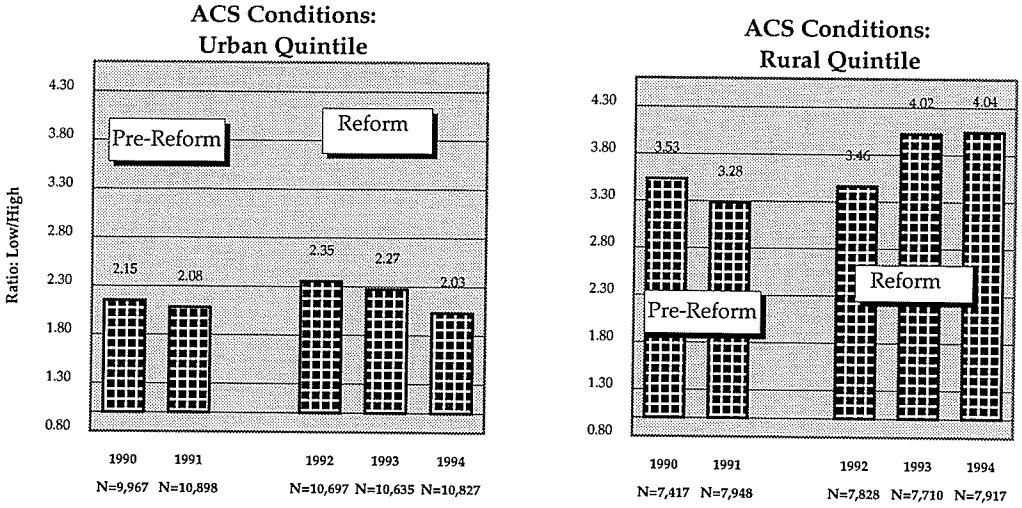
	Direct Age- and Sex-Adjusted Rates Discharges per 10,000 MB Population				
	Pre-Reform		Reform Period		
	1990	1991	1992	1993	1994
Total ACS discharges	22,944	24,720	24,497	24,178	24,737
Bacterial pneumonia	33.45	37.15	33.02	34.16	37.98
Congestive heart failure	27.11	28.67	28.70	28.48	27.16
Asthma	19.74	22.51	21.58	21.00	18.83
Chronic obstructive pulm.dis.	19.17	20.17	20.65	20.96	21.12
Gastroenteritis	13.83	14.53	14.44	13.34	13.62
Severe ENT infections	13.12	13.16	12.63	11.70	10.94
Angina	12.91	13.50	14.33	14.98	14.52
Kidney/urinary infection	11.26	12.38	12.55	12.14	12.69
Cellulitis	9.66	9.55	9.64	8.92	10.81
Dehydration	7.08	7.13	7.68	7.68	8.51
Dental conditions	5.59	5.59	4.93	4.22	4.08
Diabetes "B"	5.57	5.50	5.78	5.76	4.23
Hypertension	4.19	4.60	5.25	5.36	4.81
Pelvic inflammatory disease	4.09	4.19	4.81	4.32	4.47
Grand mal/oth.epilep.convuls.	3.91	4.08	4.91	3.84	4.02
Diabetes "C"	3.05	3.01	2.76	2.68	4.14
Convulsions "B" (age >5)	2.54	2.71	2.64	2.40	2.92
Diabetes "A"	1.99	2.28	1.96	2.26	2.45
Convulsions "A" (age 0-5)	1.98	1.98	2.10	2.22	2.19
Iron deficiency anaemia	1.29	1.85	1.47	1.10	1.06
Skin grafts with cellulitis	0.91	1.23	0.64	0.88	0.82
Hypoglycemia	0.90	0.77	0.74	0.82	0.44
Immun.related & prev.cond.	0.56	0.60	0.41	0.46	0.89
Failure to thrive	0.52	0.47	0.61	0.44	0.48
Pulmonary tuberculosis	0.51	0.54	0.52	0.54	0.71
Nutritional deficiencies	0.32	0.30	0.27	0.42	0.39
Other tuberculosis	0.16	0.26	0.33	0.38	0.33
TOTAL	205.40	218.72	215.37	211.52	214.61

4. Access Model: Influence of Income

Urban proportions of discharges were closer to rural proportions than for LMV records, with 57% to 58% representing the urban category over the five-year period and the remainder being classified as rural (Appendix D.2). The top nine

most frequently-occurring discharges for ACS conditions were retained for income analyses, all of which showed at least 1,000 hospitalizations for any given year. This was done to ensure sufficient numbers for each cell. For all years, lowest income quintile invariably had more hospitalizations than highest quintile, for both urban (ratios ranging from 2.03 to 2.35) and rural (ratios ranging from 3.28 to 4.04) areas (Figure 3).

Figure 3. Ratio of Lowest/Highest Income Quintile for Selected ACS Hospitalizations



Urban Residence. Records for the nine selected ACS conditions classified as urban showed a sharp increase in the proportion of lowest to highest income quintile hospitalizations from the pre-reform year of 1991 (ratio of 2.08) to the reform year of 1992 (ratio of 2.35) (Figure 3). For subsequent years, however, the ratio declined to 2.03, slightly lower than pre-reform levels. Chronic obstructive pulmonary disease (COPD) had the highest ratio for urban residence for four of the five study years (2.51 to 3.56) (Appendix F.2a to 2e).

Rural Residence. The rural category showed a different pattern, with the income ratio increasing from pre-reform levels of 3.53 (1990) and 3.28 (1991) to 4.02 by 1993 and remaining high at 4.04 for the last year of analysis (1994). Looking at specific conditions, ACS conditions classified as rural consistently showed extremely high ratios for severe ENT infections for all five study years (6.14 to 9.33) while COPD had the lowest ratio for three study years (2.10 to 2.48) (Appendix F.2f to 2j).

Income and Rates of Hospitalizations for ACS Conditions. Hospitalizations in the lowest income quintile category occurred at least twice as often as for the highest quintile for urban areas, and at least three times as often for rural areas. This contrasts markedly with the low-variation conditions in the LMV model which showed ratios ranging from 1.06 to 1.24 for urban areas and 0.89 to 1.39 for rural areas (Figures 2a and 2b). While the ratio for ACS conditions has gradually declined for urban areas to slightly lower than pre-reform levels, rural areas show substantially higher ratios for the most recent two reform years, suggesting the possibility of increasing problems in outpatient access for such areas.

Summary: Rates of Discharges as Measure of Hospital Utilization

Rates of discharges from the hospital discharge data have provided support for the LMV model, for the hypothesis that utilization would not change over time for low-variation conditions as a whole. Moderate-variation conditions showed some change over time as well as greater variation in the gaps between lowest and

highest income rates of discharges. Overall rates for moderate-variation conditions increased 13.15% between pre-reform 1991 and reform year 1994 while rates for low-variation conditions declined 1.42% over the same period (although 1994 represents an increase of 3.4% when compared to 1990). Comparisons of reform year 1994 with pre-reform 1991 showed a greater change for moderate-variation conditions relative to overall Manitoba hospitalization rates and the least change for low-variation conditions (Table 6). It should be noted, however, that the low-variation group consists of five study conditions while the moderate-variation group comprises only two study conditions.

Table 6. Percentage Change in Rates of Hospitalizations over Time

	Pre-Reform	Reform			Over 4 years
	1990 to 1991	1991 to 1992	1992 to 1993	1993 to 1994	1991 to 1994
All Manitoba	3.82%	-2.21%	-2.26%	-0.77%	-5.15%
Low-variation	4.87%	2.03%	1.56%	-4.86%	-1.42%
Moderate-variation	-3.37%	8.82%	-0.41%	4.41%	13.15%
ACS	6.48%	-1.53%	-1.79%	1.46%	-1.88%

Rates of discharges for ACS conditions as a whole, while declining during the reform period, simply returned to pre-reform levels. The overall decrease of only 1.88% in rates of ACS discharges between 1991 and 1994 was lower than the decrease in overall Manitoba utilization rates (5.15%). The rate of ACS days for 1994 actually reflects an increase of 4.5% when compared with 1990. No support was thus provided by the ACS model for the hypothesis that a decline in rates

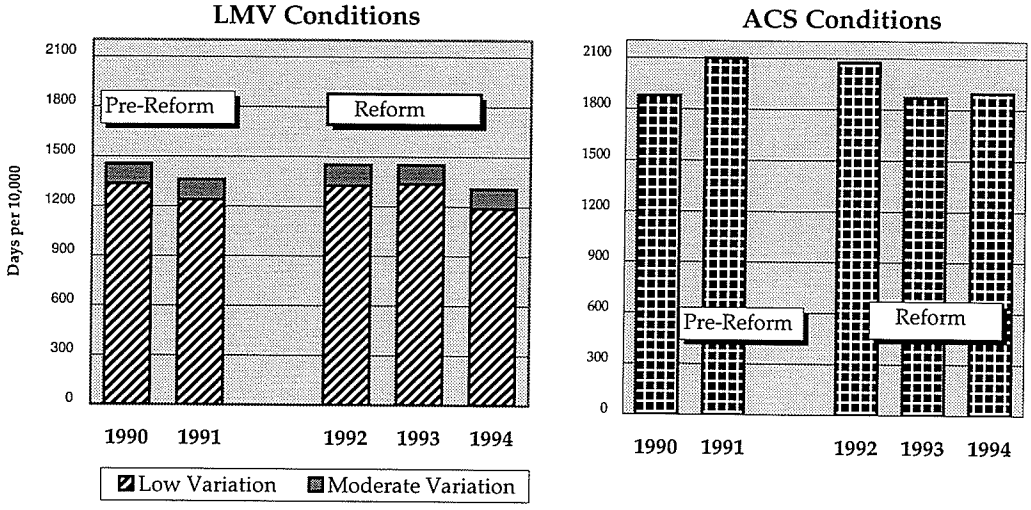
would occur with reform (this hypothesis was confirmed, however, for certain ACS conditions in the model).

The hypothesis that hospitalizations occur much more frequently for high-risk categories in the access (ACS) model received strong support via the large lowest-to-highest income quintile ratios displayed consistently for each study year, ratios substantially greater than for LMV discharges. Ratios greater than "1" in the LMV model illustrate the greater burden of illness experienced by low-income groups. According to the ACS model, the substantially greater ratios for ACS conditions highlight the additional problems experienced by such groups in terms of access to appropriate outpatient care.

B. RATES OF HOSPITAL DAYS

Only hospital days of one day or longer were retained for this portion of the analysis. This meant removing 1.7 to 2.7% of ACS records and 1.4 to 3.5% of LMV records for each study year. The excluded hospital discharge abstracts represent all day surgery contacts; that is, all records with "0" days length of stay. Although ACS records show more hospital utilization than LMV records for both rates of discharges and hospital days, Figure 4 shows that the gap is not as large for hospital days - about a third greater for ACS conditions (versus about double for rates of discharges).

Figure 4. Rates of Hospital Days



For the two-year pre-reform period, overall rates of hospital days for LMV conditions decreased in 1991 by 6.4% from 1990, from a rate of 1,453.98 days per 10,000 to 1,360.71 days per 10,000 (Appendix E.3). Overall LMV rates increased slightly with the start of reform, by 6.6% from 1991 to 1992, remaining steady for 1993, and declining to the lowest rate of days in the entire five-year period by 1994: 1,307.25 days per 10,000. Comparing the first and last year of the study period, rates of hospital days decreased by 11% for low-variation (LV) conditions but barely changed for moderate-variation (MV) conditions (less than 1%) .

For ACS conditions, the overall rate of hospital days for the pre-reform period was 11.8% higher in 1991 than in 1990, rising from a rate of 1,877.60 to 2,098.87 days per 10,000, the highest level of the five-year study period (Appendix F.3). Rates of hospital days for ACS conditions dropped by 11% to 1,868.89 days per 10,000 in 1993 and rose slightly in 1994 to 1,895.32 days per 10,000, slightly higher than pre-reform 1990.

While rates of hospitalizations remained stable over the five-year study period for LMV conditions, rates of hospital days have declined over the same time period. Although the null hypothesis for conditions does not hold true when measuring utilization with hospital days, this decline is not necessarily a cause for concern, given that hospitalizations are still occurring at rates similar to pre-reform levels. One interpretation is that although people are not staying in hospital as long, particularly for low-variation conditions, they are not being turned away from necessary hospital care.

For ACS conditions, rates of hospital days for ACS conditions peaked during 1991 (pre-reform) and 1992 (reform), with utilization for the last two years of the reform period ultimately returning to 1990 levels. The expected decline in total use of hospital days during the reform period did not transpire and, like rates of discharges, does not support the hypothesis that utilization for potentially unnecessary care would decline over time.

A closer look at rates of hospital days follows for selected conditions in each model. The effect of neighbourhood income on rates of hospital days is also examined in this section.

1. Discretionary Model: LMV Conditions

Looking at specific LMV conditions, hospitalizations for strokes used the most hospital days for each study year, rising significantly to a high of 714.51 days per 10,000 in 1993, but returning to pre-reform levels by 1994 (614.83 days per 10,000) (Table 7). Strokes also had the highest average length of stay, ranging

from 37 to 43 days over the five-year study period (compared with the overall LMV average of 15 to 17 days). Maximum length of stay drove up the average, ranging from 989 to 3,754 days over the same period. Limiting analysis to short-stay records (1 to 30 days stay) put bowel surgery in the category of longest average length of stay for the LMV conditions, ranging from 12 to 14 days over the five years. (The overall average length of stay for LMV conditions for short-stay hospitalizations was 7 to 8 days over the five-year period.)

Table 7. Rates of Hospital Days for LMV Conditions

	Direct Age- and Sex-Adjusted Rates per 10,000 MB Population				
	Pre-Reform		Reform Period		
	1990	1991	1992	1993	1994
Low Variation	1,335.91	1,239.59	1,324.84	1,335.69	1,189.31
Stroke	646.08	587.62	680.55	714.51	614.83
Hip repair	239.79	209.39	206.32	224.07	224.62
Bowel procedures	204.58	189.72	197.78	173.92	152.42
AMI	179.28	187.36	183.37	172.16	160.37
Hernia procedures	66.17	65.51	56.83	51.03	37.08
Moderate Variation	118.07	121.11	125.80	114.53	117.94
GI Bleeding	67.55	75.35	84.05	71.72	73.57
Appendectomy	50.52	45.76	41.74	42.81	44.37
TOTAL	1,453.98	1,360.71	1,450.63	1,450.22	1,307.25

Rates of hospital days for bowel procedures, AMI, and hernia procedures all dropped significantly by 1994 when compared with pre-reform levels (Appendix E.3). The declining rates of both hospitalizations and hospital days for bowel surgery suggest a decline in prevalence for diseases requiring bowel surgery. On the other hand, declining rates of hospital days for AMI, coupled

with stable rates of hospitalization, suggest a change in treatment protocol for AMI - a trend toward shorter lengths of stay. Regardless of whether length of stay is truncated, overall median length of stay remains at 6 days and the mode at 3 days.

Low-variation conditions actually fluctuated more over time than did moderate-variation conditions. For example, rates of hospital days for moderate-variation conditions increased 3.9% between the pre-reform year of 1991 and reform year of 1992, ultimately decreasing from the 1991 level by 2.6% in 1994. For low-variation conditions, rates increased 6.9% between 1991 and 1992, ultimately decreasing from 1991 levels by 4.1% in 1994.

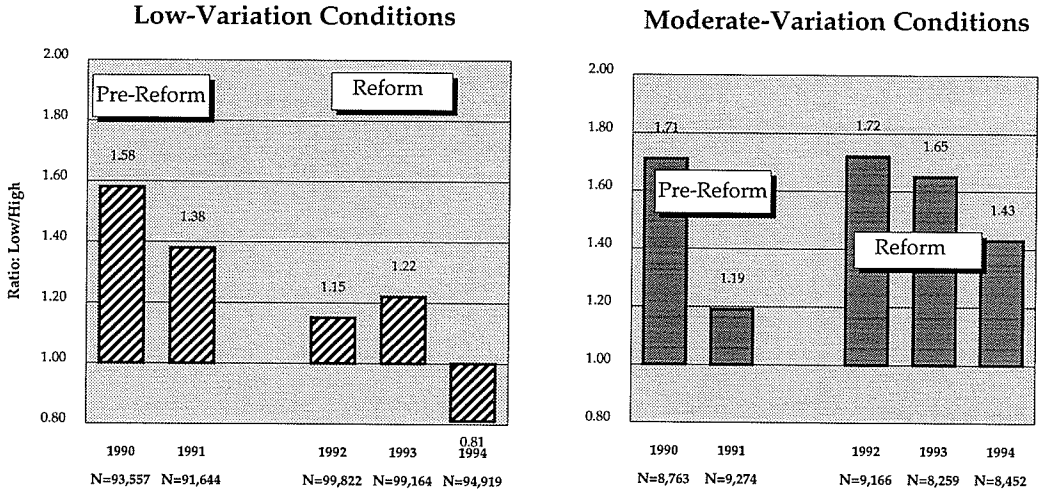
2. Discretionary Model: Influence of Income

Similarly to rates of discharges, a summary ratio measure was created by dividing the rate of hospital days for the lowest income quintile by the rate for the highest income quintile. The influence of income on hospital days, however, was difficult to interpret; no straightforward patterns emerged.

Urban Residence. The proportion of lowest-income to highest-income rates of hospital days for low-variation (LV) conditions classified as urban declined over the five-year period from an initial high ratio of 1.58 in 1990 and actually reversed in the last year to 0.81 (Figure 5a). Of the LV conditions, bowel procedures had the highest urban ratio of lowest to highest income quintile for the last three study years (1.47-1.62) (Appendix E.4a to 4e). For moderate-variation (MV) conditions classified as urban, after a dip in the pre-reform year of 1991 to 1.19 and a rise to 1.72 the following year showed a downward trend to 1.43 by 1994. Of the MV

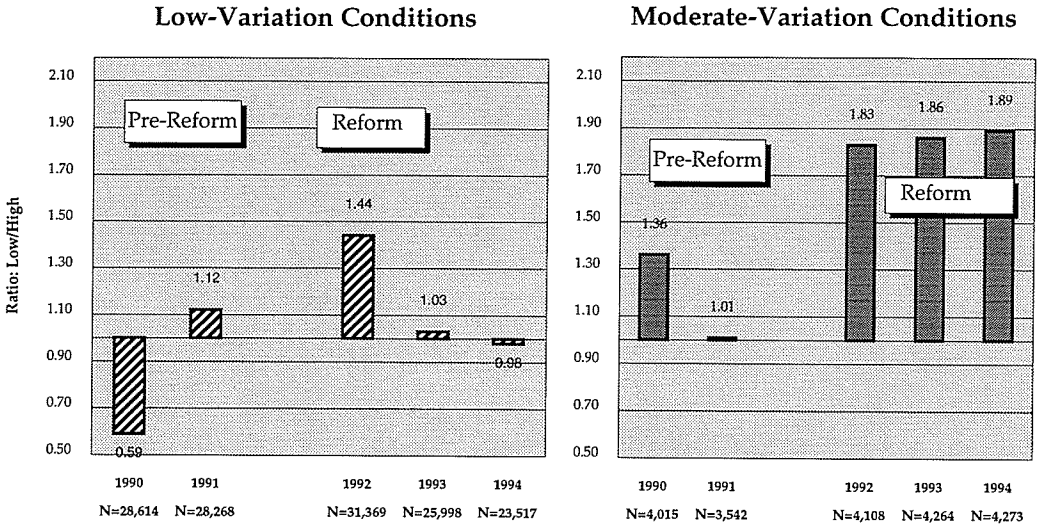
conditions, GI bleeding had the highest ratios of lowest-to-highest income quintile except for 1994. Rates of hospital days for this condition in the lowest income quintile were about double the highest quintile for three of the five study years, but this dropped to 1.38 by 1994.

Figure 5a. Urban Ratio of Lowest/Highest Income Quintile for LMV Hospital Days



Rural Residence. Rates of hospital days for low-variation conditions classified as rural behaved erratically over time, ending up in the last two years with very little difference between lowest- and highest-income quintile rates of days (1.03 and 0.98) (Figure 5b; Appendix E.4f to E.4j). The ratios for moderate-variation conditions remained fairly high during the reform period for the rural category (1.83 through 1.89), after an initial dip to 1.01 in the pre-reform year of 1991. There appears to be no consistent pattern for either low- or moderate-variation records classified as rural when each condition is examined separately.

Figure 5b. Rural Ratio Lowest/Highest Income Quintile for LMV Hospital Days



Income and Rates of Hospital Days for LMV Conditions. Ratios of lowest-to-highest income quintiles for low-variation conditions were generally much lower than for moderate-variation (MV) conditions (except for 1991), supporting the expectation that less variation would be expected in the low-variation (LV) conditions. Over time, however, the relationship between income and rates of hospital days behaved in a more consistent manner for MV conditions. Other than 1991, the trend was a narrowing of the gap between lowest and highest income quintile for urban residence while the gap widened considerably during the reform years for rural residence.

3. Access Model: Selected ACS Conditions

Looking at specific ACS conditions, congestive heart failure had the highest rate of hospital days during the pre-reform period (387.11 and 404.04 days per 10,000) and in the reform year of 1993 (403.00 days per 10,000) (Table 8). For the other two reform years, chronic obstructive pulmonary disease (COPD) had the

highest rate of days per 10,000 (460.16 and 405.79). Longest average length of stay was for nutritional deficiencies during both years of the pre-reform period and for 1993 and 1994 in the reform period (41.37 to 53.20 days). Limiting analysis to length of stay of 0 to 30 days, pulmonary and other tuberculosis had the longest average length of stays for three of the five study years (14.77 to 16.78 days). (The overall average length of stay for all five years ranged from 9.11 to 9.94 days and dropped to 5.62 to 5.86 days when removing long-stay records.) The median length of stay remained at 4 days and the mode at 2 days regardless of whether long-stay cases were excluded.

Table 8. Rates of Hospital Days for ACS Conditions

	Direct Age- and Sex-Adjusted Rates Per 10,000 Population				
	Pre-Reform		Reform Period		
	1990	1991	1992	1993	1994
Congestive heart failure	387.11	404.04	436.50	403.00	371.06
Bacterial pneumonia	325.84	375.00	304.22	296.69	319.47
Chronic obstr. pulm.dis.	309.51	397.92	460.16	375.37	405.79
Dehydration	150.82	152.85	159.31	124.32	122.54
Asthma	83.47	108.67	87.76	98.49	96.18
Kidney/urinary infection	73.86	81.18	80.41	72.08	78.39
Diabetes "B"	68.49	81.11	71.24	64.66	47.48
Angina	66.21	68.80	65.15	72.88	65.96
Cellulitis	65.36	71.73	61.69	58.13	65.27
Gastroenteritis	54.69	58.85	52.06	49.33	49.56
Severe ENT infections	42.99	43.39	38.30	32.24	30.26
Diabetes "C"	37.79	30.80	44.73	27.99	34.68
Skin grafts with cellulitis	31.84	35.72	20.59	27.15	32.50
Convulsions "B" (age >5)	27.88	17.80	21.79	20.79	18.06
Hypertension	25.59	34.84	31.46	28.28	27.54
Gr. mal/oth.epil.convuls.	25.34	33.87	39.68	22.83	23.79
Pelvic inflamm. disease	15.61	12.06	13.40	10.36	9.63
Pulmonary tuberculosis	14.57	14.17	10.60	12.11	17.05
Diabetes "A"	13.44	20.10	16.30	14.35	17.95
Nutritional deficiencies	13.11	12.98	9.43	18.14	20.25
Dental conditions	13.01	10.63	9.03	6.03	5.08
Iron deficiency anaemia	8.08	10.92	7.92	6.81	9.33
Convulsions "A" (age 0-5)	7.38	4.99	4.73	4.61	4.86
Failure to thrive	4.93	3.63	3.31	2.81	4.84
Immun.rel. & prev.cond.	4.32	4.49	4.16	2.77	4.86
Hypoglycemia	3.41	4.01	3.59	3.67	2.88
Other tuberculosis	2.96	4.35	16.00	12.77	10.08
TOTAL	1,877.60	2,098.87	2,073.52	1,868.89	1,895.32

Hospital days rose significantly during the pre-reform period from 1990 to 1991 for the following ACS conditions: chronic obstructive pulmonary disease (COPD), asthma, bacterial pneumonia, hypertension, epilepsy, iron deficiency anaemia, and diabetes "A" (Appendix F.3). Thus, while all of these conditions

except COPD showed significant declines in hospital days from 1991 during the reform period, ultimately their reform rates are very similar to 1990 levels. By 1994, bacterial pneumonia and epilepsy showed a very slight decrease in hospital days when compared with 1990; asthma, hypertension, diabetes "A", and anaemia actually showed an increase in rates of hospital days when compared to 1990. Although total hospital days decreased from 1990 to 1991 for a few conditions (e.g., pelvic inflammatory disease (PID), failure to thrive, convulsions), only the rate for PID was significantly different from the previous year and continued to decline (significantly for 1993 and 1994).

Taking both 1990 and 1991 rates of hospital days into account and looking at changes in the reform period, several ACS conditions showed marked, significant changes in utilization by 1994. Dehydration, with pre-reform rates of about 150 days per 10,000, declined to 122.54 days per 10,000. Rates of diabetes "B" dropped from 68.49 and 81.11 days in 1990 and 1991 to 47.48 days per 10,000 by 1994. Severe ENT infections, after pre-reform rates of about 43 days per 10,000, dropped to 30.26 days per 10,000 by 1994. Rates of days for dental conditions more than halved from pre-reform levels of 11 to 13 days per 10,000 to 5.08 days per 10,000 by 1994. On the other hand, rates of days showed an unusually large increase for "other tuberculosis", from 2.96 and 4.35 days per 10,000 in pre-reform 1990 and 1991 to 16.00 days in 1992. This declined, however, to 12.77 and 10.08 days per 10,000 in 1993 and 1994.

While overall rates of hospital days for ACS conditions declined from 1991, they are still higher than the 1990 rate, providing little support for the hypothesis that rates would generally decline over the period of reform. The category of "other tuberculosis", particularly, is noteworthy for the substantial increase in utilization, although this appears to be declining once again. The model also showed noteworthy decreases in utilization for dehydration, diabetes "B", severe ENT infections, and dental conditions. According to the ACS model, the decrease in hospital days suggests improvements may have occurred in ambulatory access for these four conditions (individuals may be obtaining the care needed to prevent an exacerbation of illness requiring longer stays).

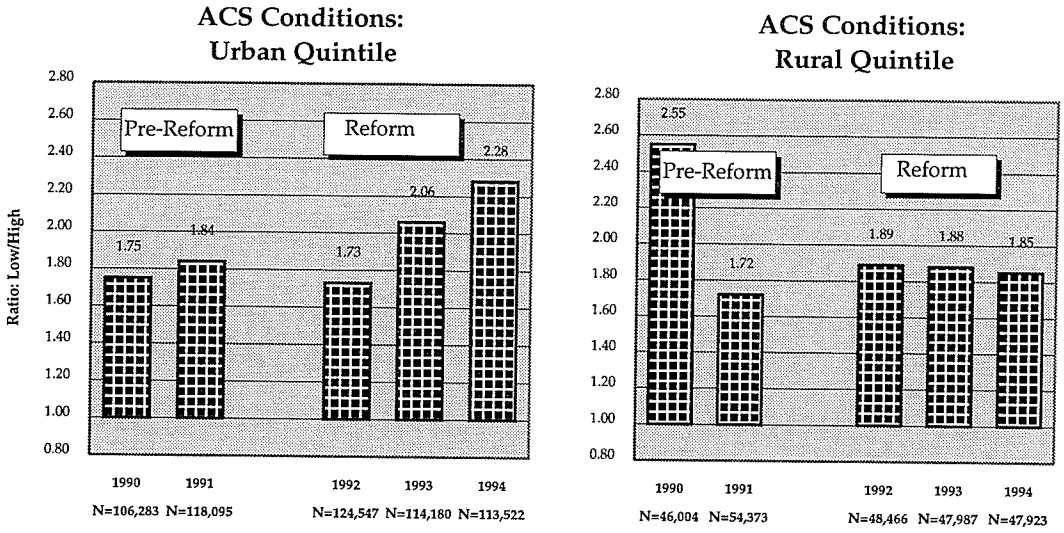
4. Access Model: Influence of Income

The top nine ACS conditions in terms of total hospital days were the focus for income analyses. All but two matched the list of the top nine ACS conditions in terms of frequency of hospitalization (diabetes "B" and dehydration replaced severe ENT infections and gastroenteritis, which were part of the discharge analysis). For all years, records falling into the lowest income quintile invariably showed more hospital days than the highest income quintile, the ratio ranging from 1.73 to 2.28 for urban areas and 1.72 to 2.55 for rural areas (Figure 6).

Urban Residence. Figure 6 shows the ratio of hospital days between lowest and highest income quintile steadily increasing over the reform period for urban residence after an initial decrease in 1992 from the pre-reform period. Diabetes "B" had the highest ratios for the pre-reform period (6.82 and 8.56), with the following

conditions having the highest ratios for the reform period: cellulitis (3.87), COPD (2.91), and kidney/urinary infection (3.20) (Appendix F.4a to F.4e).

Figure 6. Ratio of Lowest/Highest Income Quintile for Hospital Days for Selected ACS Conditions



Rural Residence. Rural residence showed a stable pattern of income ratios (1.85 to 1.89) over the reform period (Figure 6; Appendix F4f to F4j). Although showing a slight increase from the pre-reform year of 1991, it was 1990 that had the highest income ratio of all five years (2.55). Cellulitis and diabetes "B" had the highest ratios for 1990 and 1991, 4.45 and 9.39 respectively, while the following conditions had the highest ratios in the reform period: kidney/urinary infection (4.77 for 1992), diabetes "B" (6.37 for 1993), and cellulitis (5.20 for 1994).

Income and Rates of Hospital Days for ACS Conditions. For those with rural residence, the lowest income quintile used almost twice as many hospital days while for those with urban residence, this figure has been surpassed and appears to be steadily increasing. Both the size of the ratios and the pattern over

time for ACS conditions with rural residence are very similar to moderate-variation conditions with rural residence (urban residence for MV conditions showed a trend in the opposite direction, i.e., decreasing income ratios). There was no comparison with low-variation conditions, which showed both lower income ratios and erratic patterns for hospital days.

Summary: Rates of Hospital Days as Measure of Hospital Utilization

The decline in hospital days per 10,000 over the five-year study period has not supported the hypothesis that there would be no change in utilization for LMV conditions as a whole. Separating low- from moderate-variations showed most of this decline was for low-variation conditions, with the moderate-variation conditions changing very little overall for rates of hospital days. Overall rates for moderate-variation conditions decreased 2.62% between pre-reform 1991 and reform year 1994; there was little change when compared with 1990 (Table 9). Low-variation rates over the same period decreased 4.06%, but it should be noted that 1991 represents a decrease of 7.21% from the previous year. Thus, the moderate-variation conditions, when examined over time, seemed to provide more support for the hypothesis than did the low-variation conditions when measuring utilization using hospital days.

Table 9. Percentage Change in Rates of Hospital Days over Time

	Pre-Reform	Reform			Over 4 years
	1990 to 1991	1991 to 1992	1992 to 1993	1993 to 1994	1991 to 1994
All Manitoba	1.51%	-1.42%	-5.96%	-8.23%	-14.92%
Low-variation	-7.21%	6.88%	0.82%	-10.96%	-4.06%
Moderate-variation	2.58%	3.87%	-8.95%	2.97%	-2.62%
ACS	11.78%	-1.21%	-9.87%	1.41%	-9.70%

While the access (ACS) model did indeed show a decline in utilization of hospital days during the reform period when compared to the pre-reform year of 1991, it is important to note the hospital days measure simply returned to a level very similar to that of the other pre-reform year, 1990. Thus, it would be misleading to suggest that the data support the hypothesis indicating a disproportionate decline in utilization for ACS conditions would occur with reform (although such a hypothesis did hold true for certain ACS conditions). Comparisons of reform year 1994 with pre-reform 1991 showed rates of hospital days decreased for all study conditions, although none of the three study groups showed the substantial decrease in days reflected in overall Manitoba utilization rates.

Income quintile ratios ranging from 1.72 to 2.55 for urban and rural areas provided support for the hypothesis that utilization would be greater for high-risk categories in the access (ACS) model (Figure 6). There was very little difference for the reform period in ACS income ratios when compared to moderate-variation conditions. These ratios, however, were substantially higher than those of low-

variation conditions, which ranged from 0.59 to 1.58 (Figures 5a and 5b). This suggests factors other than burden of illness are contributing to the disproportionately high use of hospital days for ACS conditions by the lowest-income group.

C. RESOURCE USE

Resource use can be assessed by examining where hospitalization takes place, location and type of hospital, and proportion of long-stay cases. These three measures are presented in this section for both models.

1. Discretionary Model: LMV Conditions

As shown in Table 10 and Appendix E.5, the majority of hospitalizations for LMV conditions (84%) occurred within the person's region of residence for each study year. Of the remaining records showing hospitalization occurred outside region of residence, most took place in Winnipeg (about 11% of all LMV conditions). Most hospitalizations for LMV conditions in all study years occurred in urban hospitals (about 22% in the two Winnipeg teaching hospitals and about 48% in other urban hospitals). Rural hospitals had 26 to 28% of hospitalizations for LMV conditions. For each study year, a few LMV discharges occurred in chronic care hospitals (<1%) and out-of-province hospitals (2%). Type of stay was the only indicator of hospital use to show any change. The five-year period showed an increase over time for surgical outpatient contacts, more than doubling from 1990 by the most recent year, 1994.

Table 10. Resource Use for LMV Conditions

	Pre-Reform		Reform Period		
	1990	1991	1992	1993	1994
Total LMV discharges	9,562	9,979	10,437	10,622	10,441
Region of Hospitalization					
In region residence	83.51	83.88	84.02	84.17	83.94
Outside region of residence:					
- Winnipeg	11.69	10.91	11.02	10.69	10.86
- Non-Winnipeg	4.80	5.21	4.96	5.13	5.20
Type of Hospital					
Teaching	22.52	21.56	22.00	21.92	21.81
Urban	48.86	48.28	47.94	48.02	47.97
Major rural	14.31	14.86	15.16	14.74	15.86
Other rural	12.04	12.79	12.77	12.68	12.03
Chronic	0.20	0.20	0.22	0.44	0.19
Out-of-province	2.08	2.31	1.92	2.19	2.14
Type of Stay					
Short-stay (<=60 days)	94.26	94.63	93.94	92.84	92.11
Long-stay	4.37	3.69	4.04	4.57	4.43
Surgical Outpatient	1.37	1.68	2.02	2.60	3.46

The figures in Table 10 display utilization using percentages of discharges. Distribution of resource use was also assessed using percentages of hospital days to see if the proportions changed. The proportion of hospital days for those hospitalized within region of residence was 88% to 89%, slightly higher than for discharges, with most hospital days outside region of residence occurring in Winnipeg. The distribution by type of hospital remained in similar proportions and figures as for discharges. With 0-day length of stay records removed for this part of the analysis, the proportion of days used for short stays (60 days and less) ranged from 52% to 61% (the high point occurring in 1991).

2. Access Model: ACS Conditions

As shown in Table 11 and Appendix F.5, the majority of hospitalizations for ACS conditions occurred within the person's region of residence over the five-year period (86% to 87%). Of the remainder showing hospitalization outside region of residence, almost 6% were hospitalized in Winnipeg, with slightly greater proportions being hospitalized outside Winnipeg (7% to 8%). Most hospitalizations for ACS conditions in all study years occurred in rural hospitals (53% to 55%), with urban utilization being fairly evenly split between teaching hospitals (18% to 19%) and other urban hospitals (22% to 23%). A few ACS discharges occurred in chronic care hospitals (about 1%) and out-of-province hospitals (2% to 3%). Hospitalizations in chronic care hospitals, although the numbers were small, more than doubled from 1990 (0.88%) to 1994 (1.49%). Type of stay showed a steady, gradual increase in the proportion of surgical outpatient contacts, from 1.70% to 2.58% over the five-year period.

Table 11. Resource Use for ACS Conditions

	Pre-Reform		Reform Period		
	1990	1991	1992	1993	1994
Total ACS discharges	22,944	24,720	24,498	24,178	24,737
Region of Hospitalization					
In region of residence	86.43	86.60	86.77	87.04	87.05
Outside region of residence					
- Winnipeg	5.94	5.78	5.72	5.48	5.61
- Non-Winnipeg	7.63	7.61	7.50	7.48	7.34
Type of Hospital					
Teaching	19.29	19.68	18.92	18.19	18.93
Urban	22.63	23.06	22.86	23.22	22.99
Major rural	21.06	20.78	20.54	21.17	20.76
Other rural	33.63	32.96	34.00	33.65	33.62
Chronic	0.88	0.99	1.28	1.33	1.49
Out-of-province	2.51	2.52	2.40	2.43	2.22
Type of Stay					
Short-stay (<=60 days)	96.64	96.38	96.12	95.50	95.76
Long-stay	1.66	1.68	1.70	1.83	1.66
Surgical Outpatient	1.70	1.94	2.18	2.67	2.58

Shifting the analysis to hospital days, a slightly higher proportion of records (about 90%) were categorized as occurring within region of residence. Chronic care also shows a larger proportion of utilization when using this measure, ranging from 5% to 11% of total hospital days over the five-year period (about 1% of discharges were chronic care). Urban hospitals showed a higher proportion of hospital days when compared with rural hospitals (essentially reversing the proportions indicated for discharges). Removing 0-day length of stay records left 66% to 71% of total hospital days categorized as short stay (<=60 days).

Summary: Resource Use as Measure of Hospital Utilization

Region of hospitalization showed little change over time for both ACS and LMV conditions, although for those being hospitalized outside their region of residence, it was much more likely to be in Winnipeg for LMV conditions, while for ACS conditions, it was more likely to be in a region other than Winnipeg. This did not change over time. Regarding type of hospital, hospitalizations for ACS conditions were far more likely to take place in rural hospitals (53% to 55%) than were hospitalizations for LMV conditions (26% to 28%) (Tables 10 and 11). All categories of hospitals showed little change over time for ACS conditions except for chronic care, which showed a steady increase over time (0.88% in 1990 to 1.49% in 1994) although the numbers were small. Both models showed a steady increase over time in the proportion of surgical outpatient contacts, although the increase was greater for ACS conditions (1.70% to 2.58% for LMV conditions and 1.37% to 3.46% for ACS conditions.

D. DEMOGRAPHICS

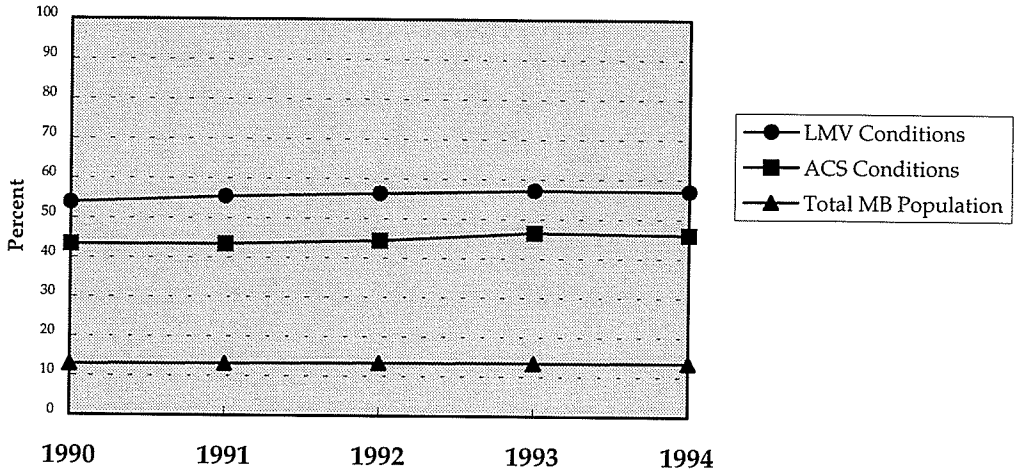
The demographic characteristics of individuals hospitalized in both models were compared with the demographic distribution of the Manitoba population for each of the five study years. For each model, all individuals with multiple hospitalizations were assigned to the study condition occurring on the most recently-occurring hospital discharge abstract within each fiscal year.

1. Age

The age 65 and older group had a disproportionately high number of hospitalizations in both models, particularly for strokes and hip surgery (at least 80% were age 65+ for both conditions). Over the five-year period, 54 to 57% of the individuals hospitalized for LMV conditions were aged 65+, about 4 times greater than the proportion occurring in the general population (Figure 7). This proportion remained fairly stable over time, with ratios ranging from 4.16 to 4.26 relative to the Manitoba population (Appendix E.6). In the LMV model, only appendix surgery appeared in proportions for this age group lower than that of the general population.

Individuals hospitalized for ACS conditions showed a similar trend over time, although the proportions in the overall model aged 65+ were smaller (ratios ranging from 3.31 to 3.47) (Appendix F.6). For chronic obstructive pulmonary disease, however, their proportions matched those in the LMV model who experienced strokes and hip surgery. For congestive heart failure, the proportions were even higher; just over 87% in each study year were age 65+ (versus approximately 13% in the population).

Figure 7. Proportion Age 65+ Hospitalized for Study Conditions

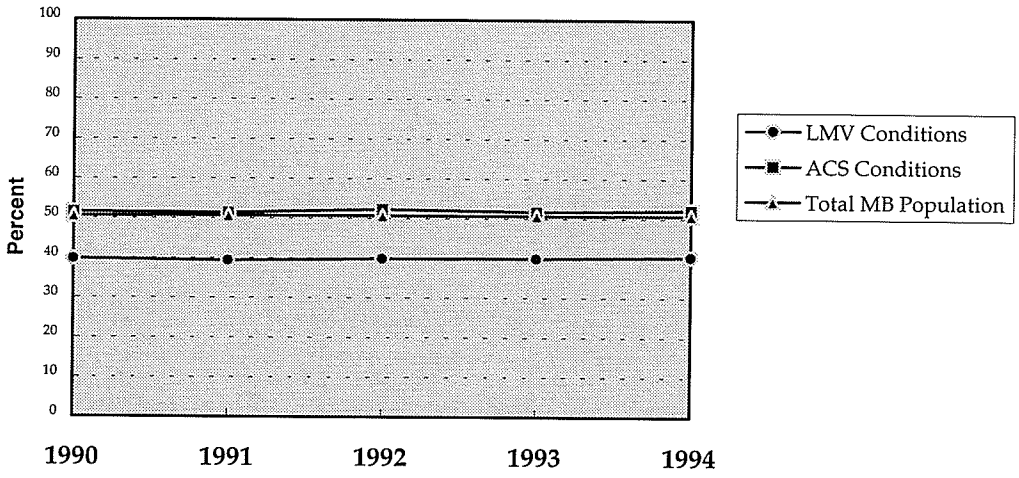


2. Sex

For LMV conditions, men were more likely to be hospitalized (Figure 8). Hernia surgery and AMI were largely responsible for this unexpected finding: men represented 88% to 90% of the hernia surgery category, and 60% to 63% of the individuals hospitalized for AMI. The proportion of women being hospitalized for LMV conditions was about 10% lower than the general population, remaining stable at 39.30 to 40.26% over the five years (Appendix E.6 to E.6e). On the other hand, women were far more likely to be hospitalized for hip fracture (66% to 69%).

The proportion of women being hospitalized for ACS conditions remained stable over the five-year period (ranging from 51.36% to 52.21%), and was slightly higher than the proportion occurring in the Manitoba population (50.55% to 50.70%) over the same time (Figure 8; Appendix F.6 to F.6e). Hospitalizations for kidney urinary infection consistently showed the highest proportions of women (at least 70% for each year) when compared to other conditions.

Figure 8. Proportion Women Hospitalized for Study Conditions

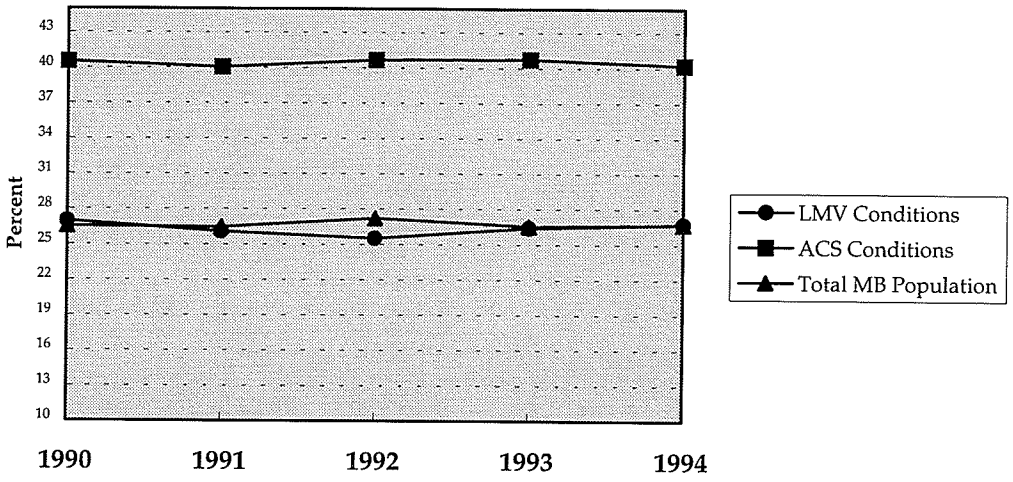


3. Residence

The proportion of individuals hospitalized for LMV conditions and residing in rural areas (ranging from 25.49% to 26.97%) was almost identical to the proportion of rural residents in the Manitoba population (26.41% to 26.68%) (Appendix E.6 to E.6e). Figure 9 illustrates their stability over time. Each LMV condition was fairly close to these proportions, with GI bleeding and appendix surgery proportions being somewhat higher for each year (29% to 33% and 29% to 35% respectively).

A greater proportion of individuals hospitalized for ACS conditions, on the other hand, were from rural areas (ranging from 40.02% to 40.74%), about 1 1/2 times the proportion in the general population (Appendix F.6 to F.6e). Several conditions, such as hypertension and anaemia, appeared in much larger proportions for rural areas over the five-year period relative to the Manitoba population (55% to 60% and 55% to 69% respectively).

Figure 9. Proportion Rural Residents Hospitalized for Study Conditions

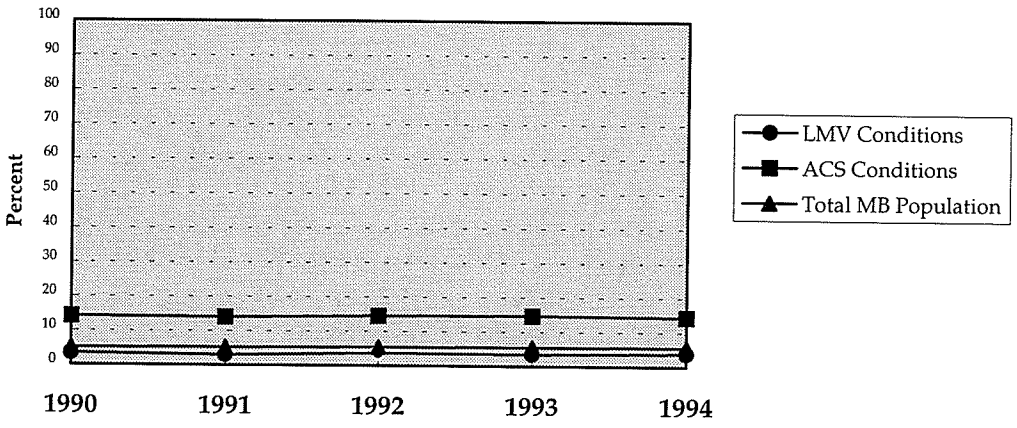


4. Treaty Indian

Figure 10 compares the proportion of Treaty Indians in each study group with the proportion present in the Manitoba population. For LMV conditions, these individuals were present in much smaller proportions compared with the general population (ratios of 0.58 to 0.68 over the five-year period) (Appendix E.6) (they are overrepresented, however, for GI bleeding and appendix surgery). Although hospitalizations for LMV conditions in general are less likely to occur for this group, they are greatly overrepresented for ACS conditions when compared with the general Manitoba population (ratios of 2.58 to 2.76) (Appendix F.6). While Treaty Indians comprise a little over 5% of the general population, they are substantially overrepresented for such conditions as iron deficiency anaemia (52% to 63%) and unexpectedly underrepresented for angina (about 3% to 5%) and congestive heart failure (4% to 5%). Again, these findings apply only to individuals for whom Treaty Indian information is available from Manitoba

Health (estimated at roughly 80% of the total Treaty Indian population). In addition, the findings do not necessarily reflect utilization patterns of the greater aboriginal population.

Figure 10. Proportion Treaty Indians Hospitalized for Study Conditions

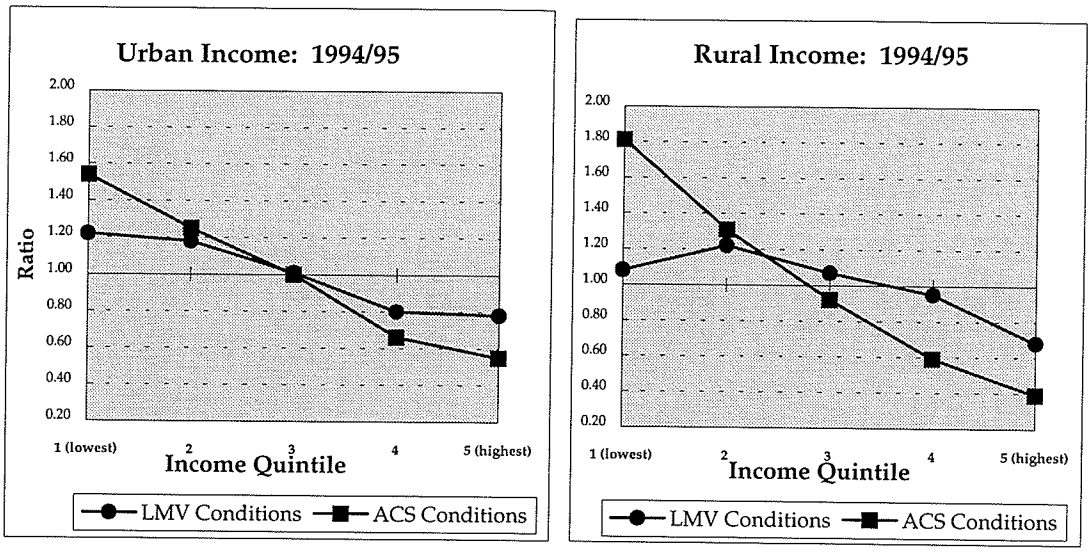


5. Income

The lowest two income quintiles, whether urban or rural, were always overrepresented in individuals hospitalized for either LMV or ACS conditions while the highest two income quintiles were almost always underrepresented. The proportions were quite stable for urban area residents over time, with lowest and highest quintile ratios relative to the Manitoba population ranging from 1.22 to 1.28 and 0.69 to 0.78, respectively, for LMV conditions (Appendix E.6). For ACS conditions, the lowest urban ratio ranged from 1.51 to 1.54 and the highest from 0.52 to 0.55 over the five years (Appendix F.6). Rural income quintile ratios were also stable over time, ranging 1.76 to 1.81 for the poorest income quintile and 0.37

to 0.42 for the highest quintile for ACS conditions and, for LMV conditions, 0.96 to 1.10 for lowest and 0.68 to 0.84 for highest income quintile.

Figure 11. Ratio of Lowest and Highest Income Relative to MB Population



Using the most recent year of data, Figure 11 illustrates the greater proportion of low income residents found in the study groups relative to the Manitoba population, which represents a ratio of 1.00. It also shows the wealthier quintiles present in much lower proportions relative to the Manitoba population. The relationship between income and hospital use appears stronger for the ACS model, which shows a steeper, apparently more linear gradient than the LMV model in both urban and rural categories.

Summary: Demographics of the Study Groups

The demographic analysis has shown that very little variation occurred in the demographic distribution of the study groups over the five-year period. Similarly, the demographic composition of the population remained stable over

the study period. Each model, however, showed differing proportions for each of the demographic variables.

For conditions not expected to vary (low-variation), or to vary somewhat (moderate-variation), the demographic analysis has shown that individuals hospitalized for the LMV conditions of the discretionary model are disproportionately age 65 and over, at least 4 times the proportion present in the Manitoba population in each year of the study period (ratios ranging from 4.2 to 4.3) (Appendix E.6). There is also a somewhat higher proportion of men (ratios of 1.2 for each year) as well as residents from lowest income quintile neighbourhoods (ratios ranging from 1.2 to 1.3 for urban and 1.0 to 1.1 for rural residents). Treaty Indians, on the other hand, are less likely to be part of the LMV group when compared to the Manitoba population (ratios ranging from 0.6 to 0.7). The nature of the conditions included for analysis in the discretionary model suggests that the demographic subgroups identified using a ratio of greater than "1" relative to the Manitoba population reflect their greater burden of illness.

Separating low- from moderate-variation conditions, analyses showed the moderate-variation group was younger (31% to 37% were age 65+ versus 61% to 64% for LV conditions) with a greater proportion classified as rural (29% to 32% versus about 24% for LV conditions) and Treaty Indian (6% to 8% versus 2% to 3% for LV conditions). Moderate-variation conditions also showed wider ratios for rural income quintiles, although they were more similar to low-variation conditions for urban quintiles. The demographic characteristics of hospitalizations

for moderate-variation conditions were closer to the demographic distribution for ACS conditions.

For conditions where some hospital utilization might be regarded as unnecessary, several high-risk subgroups of the population have been identified. The nature of the conditions in the access (ACS) model suggests not only a greater burden of illness for these subgroups but also potential problems in the organization of care (i.e., access to appropriate ambulatory care, according to the model). Individuals age 65 and over were disproportionately overrepresented, with ratios ranging from 3.3 to 3.5 over the five-year study period when compared to the Manitoba population (Appendix F.6). Females were very slightly overrepresented when compared to the general population (ratios ranging from 1.01 to 1.03) while larger ratios are present for rural residents (1.5), Treaty Indians (ranging from 2.6 to 2.8), and lowest income quintile (1.5 for urban and 1.8 for rural for each study year).

Figure 12a compares the proportions present in both ACS and LMV study groups relative to the Manitoba population for four of the five demographic variables for the most recent study year. ACS conditions were overrepresented for all four high-risk characteristics (age 65+, female, rural residence, and Treaty Indian) while LMV conditions showed overrepresentation only for age 65+.

Figure 12a. Demographic Proportions of Study Groups Relative to Manitoba Population for 1994 for Age, Gender, Residence, and Treaty Indian Subgroups

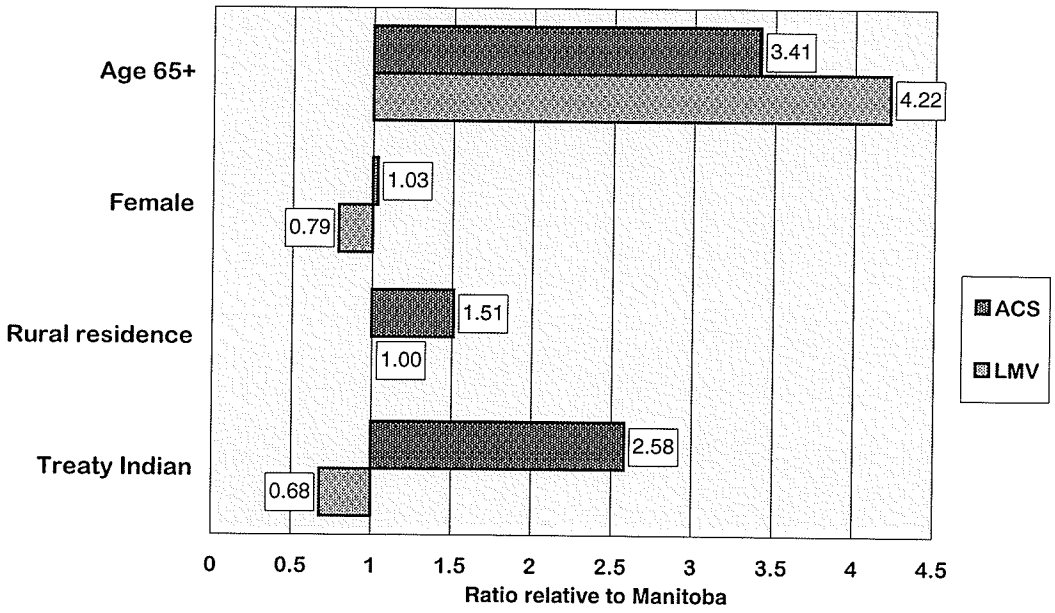
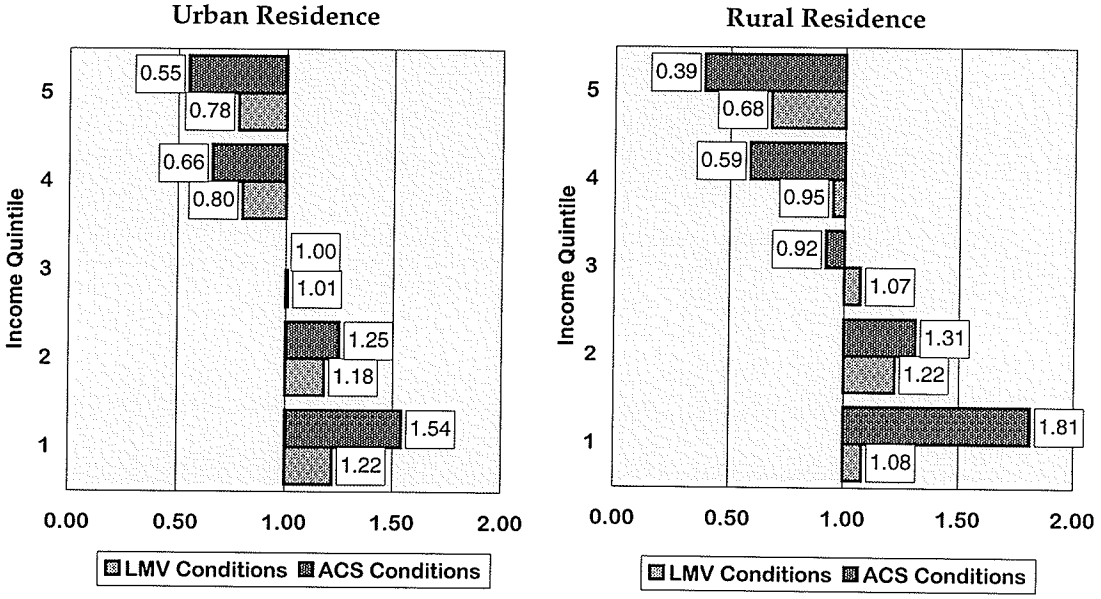


Figure 12b illustrates the proportions present in each of the two study groups relative to the Manitoba population for income quintile in 1994. For both urban and rural residence, ACS conditions are overrepresented for the lowest two income quintiles and underrepresented for the highest two income quintiles, in every case with higher ratios than LMV conditions. ACS conditions also show an apparently linear trend, unlike LMV conditions; that is, the lower the income quintile, the greater the proportion hospitalized for an ACS condition.

Figure 12b. Demographic Proportions of Study Groups Relative to Manitoba Population for 1994 by Income Quintile



E. POTENTIALLY REDUCIBLE STAYS

Several steps were involved in defining potentially reducible hospital stays. These steps were applied only to the access (ACS) model since, by definition, all hospitalizations for low-variation conditions in the discretionary model are considered necessary. First, several variables were used to identify and exclude records showing a relatively higher level of illness, which implies a greater need for hospital resources. A subgroup of the remaining records was then identified by creating a risk index to provide a standard of expected total hospital days. Finally, total hospital days used by other subgroups were calculated and compared against this standard to yield a measure of potentially reducible stays.

Level of Illness

Records with a higher level of illness were defined as having one or more comorbid conditions (captured with the Charlson Comorbidity Index) or having a moderate-to-high level of both comorbidity and complications (captured with RDRG illness severity measure). Over half of the ACS records had no comorbid conditions present for each of the five study years (55% to 58%) and a larger proportion had a low level of both comorbidity and complications (63% to 66%) (Appendix F.7). Any record satisfying both conditions were excluded; about 42% to 44% of the original study group for each year were kept for analysis.

Other variables available from the hospital discharge abstracts were used to eliminate additional records deemed unlikely candidates for defining potentially unnecessary care (Appendix F.8). Day surgery records (3.8% to 6.2%) were excluded because of their length of stay of 0 days (i.e., a stay that could not be shortened). Another 1.2% to 1.4% of records were excluded because the person died in hospital. Transfers to/from another hospital or institution, as well as discharges occurring with home care in place, imply a greater degree of illness so these records were also eliminated (9.4% to 10.8% were transfers and 1.6% to 2.5% were discharges to home care). Long length of stay suggests a need for long-term institutional care; most of these were captured in the other categories with fewer than 1% more records eliminated with this criterion. Another small percentage (less than 1%) had to be excluded because of missing income data, required for assignment to the risk index.

After exclusions, there were no hospital stays left for chronic obstructive pulmonary disease, asthma, and diabetes "A" and "B" for any of the study years. Two of these conditions are part of the top five ACS conditions in each year for hospital utilization, whether measured in discharges or hospital days. Of the stays that do remain, almost half of the discharges (43% to 46%) are represented by severe ENT infections, bacterial pneumonia, or gastroenteritis.

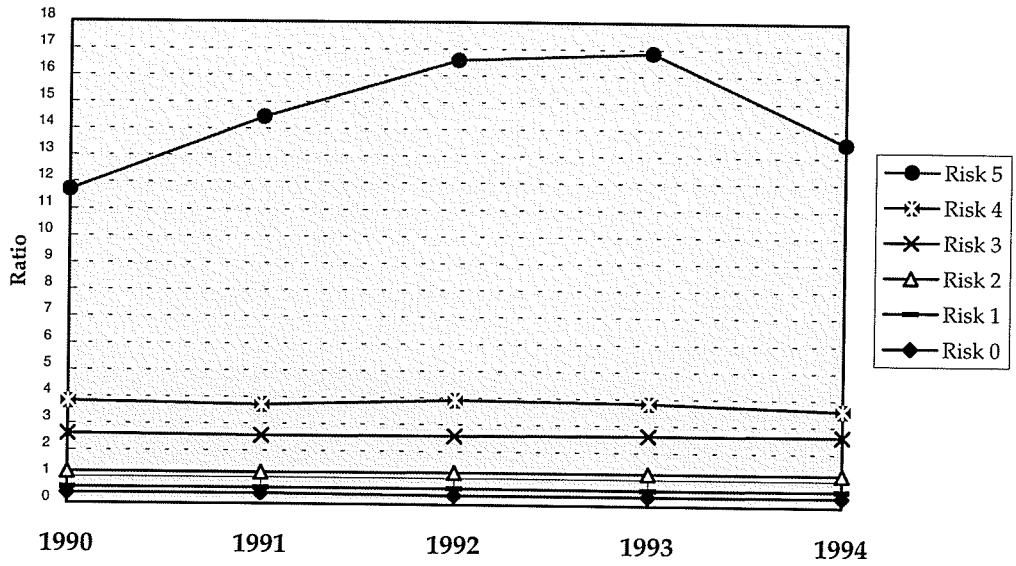
Risk Index

A summary risk index was calculated for records where hospital utilization might be reduced, i.e., for all ACS hospitalizations showing a lower level of illness. The following subgroup was identified as more likely to be hospitalized than other subgroups relative to the proportions present in the Manitoba population: age 65 and over, female, rural area resident, Treaty Indian membership, and/or residing in the lowest two income quintiles (both rural and urban). Little change in these proportions occurred over time (Appendix E.6 and F.6). All categories consistently had ratios greater than 1 for each study year. A value of "1" was assigned for each high-risk category present on the discharge abstract. That is, if an individual possessed all five high-risk attributes, a risk index of "5" was assigned. If the individual had none of these attributes, the risk index was "0".

Subgroups having a risk index of 3 or more were greatly overrepresented in the ACS group. Individuals categorized as "3", for example, represented at least 24% of the ACS group for each year while this subgroup represented less than 10% of the Manitoba population. Similarly, those with risk index "4" comprised at

least 9% of the ACS group but less than 3% of the general population. Although there were at least 12 to 17 times more individuals in the ACS group having a risk index of "5" relative to the population, it should be noted that their numbers were small for each study year (Appendix F.6).

Figure 13. Ratios of Risk Index for ACS Conditions Relative to MB Population



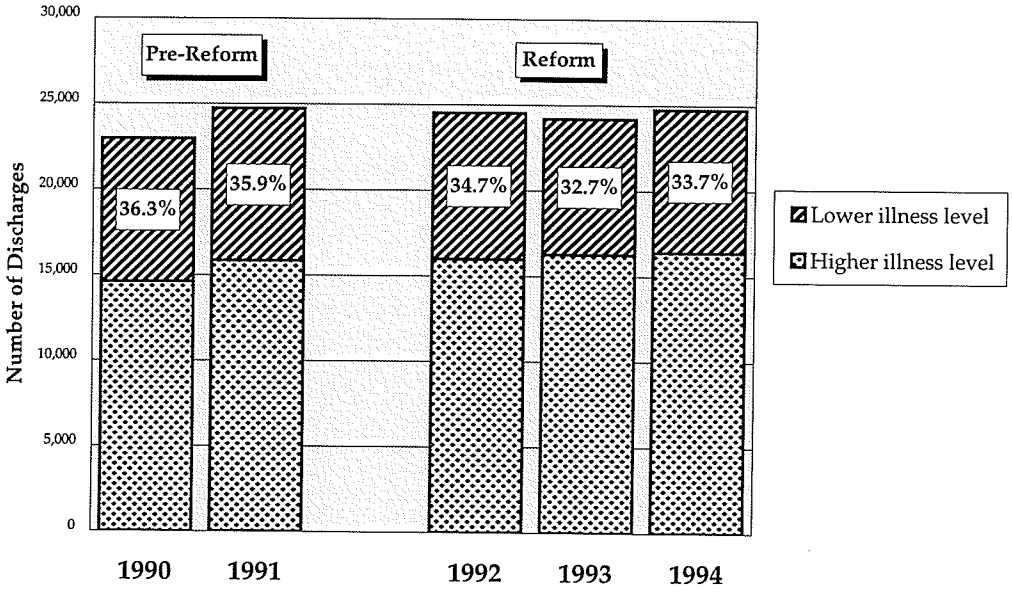
The proportions in each level of the risk index remained fairly constant over time except for individuals with a risk index of 5 (Figure 13). More individuals in this group were hospitalized for ACS conditions with each successive year, except for the last year of the study, which showed a decline in the risk index to pre-reform levels.

Potentially Reducible Hospital Days

Total hospital days were calculated for all records in the category of low level of illness (Appendix F.9). Figure 14 highlights the proportion of records that were kept for this part of the analysis for each year. The proportion of records

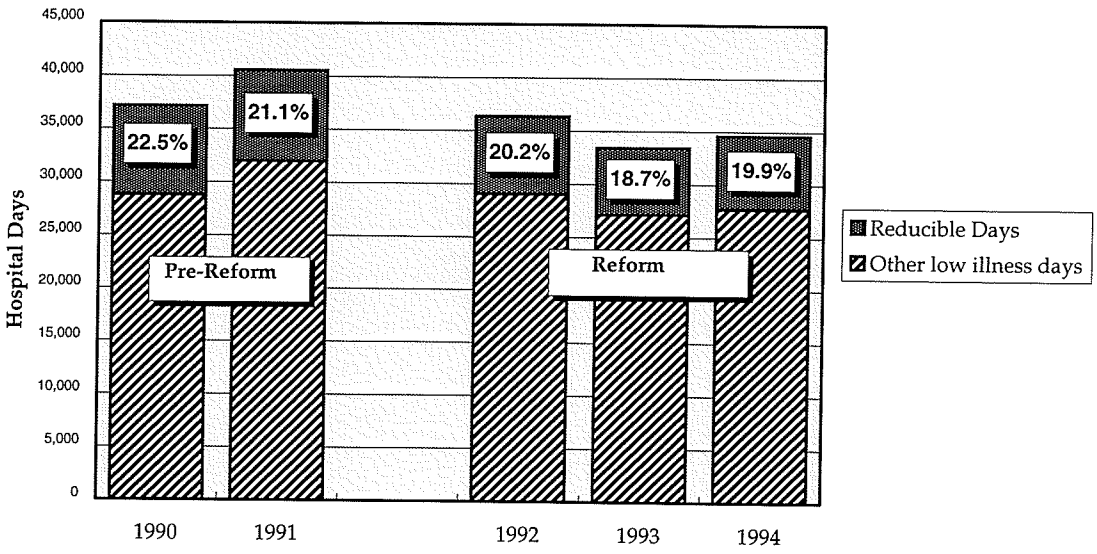
categorized as low-illness was lower for each reform year when compared to either pre-reform year. Hospitalizations were slightly less likely for individuals with a lower level of illness, whereas the proportion having a higher level of illness increased slightly over the reform period.

Figure 14. Proportion of ACS Hospitalizations with Low Illness Level



Expected total days for each risk index level were calculated using average length of stay for records having a risk index of "0" as the standard (i.e., multiplying the number of discharges by the average length of stay for risk index of "0"). Records in the risk index "0" category invariably had the lowest length of stay of all other risk levels and for all study years. Figure 15 displays the proportion of hospital use, measured in hospital days, which could be eliminated if the high-risk group were hospitalized at the same rate as the low-risk group.

Figure 15. Reducible ACS Hospital Days for Low-Illness Hospitalizations



The total number of hospital days for individuals with a low level of illness dropped substantially during the reform period, decreasing by 14.38% from a high of 40,541 days in 1991 to 36,369 days in 1992, with another large drop in 1993 followed by a 10.16% increase in 1994. The proportion of days that could be eliminated reflect this trend (Figure 15). Thus, while it is encouraging that hospital days are being reduced where the ACS model suggests that is possible to do so, the direction has shifted in 1994. Only data from the subsequent year, once available, will be able to help determine whether this is a new trend or simply a one-year anomaly in a generally downward trend. The five-year data show, however, that hospital days used by the ACS subgroup could be reduced 18.73% to 22.54% of hospital days if the high-risk group were hospitalized at the same rate as the low-risk group.

CHAPTER 6: DISCUSSION AND CONCLUSION

A. DISCUSSION

1) Utilization does not vary over time for low-variation conditions in the discretionary (LMV) model, but varies to a small degree for moderate-variation conditions.

Using rates of hospitalizations as a measure of utilization, the data support this hypothesis, both for low- and moderate-variation conditions. Rates for low-variation conditions were fairly stable over the five-year period, while rates for moderate-variation conditions exhibited a slight increase over the same period. Comparing reform year 1994/95 with pre-reform 1991/92, the percentage change for low-variation conditions (-1.42%) was closer to that for all Manitoba hospitalizations for all Manitoba residents (-5.15%) than that of moderate-variation conditions (13.15%) (although the latter consists of only two conditions while the low-variation group comprises five conditions).

Using hospital days per 10,000 as a measure of utilization, little support was shown for this hypothesis. Rates declined over time to levels lower than the pre-reform study years. Unexpectedly, low-variation conditions were largely responsible for this trend, while rates of hospital days for moderate-variation conditions changed very little. Rates of hospital days for low-variation conditions decreased 4.06% between 1991/92 and 1994/95 (a total of almost 11% since 1990/91, closer to the 14.92% decline for all Manitoba hospital days) while rates for moderate-variation conditions declined only 2.62%. Resource use showed little

change over time for LMV conditions. For outpatient surgery, however, the rates steadily increased over time (although the numbers remained relatively small).

For urban residents, LMV ratios of lowest to highest income quintile declined over time for both rates of hospitalizations and days. For rural residents, LMV ratios increased for MV conditions on both measures while no particular pattern was evident for LV conditions. Utilization patterns for the moderate-variation conditions had relationships with income similar to the ACS group.

According to the discretionary (LMV) model, the stability of rates of hospitalization over time suggests that admission criteria for the conditions defined as requiring hospitalization did not change over the five-year study period. The decline in rates of total hospital days suggests a change in practice patterns. Lengths of stay for AMI, for example, have been declining over the past several years (Harrison et al., 1995). The decline in the gap between lowest and highest income quintile rates for urban residents in the LMV model was largely attributable to an increase in hospital utilization by the highest income quintile. Rates of utilization for urban Quintile 5 (highest income) residents approached or surpassed the rates of Quintile 1 (lowest) by 1994/95 while there was little change for Quintile 1 over the five-year period. The model implies a change in prevalence, an increasing likelihood for higher income urban residents to be hospitalized and to use more hospital days for LMV conditions.

2) Utilization decreases over time for ambulatory care sensitive conditions in the access (ACS) model.

Using rates of hospitalizations as a measure of utilization, hospital utilization for ACS conditions declined slightly since pre-reform 1991/92 but for 1994/95 remained higher than the 1990/91 rate. Comparing reform year 1994/95 with pre-reform 1991/92, rates of hospitalizations for ACS conditions decreased only 1.88%, a lower rate of decline than that for all Manitoba hospitalizations (5.15%). The hypothesis of decline over time was not supported for ACS conditions as a group, although results were mixed when ACS conditions were examined individually. Some conditions showed significant decreases in rates of hospitalizations for fiscal 1994/95 when compared with pre-reform year 1991/92 while others showed significant increases.

Previous research on ACS conditions has focused on rates of hospitalization; this study extended the model to apply it to rates of hospital days and found similar trends in utilization. Using rates of hospital days, rates for ACS conditions declined since pre-reform 1991/92 but, as for hospitalizations, remained slightly higher than 1990/91. Rates of hospital days for ACS conditions did not reflect the annual increasing decline in hospital days for all Manitoba hospitalizations (a total of 14.92% over the last four years). Like LMV conditions, resource use was stable over time except for the steady increase in the rate of outpatient surgery (although the numbers remained relatively small).

Results were mixed for the nine ACS conditions selected for income analyses. Comparisons of rates of utilization over time for the lowest quintile versus the highest quintile showed urban income ratios increasing for rates of days but decreasing for rates of hospitalizations. Conversely, ACS income ratios for rural residents increased over time for the latter measure and showed a slight overall increase during the reform period for hospital days since 1991/92.

Urban area residents in the lowest income quintile for the ACS subgroup showed little change over time in their rates of hospitalizations since fiscal 1991/92 (pre-reform) with little overall change as well in the rates of hospital days. Urban area residents in the highest income quintile also showed little change over time in their rates of hospitalization for ACS conditions. Their rates of days, however, showed a substantial drop by 1994/95 (at least 20% when compared against either pre-reform year).

Rural area residents in the lowest income quintile were hospitalized increasingly more often by 1994/95 (11% higher rate than 1990/91 and 3.4% higher than 1991/92); however, their rates of hospital days were stable over time except for a peak in 1991/92. For the highest income quintile, rates of hospitalizations for rural area residents returned to the pre-reform 1990/91 level by 1994/95. Rates of hospital days for this group were stable over the reform period after a peak in 1991/92, but remained higher than the 1990/91 level.

The general stability of rates both of hospitalization and of days over time for the access (ACS) model suggests that potentially unnecessary care was not

reduced to the extent it might have been for certain conditions. As illustrated by the subsets of ACS conditions selected for income analyses, the disparity also generally grew over time in rates of utilization between lowest and highest income subgroups. Income ratios increased for urban residents in terms of hospital days and increased for rural residents in terms of hospitalizations (and, to a certain extent, days).

Changes in income ratios between lowest and highest income quintiles can be explained by shifts in utilization by either quintile. The increase in ratio over time for hospital days for urban residents is largely attributable to a substantial decline in the use of hospital days by the highest income quintile. The lowest income quintile by 1994/95 used rates of days similar to the pre-reform period. The increase in ratio over time for hospitalizations for rural residents was due primarily to an increase in such rates for the lowest income quintile (highest quintile rates for 1994/95 were similar to 1990/91).

3) Hospital utilization for both models is more likely to occur for high-risk subgroups of the population; no change is expected in demographic proportions of the study groups over time.

Certain subgroups were greatly overrepresented in the group hospitalized for ACS conditions relative to the Manitoba population, with risk ratios for 1994/95, for example, of 3.41 for age 65+, 1.03 for female, 1.51 for rural, 2.58 for Treaty Indian, 1.54 for urban low income, and 1.81 for rural low income. For the LMV conditions, except for age 65+ (4.22), all other risk ratios were lower for the same year: 0.79 (female), 1.00 (rural), Indian (0.68), urban low income (1.22), and

rural low income (1.08). In both models, the demographic composition of individuals composing the two study groups was similar for each fiscal year of the study.

Support was provided for the hypothesis with regard to the overrepresentation of high-risk subgroups for every category in the ACS model, although the female-to-male risk ratio was only slightly higher than the Manitoba population. For the LMV model, however, the hypothesis was not supported regarding the proportions of Treaty Indians and women, both of whom were present in much smaller proportions relative to the population or, for rural residents, in the same proportion (ratio of 1.00).

Using rates of hospitalizations as a measure of utilization, it was shown that hospitalizations were generally more likely to occur for the lowest income quintile than for the highest quintile for both models. The ratios of lowest-to-highest rate of hospitalizations, however, were always higher for ACS conditions. In 1994/95, for example, hospitalizations for ACS conditions were 2.03 times more likely for the lowest income quintile, almost double that for LMV conditions (1.11). Moderate-variation conditions showed larger gaps between the rates of hospitalization for lowest and highest income quintiles than low-variation conditions, but did not approach those of ACS conditions.

Using hospital days as a measure of utilization, the relationship with income was similar to that for hospitalizations: the lowest income quintile always showed higher rates of hospital days than the highest quintile, and ACS conditions

almost always had higher ratios than LMV conditions. The pattern between hospital days and income for ACS conditions, however, appeared less linear than it was for hospitalizations. Moderate-variation conditions showed a pattern very close to ACS conditions, particularly for rural areas.

4) The greater the number of high-risk characteristics for individuals hospitalized with ACS conditions, the greater the possibility for reducing hospital use.

A risk index was used to classify the high-risk subgroups of the population hospitalized for ACS conditions and to provide a standard, or "prescribed norm" (Weissman et al., 1992) based on utilization by the low-risk subgroup. Prior to applying the index, hospitalizations for ACS conditions were categorized by illness level. The proportion categorized as having a lower illness level (i.e., less sick) varied somewhat over the five-year period, from highs of 36.3% and 35.9% in the pre-reform years (1990 and 1991) to lower levels in the reform period (32.7% to 34.7%). This meant a corresponding increase in the proportions of individuals hospitalized for ACS conditions with a greater level of illness. For hospitalizations categorized into a lower level of illness, the overall hospital days used by this group declined between the pre-reform and reform periods.

Almost a quarter of the hospital days used by the lower illness group were judged potentially reducible when applying the utilization levels of the subgroup at lowest risk of hospitalization. This subgroup (risk index "0") consisted of individuals who were NOT age 65+, female, urban residents, Treaty Indian, nor in quintiles 3 to 5 (higher income). If all individuals were hospitalized at the same

rate as those with a risk index of "0", 21.1% to 22.5% of days for the pre-reform period would be classified as potentially reducible. During the reform period, these proportions declined 4.3% in 1992/93 to 20.2% of hospital days and a further 7.4% in 1993/94 to 18.7% of hospital days. This rose 6.4% in the final reform year, however, reversing a downward trend in the proportion of days classified as potentially reducible.

B. POLICY IMPLICATIONS

According to the discretionary model, reform measures implemented over the last several years appear to be operating as intended for individuals suffering from low-variation conditions. Although hospital days have declined, there has been no change in rates of hospitalizations over the five-year period. No particular pattern was evident for income ratios for rural residents, that is, when comparing rates of utilization for the lowest income quintile versus the highest income quintile. For urban residents, such ratios have declined, suggesting that low-income subgroups are not being adversely affected relative to higher-income subgroups.

According to the access model, reform measures have operated to some extent as intended, with declines in utilization in certain categories; however, utilization has increased for other conditions. Looking at the overall model, there was little change in rates of days and hospitalizations over time. For the subset of ACS conditions selected for income analyses, the ratio of lowest-to-highest income

quintile rates of hospitalizations decreased over time for urban residents. Other income ratios, however, increased over the five-year period. The disparity grew for rates of days as a result of a substantial decline in hospital days used by high-income urban residents. For rural residents, the income ratio increased over time with an increase in rates of hospitalization for the lowest income quintile.

This study has shown that, according to the access model, reductions in hospital utilization may be made possible by improving the nature of care received prior to hospitalization. To effect change in utilization patterns for ACS conditions, this model calls for adequate and timely access to ambulatory care resources since these conditions are believed to reflect a lack of, or barriers to, such care. This study has shown, however, that a large portion of ACS hospitalizations (over 60%) are for chronically ill individuals who are likely to have other co-existing conditions. Such individuals may not benefit from improved ambulatory care.

It is also important to recognize the environmental and social factors that contribute to the development of certain ACS conditions and for which traditional medical outpatient approaches are neither appropriate nor effective. The ACS condition of tuberculosis, for example, was associated with malnutrition and overcrowding in the 19th century (Eglinton, 1989); it has increased in Manitoba over time both in terms of rates of hospitalizations and rates of hospital days. This study has also shown hospitalizations for cellulitis have increased significantly

since health reform began in Manitoba; this condition has frequently been associated with the homeless (Aday, 1994; Caper, 1991).

Any program designed to reduce hospital utilization for ACS conditions (at least those amenable to change with ambulatory care resources) must address not only availability of ambulatory care resources but also how to motivate high-risk individuals to seek that care. Introducing user fees, for example, would have the greatest deterrent impact on primary care, not on hospital use or other expensive interventions (Deber et al., 1994), and would further deter such individuals from seeking care for detection/prevention of illness.

The Manitoba government must ensure that those most in need have been adequately considered in their plan of hospital reform, and the research upon which policy makers base their decisions must also take this group into account. Recommendations for policy arising from this study are:

1) that hospital utilization management meetings regularly include information about utilization for ACS conditions, along with information about the conceptual framework, to assist in resource planning. According to the ACS model, if hospitalizations for such conditions are increasing, this could flag potential problems in outpatient resources at that hospital. (Ambulatory care in general might be improved with coordination between community-based and hospital-based practitioners.) Income information about the neighbourhood in which the individual resides, along with other demographic data, can be used to determine the extent to which the problem exists among those most vulnerable to

hospitalization. Both inpatient and outpatient use at other hospitals could also be tracked for individuals hospitalized with ACS conditions. St. Boniface General Hospital, for example, liaises with the Manitoba Centre for Health Policy and Evaluation (MCHPE) to routinely receive population-based information such as readmission rates.

2) that hospitals use ACS conditions to assist in determining whether existing outreach programs are working satisfactorily. If such individuals are being hospitalized less frequently for ACS conditions, this might serve as a measure of the program's success.

3) that the reports generated by MCHPE on physician visit utilization include information on the proportion attributable to ACS conditions. Changes over time can be used to inform policy makers on the appropriateness of such utilization, particularly for conditions where rates of hospital utilization have increased, rather than decreased as expected with reform. Reports on hospital utilization might also include more detailed information on specific ACS and LMV conditions that show marked changes over time.

4) that public health organizations regularly receive small-area utilization rates of ACS conditions, both inpatient and physician contacts, to assist them in their education programming efforts.

5) that more joint collaborative studies occur between traditionally qualitatively-oriented disciplines like Sociology and the quantitatively-oriented ones of the medical model. The ACS framework, originating within the medical

model, yet emphasizing vulnerable subgroups of the population, is an example of how knowledge from quite disparate disciplines can be integrated to provide significant contributions in the development of equitable health policy.

6) that information about the theory underlying utilization for ACS conditions be incorporated into physician care maps, given that care maps are designed to include services from a broad spectrum of caregivers (Canadian Medical Association Quality of Care Program, 1996). For severe ENT infections or gastroenteritis, for example (both of which were present in large proportions in the potentially reducible category of care), the importance of appropriate and timely outpatient care could be noted in the care maps developed for such conditions.

C. LIMITATIONS OF THE STUDY

Although the Manitoba Health administrative data base captures almost all contacts with the health care system, it does not necessarily capture the prevalence of illness in the population. Research has shown that certain subgroups of the population are more likely to contact the health care system than others. An individual's decision as to whether he/she is ill, whether care should be sought, and what type of care is needed are all related to his/her demographic profile, and are influenced by such factors as the extent of social networks, psychosocial characteristics, and knowledge of (and attitudes toward) health, illness, and health care (Andersen and Newman, 1973; Becker and Maiman, 1983). It has been estimated that more than 80% of those who visit a physician's office have already

attempted to remedy their problem through self-care activities which can involve the assistance of friends and relatives but usually do not involve the formal health care system (DeFriese and Earp, 1989).

Administrative data are also subject to error at various stages in the process of diagnosis, treatment and submission of claims for services provided. The literature review for the discretionary model of hospital utilization has shown the variability inherent in both diagnosis and treatment decisions, with further interpretation required as they are translated into numbers at hospitals and physicians' offices.

This study generated an annual cross-sectional analysis of hospital utilization for LMV and ACS conditions for a five-year period. Interpretation of trends in the hospital data would have been enhanced by generating similar information from the physician claims data, which captures all contacts with physicians in the Manitoba population for insured individuals, including outpatient and office visits. Additional theoretical support could have been provided for the ACS model by determining how much ambulatory care is actually received by individuals hospitalized for ACS conditions.

Other factors that might have had a significant impact on utilization were not examined; for example, the one-month long Winnipeg nursing strike of early 1991 (Roos and Shapiro, 1994), changes in funding support, changes in organizational relationships, and introduction of TQM (total quality management) into certain care settings. For the factors that were included in this study,

regression analysis would have provided information on the extent to which each variable predicts utilization.

The limitations of the models themselves must also be taken into account when interpreting the data. While both models are subject to the vagaries of coding and the dynamic nature of the administrative claims data, each has its own weaknesses. No mechanism exists in the discretionary model, for example, to consider the impact of technological change on physician decision-making. On the other hand, one of the most basic assumptions of the access model remains untested. Even though associations have been drawn by inference, the question remains whether individuals suffering from ACS conditions actually benefit from improved ambulatory care.

The models should be used as guides in assessing hospital utilization, and not in isolation from other explanations for observed trends. Referring to the discretionary model, Roos (1992) has cautioned against relying solely on this type of logical model, a model which emphasizes efficacy and technical proficiency. She has indicated that it neglects the potential contribution of other types of factors in explaining variation. The models are clearly-defined, with a straightforward conceptual framework, and can misleadingly suggest a similar approach to analysis. In addition, focusing on overall trends in utilization for each model can mask some interesting, and possibly important, findings for individual conditions. The usefulness of the models appears to lie in their ability to target unusual trends that warrant further investigation.

D. FUTURE RESEARCH DIRECTIONS

In addition to the research proposed from the limitations of this study, future projects might look at the extent to which individuals are receiving appropriate outpatient care and are NOT being hospitalized (Bindman et al., 1995). Bindman et al. (1995) propose studying individuals with chronic medical conditions and their access to health care to see where improvements in ambulatory care are associated with a lower probability of hospitalization. Analysis of ACS data could also be extended in several ways; care received prior to hospitalization for ACS conditions could be examined for the effects of:

* **Nature of primary care.** Physician visits could be categorized into preventative or illness-related care, or they could be linked to a hospital episode of care (Fleming, 1995). Fleming (1995:101) proposes a hazard rate model to describe patterns and episodes of care to help determine "whether primary care per se (for any condition) has an impact on the likelihood of being hospitalized or whether the primary care must be for certain conditions only".

* **Income.** Billings et al. (1993:169) call for prospective or case-control studies "that compare the outpatient care provided to patients from low- and high-income areas before admission".

Additional research outside the classical medical model has also been proposed, on the nature and causes of barriers to care (economic, structural,

personal), the nature and causes of disease prevalence, and environmental risks such as deficiencies in housing and sanitation (Billings et al., 1993).

Such studies are necessary in order to draw definitive conclusions about the relationships between ambulatory care, avoidable hospitalizations, and income. Decter (1994) has suggested that research organizations in the biomedical research community such as the Medical Research Council will need to shift their focus in order to embrace a broad spectrum of health research including disciplines such as economics, political science and sociology. The Manitoba Centre for Health Policy and Evaluation, whose research has been influential in the development of health policy, is already incorporating this shift in approach to analyses of health care.

E. CONCLUSION

Both discretionary (LMV conditions) and access (ACS conditions) models are useful for explaining variation in rates of hospitalization for selected medical conditions. They provide frameworks for evaluating changes in health care utilization and ways of examining potentially unnecessary hospital utilization. The discretionary model for assessing hospital utilization tends to focus on clarifying treatment guidelines, with the expectation that physicians will adjust their decision-making in ways that will not affect quality of care. The access model shifts the focus of analysis to individuals who are members of specific, high-risk, subgroups of the population, who are more likely to experience barriers to appropriate health care. This shift in perspective might be regarded as a major

strength of this model. On the other hand, the evidence is strong for the discretionary model that a change in practice patterns will affect utilization patterns. While policy based on the discretionary model can increase the efficiency and effectiveness of health care by improving physician-decision making, the second model permits policy-makers to explicitly take into account that fact that certain subgroups may not have access to the care they require.

The process of reform must be monitored not only for the nature of changes in health care utilization but also for any cost savings accrued by cost containment measures such as bed closures. It is likely that hospital spending will continue to be reduced as hospital budgets are cut; this process can be more closely evaluated in terms of dollars with a recently-developed methodology to impute costs to hospital stays (Shanahan et al., 1996). This is not sufficient information, however, to determine whether reductions in hospital utilization actually translate into savings for the publicly-finded component of the health care system as a whole. As Deber et al. (1994:95) point out, "it is usually easier to shift costs to someone else rather than to control them". With early discharges from hospital, for example, the costs normally assumed by the hospital may shift to personal care homes, home care budgets, or to family members. The growing trend toward privatization of health care services highlights the need to examine this component in any analysis of shifts in hospital care spending.

Governments are ultimately placed in a difficult management position in a highly politicized environment. They are involved, for example, in a catch-22

situation of whether to first provide alternative care delivery or to first implement cost-containment measures. Bed closures require that alternate services be provided, but alternate services may need to be paid for by any money saved from cutting beds. The Manitoba government appears to have given priority to containing costs first. Their early acknowledgement of the importance of home care for the elderly, for example, both in decreasing the personal care home waiting lists and in reducing costs of acute care hospital stays (Manitoba Health, 1992) seems to have given way to other cost-containment considerations in light of subsequent cutbacks in home care funding (Bray, 1993) and, more recently, the proposal to privatize home care provision (Paul, 1996b).

Reforms focusing on improving the quality of care and reducing health care costs, although apparently more immediately achievable, may improve the medical care system but, according to Hurowitz (1993:132), "they should not be expected to have a substantial effect on the overall health status of the population". As Roos and Shapiro (1994:5) point out, "well-targeted and thoroughly evaluated public health and social policy programs may prove to be more cost-effective in improving the health of Winnipeg residents than relying on hospital services". Hurowitz (1993:132) has proposed a social model of health that:

> ...incorporates the beliefs that health policy and economic policy are inseparable and that other social systems may be better suited to respond to social problems than the medical care system. It is also based on the recognition that the medical care system should respond to unavoidable diseases. Over time, resources should be reallocated from the medical care system to systems that support the prevention of illness - for example, through the creation of

meaningful jobs and a resulting higher standard of living, or through a cleaner environment.

The goal of health care reform has been to decrease hospital use by increasing the efficiency and effectiveness of the Manitoba health care system without harming quality of care. As measured by hospital utilization for the low-variation conditions in the discretionary model, quality of care does not appear to have been harmed since the reform measures were implemented. Potentially unnecessary hospital utilization, however, as measured by the access model, has not shown the expected decrease over time. The access (ACS) model implies, therefore, that access to appropriate and timely care prior to hospitalization has not improved and that a proportion of hospital utilization for these conditions remains potentially reducible. Furthermore, the gap has generally widened over time between highest and lowest income residents for potentially reducible utilization. This was due to, for example, large reductions in hospital days by the highest income quintile rather than by the lowest income quintile. This trend, combined with the unexpected general stability of ACS rates, suggests that policy makers examine more closely both hospital and ambulatory care use by high-risk subgroups as reforms continue to take place in Manitoba.

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APPENDIX A. DEFINITION OF STUDY CONDITIONS

1. Ambulatory Care Sensitive Conditions

All 28 ambulatory care sensitive conditions (Billings et al., 1993) are defined using ICD-9-M codes except for one condition which notes that DRG is used (skin grafts with cellulitis).

CONDITION	ICD-9-CM*	DESCRIPTION	COMMENT
1. Congenital syphillis	090	- Congenital syphillis	Any secondary diagnosis Newborns only
2. Immunization-related and preventable conditions	033 037 045 320.0 390,391	- Whooping cough - Tetanus - Acute poliomyelitis - Hemophilus meningitis - Rheumatic fever	Primary diagnosis. For 320.0: age 1-5 only
3. Grand mal status & oth epileptic convulsions	345	- Epilepsy	Primary diagnosis
4. Convulsions "A"	780.3	- Convulsions	Primary diagnosis. Age 0-5 only.
5. Convulsions "B"	780.3	- Convulsions	Primary diagnosis. Age >5 only.
6. Severe ENT infections	382 462 463 465 472.1	- Suppurative and unspecified otitis media - Acute pharyngitis - Acute tonsillitis - Acute upper respiratory infections of multiple or unspecified sites - Chronic pharyngitis	Primary diagnosis. Exclude any 382 with procedure 20.01 (myringotomy)
7. Pulmonary tuberculosis	011	- Pulmonary tuberculosis	Primary diagnosis
8. Other tuberculosis	012 013 014 015 016 017 018	- Other respiratory tuberculosis - Tuberculosis of meninges & CNS - TB intestines, peritoneum, mesenteric glands - TB bones & joints - TB genitourinary system - TB other organs - Miliary tuberculosis	Primary diagnosis.
9. Chronic obstructive pulmonary disease	491 492 494 496 466.0	- Chronic bronchitis - Emphysema - Bronchiectasis - Chronic airway obstruction,NOS - Acute bronchitis	Primary diagnosis. Include 466.0 only with secondary diagnosis of 491,492,494,496.
10. Bacterial pneumonia	481 482.2 482.3 482.9 483 485 486	- Pneumococcal pneumonia - Pneumonia due to Hemophilus influenzae - Pneumonia due to Streptococcus - Bacterial pneumonia unspecified - Pneumonia due to other unspecified organism - Bronchopneumonia, organism unspecified - Pneumonia, organism unspecified	Primary diagnosis. Exclude: a) cases with secondary diagnosis of 282.6 (sickle cell) b) all patients < 2 months.
11. Asthma	493	- Asthma	Primary diagnosis.

CONDITION	ICD-9-CM*	DESCRIPTION	COMMENT
12. Congestive heart failure	428 402.01, 402.11, 402.91 518.4	- Heart failure - Hypertensive heart disease with congestive heart failure - Acute edema of lung, unspecified	Primary diagnosis. Exclude cases with the following surgery: a) 36.01,36.02,36.05 (PTCA) b) 36.1 (bypass anastomosis) c) 37.5 (heart transplant) d) 37.7 (pacemaker)
13. Hypertension	401.0, 401.9 402.00, 402.10, 402.90	- Malignant or unspecified essential hypertension - Hypertensive heart disease without congestive heart failure	Primary diagnosis. Exclude cases with: a) to d) as above
14. Angina	411.1 411.8 413	- Intermediate coronary syndrome - Other acute and subacute forms of ischemic heart disease - Angina pectoris	Primary diagnosis. Exclude cases with surgical procedures (any from 01-86.99 <diagnostic and therapeutic procedures can be present>)
15. Cellulitis	681 682 683 686	- Cellulitis & abscess finger/toe - Other cellulitis & abscess - Acute lymphadenitis - Other local infections skin & subcutaneous tissue	Primary diagnosis. Exclude cases with surgical procedures (any from 01 - 86.99) except 86.0 (incision skin/sub.tissue), where it is the only listed procedure
16. Skin grafts with cellulitis* * defined with DRGs instead of ICD-9-CM.	263, 264	- Skin graft &/or debrid.for skin ulcer or cellulitis w/ or w/o complications	Exclude admissions from Skilled Nursing/Intermediate Care Facility**
17. Diabetes "A"	250.1 250.2 250.3	- Diabetes w/ ketoacidosis - Diabetes w/ hyperosmolar coma - Diabetes w/ other coma	Primary diagnosis
18. Diabetes "B"	250.8 250.9	- Diabetes w/oth.specified manifestations - Diabetes w/unspecified complication	Primary diagnosis.
19. Diabetes "C"	250.0	- Diabetes mellitus without mention of complication	Primary diagnosis.
20. Hypoglycemia	251.2	- Hypoglycemia, unspecified	Primary diagnosis.
21. Gastroenteritis	558.9	- Other and unspecified noninfectious gastroenteritis and colitis	Primary diagnosis.
22. Kidney/urinary infection	590 599.0 599.9	- Infections of kidney - Urinary tract infection, site not specified - Unspecified disorder of urethra and urinary tract	Primary diagnosis.
23. Dehydration	276.5	- Volume depletion	All diagnoses.
24. Iron deficiency anemia	280.1 280.8 280.9	- Secondary to inadequate dietary iron intake - Other specified iron deficiency anemias - Iron deficiency anemia, unspecified	All diagnoses. Age 0-5 only for all.
25. Nutritional deficiencies	260 261 262 268.0 268.1	- Kwashiorkor - Nutritional marasmus - Other severe protein-calorie malnutrition - Rickets, active - Rickets, late effect	All diagnoses.
26. Failure to thrive	783.4	- Lack of expected normal physiological development	Primary diagnosis. Age <1 only
27. Pelvic inflammatory disease	614	- Inflammatory disease of ovary, fallopian tube, pelvic cellular tissue, and peritoneum	Primary diagnosis. Women only. Exclude all cases with surgical procedure

CONDITION	ICD-9-CM*	DESCRIPTION	COMMENT
28. Dental conditions	521	- Diseases hard tissues of teeth	Primary diagnosis
	522	- Diseases pulp & periapical tissue	
	523	- Gingival & periodontal diseases	
	525	- Other diseases/conditions of teeth & supporting structures	
	528	- Diseases oral soft tissues, excl. lesions specific for gingiva and tongue	

* "Most responsible diagnosis" in the Manitoba Health data was used to assign primary diagnosis while diagnostic fields 2-16 were used to assign secondary diagnosis. Procedure fields 1-12 were used where the selection was qualified with surgical codes. Exceptions were dehydration, iron deficiency anemia, and nutritional deficiencies, where the code could be present in any diagnostic field.

** Manitoba does not have skilled nursing facility or intermediate care facilities; instead, records denoting transfers from personal care home were excluded.

2. Low- and Moderate-Variation Categories

The low- and moderate-variation categories (Roos et al., 1988) are defined using DRG codes.

CONDITION	DRG CODE	DESCRIPTION
Low-Variation Conditions		
1. Acute myocardial infarction		Circulatory disorders w/AMI
	121	- & cardiovascular complications; disch.alive
	122	- w/o cardiovascular complications; disch.alive
	123	- expired
2. Specific cerebrovascular disorders (stroke)	14	- except TIA (transient ischemic attack)
3. Inguinal & femoral hernia operations	161	- age >17 with CC
	162	- age >17 without CC
4. Major small & large bowel operation	148	- with CC
	149	- without CC
5. Hip repair except joint replacement	210	- age >17 with CC
	211	- age >17 without CC
Moderate-Variation Conditions		
1. Gastrointestinal hemorrhage	174	- with CC
	175	- without CC
2. Appendicitis with appendectomy	164	- w/complicated principal diagnosis with CC
	165	- w/complicated principal diagnosis w/o CC
	166	- w/o complicated principal diagnosis with CC
	167	- w/o complicated principal diagnosis w/o CC

CC: significant comorbidities or complications

APPENDIX B: CONSTRUCTION OF CENSUS INCOME QUINTILES

This work follows in the footsteps of many previous brave pioneers including Cam Mustard and Ngiap Koh who took the first steps in understanding the 1986 census. Cam Mustard, Teresa Mayer, Shelley Derksen and Leonard McWilliam continued the journey into the 1991 census. This document was prepared by Shelley Derksen, with minor editing by Ruth Bond.

Income quintile rankings are based upon the rankings of the Manitoba population from 1984 to 1993. The 1986 census was used to rank years 1984 to 1988 and the 1991 census was used to rank 1989 to 1993.

Income quintiles were attached by postal code in strictly urban areas and by municipality code in mixed urban/rural areas and strictly rural areas. A variable called _RANK_ was created, which has the following range of values:

N1=Out of Province Municipal Code
N2=Out of Province Postal Code
N3=Postal Code of a Personal Care Home
N4=Postal Code of Other Institution
N5=Postal Code Missing Income
N6=Municipal code Missing Income
N7=Post Code Not Present on Postal Code Conversion File
U1 to U5 =Urban Quintile 1 (lowest) to 5 (highest)
R1 to R5 =Rural Quintile 1 (lowest) to 5 (highest)

The values N1 to N7 identify unrankable observations. U1 to U5 and R1 to R5 are the income quintile rankings within an urban/rural designation. The urban/rural designation is based on a census definition of urban/rural involving a population density rule.

Both the 1986 and 1991 censuses are organized as one record per enumeration area (EA). Enumeration areas are the smallest unit of geography for which census data are normally available. Enumeration areas can be grouped up into census tracts (CT), census subdivisions (CSD), and census divisions (CD). The method of attaching census average income values available at the enumeration area level to the Manitoba population data bases involved several steps.

Step 1: Exclusion of records which cannot be ranked to an Income Quintile

An observation was defined as unrankable for several reasons:

1) Postal codes associated with a personal care home. Postal codes where the majority of residents (>90%) were in a personal care home (PCH) were excluded from ranking because the census does not collect income for institutionalized populations.

2) Postal codes associated with other institutions. Some examples of such postal codes are those belonging to the public trustee office, prisons, and mental health institutions. These postal codes were collected from various sources, most notably, Charles Burchill, who, in collaboration with Fred Toll, provided a most comprehensive list of institutions which have their own postal code.

3) Postal codes not present on the postal code conversion file (PCCF). The postal code conversion file provides a link from the postal code to the census enumeration area. If the postal code is not present on the PCCF there is no way to attach census income values required for the ranking procedure. (This was not entirely true as a portion of the data may be linked to the census by municipality code. More on this later.)

4) No income value was provided on the census. The census will suppress income information for the EA if the non-institutional population of the EA is less than 250. An effort was made to impute an income value to these EAs as much as possible. Some EAs were left with a missing income value as the census defined no non-institutional population in that EA; for example, other institutions not defined above, or industrial or business districts in the city with no homes present.

Step 2: Preparing the Remaining Population for Ranking

After removing unrankable observations, the population was divided into a group rankable by postal code (strictly urban population) and a group that can be ranked by municipality code (mixed urban/rural and strictly rural populations).

The urban/rural status of a postal code was determined by the urban/rural designation of the EA linked to the postal code using the postal code conversion file. In addition several postal codes identified from the postal code book as rural routes link to strictly urban EA's according to the postal code conversion file. In reality, however, these postal codes are mixed urban/rural

since they involve post office boxes which, while they are located in urban areas, have mail delivered to populations residing in rural areas.

a) Preparing the Strictly Urban Population for Ranking

The strictly urban population was ranked by postal code. The postal code was linked to the census enumeration area via the postal code conversion file.

When a postal code linked to two or more EAs, the average income value assigned was the weighted mean of the average income values of each EA, using the total number of private households in each EA as the weight.

It was possible to link to EAs where the average income value had been set to "0". These "0" values were reset to missing so that they do not contribute to the weighted mean average income value assigned to the postal code.

b) Preparing Mixed Urban/Rural and Strictly Rural Populations for Ranking

After preparing the strictly urban postal codes, the mixed urban/rural and strictly rural postal codes remained. This population was ranked by municipality code.

Previously it was found that ranking rural populations by postal code was unsatisfactory because rural postal codes often encompass too wide a geographical area. (For example, a rural town and the surrounding municipality often share a common postal code. Municipal code can be used to distinguish them, however, and the mean income value was calculated on the basis of municipality code.)

The municipality was linked to the federal enumeration areas belonging to the census subdivision that corresponds to the municipality. In most cases there was a one-to-one correspondence between municipality and census subdivision. The link between municipality and census subdivision was provided by some work done by Cam Mustard and Fred Toll.

Like the strictly urban postal codes, it was possible for a municipality to link to two or more EAs. When this happened, the weighted mean of the average income value of each linking EA was assigned to the municipality. Again, the weighted mean was calculated using the total number of private households as the weight.

Several municipalities did not link to a census subdivision for three reasons:

1) The 1986 population file contains several pre-1989 municipalities which were re-assigned in 1989. Since the municipality/census subdivision correspondence was developed in 1990, no corresponding census subdivision was provided for these municipality codes. A link was determined between the pre- and post-1989 municipalities and a weighted average income value was provided for the "old" municipal codes. Two old municipal codes (309 and 314) could not be fixed using this technique so it was decided that the population in these municipal codes would be forced to "strictly urban" and ranked by postal code.

2) Several native bands boycotted the 1986 and 1991 censuses and hence no average income value was provided for their municipalities. An average income value was imputed to these municipalities by calculating the weighted average income value of all native bands that did not boycott the census by north/south zone. The average income value was imputed to the boycotting bands on the basis of their zone.

3) One municipality code (A53) is defined as Inuit and out of province native. This population is unrankable and was described previously as the unrankable population due to missing average income value for the municipality.

Several municipalities linked to mixed urban and rural EAs. Because the municipality had to be defined as either urban or rural, the weighted mean of GURBAN (GURBAN=0 indicates rural EA, and GURBAN=1 indicates urban EA) was calculated for each municipality. The rounded value of this mean determined the urban/rural nature of the municipality.

Step 3: Ranking by Urban and Rural Designation

Strictly urban populations were summed by postal codes, defined as urban (GURBAN=1 in all cases) and having an average income value attached. Mixed urban/rural populations were summed by municipality codes, defined as urban or rural by a weighted majority rule and also had an average income value attached.

To rank postal codes and municipal codes to a quintile, these two files were concatenated, sorted by rural/urban and average income value. The total population by urban/rural was calculated. Within an urban/rural designation, postal code or municipal code populations were summed into classes so that

approximately 20% of the population was in each class. These classes formed quintiles within the urban/rural designation.

After ranking each postal code or municipal code, the population was again broken apart into the set ranked by postal code and the set ranked by municipal code.

From these two data sets, a format that assigns an income quintile value to a postal code and a format that assigns an income quintile value to a municipal code was produced.

Important consequences of this method of assigning income quintile:

1) Native people with strictly urban postal codes will be assigned an income quintile on the basis of their postal code. All others will be assigned an income quintile on the basis of their home reserve, regardless of whether they actually live on the reserve. This cannot be overcome, because native people always maintain their home reserve municipal code whether they live there or not.

2) Portions of any event data set will not be ranked for various reasons. These reasons were described in the deletions above.

3) Populations living on the periphery of Winnipeg may be defined as rural by the census. The census defines the urban/rural nature of a population by a density rule. Populations living in East St. Paul Rural Municipality, for example, are defined as rural by the census.

APPENDIX C. MULTIPLE HOSPITALIZATIONS

Table C1. Low/Moderate Variation (LMV) Diagnosis Related Groups: Multiple Hospitalizations

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Low Variation										
Total LV discharges	7,225		7,704		7,953		8,141		7,837	
Number of LV discharges per person										
1	6,402	94.40	6,787	94.12	6,951	93.65	7,098	93.62	6,907	94.08
2	324	4.78	364	5.05	426	5.74	424	5.59	384	5.23
3 or more	56	0.83	60	0.89	45	0.61	60	0.79	51	0.69
Total LV individuals	6,782		7,211		7,422		7,582		7,342	
Moderate Variation										
Total MV discharges	2,337		2,275		2,484		2,481		2,604	
Number of MV discharges per person										
1	2,070	94.61	1,971	93.46	2,172	93.90	2,152	93.73	2,288	94.27
2	97	4.43	120	5.69	119	5.14	122	5.31	115	4.74
3 or more	21	0.96	18	0.85	22	0.95	22	0.96	24	0.99
Total MV individuals	2,188		2,109		2,313		2,296		2,427	
Total LMV discharges	9,562		9,979		10,437		10,622		10,441	
Number of LMV discharges per person:										
1	8,386	93.98	8,645	93.37	8,964	92.93	9,110	92.94	9,040	93.38
2	454	5.09	528	5.70	603	6.25	604	6.16	552	5.70
3 or more	83	0.93	86	0.93	79	0.82	88	0.90	89	0.92
Total individuals with LMV discharges	8,923		9,259		9,646		9,802		9,681	

Table C2. Ambulatory Care Sensitive (ACS) Conditions: Multiple Hospitalizations

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Total ACS discharges	22,944		24,720		24,498		24,178		24,737	
Number of ACS discharges per person										
1	14,514	81.94	15,517	81.35	14,829	80.08	15,062	81.15	15,267	80.95
2	2,156	12.17	2,444	12.81	2,479	13.39	2,357	12.70	2,415	12.80
3	593	3.35	627	3.29	680	3.67	657	3.54	640	3.39
4 or more	450	2.54	486	2.55	529	2.86	484	2.61	538	2.85
Total individuals with ACS discharges	17,713		19,074		18,517		18,560		18,860	

APPENDIX D: DATA EXCLUSIONS

Table D1. Data Exclusions: Low/Moderate Variation (LMV) Diagnosis-Related Groups

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Total hospital claims	270,061		289,403		283,522		287,604		298,211	
LMV records	10,909	4.04	11,444	3.95	11,870	4.19	12,340	4.29	12,094	4.06
Exclusions: Basic										
Non-MB residents	290	2.66	355	3.10	326	2.75	370	3.00	356	2.94
Outside fiscal year	233	2.14	114	1.00	94	0.79	140	1.13	104	0.86
Nonsurgical daycare	824	7.55	996	8.70	1,013	8.53	1,208	9.79	1,193	9.86
Subtotal	9,562	12.35	9,979	12.80	10,437	12.07	10,622	13.92	10,441	13.66
Exclusions: Income										
Out-of-province	7		9		11		5		10	
Personal care home	302		317		274		290		257	
Other institutions	85		84		110		114		122	
No income for PC	58		64		67		105		82	
No income for MC	1		0		3		2		1	
Nonlinkable PC	3		4		4		12		54	
Subtotal	456	4.77	478	4.79	469	4.49	528	4.97	526	5.04
Total LMV claims after exclusions	9,106		9,501		9,968		10,094		9,915	
Rural	2,563	28.15	2,595	27.31	2,673	26.82	2,779	27.53	2,778	28.02
Urban	6,543	71.85	6,906	72.69	7,295	73.18	7,315	72.47	7,137	71.98

NOTE: Records can occur in more than one exclusion category.

Table D2. Data Exclusions: Ambulatory Care Sensitive Conditions

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Total hospital claims	270,061		289,403		283,522		287,604		298,211	
ACS records	27,128	10.05	29,418	10.17	29,171	10.29	29,223	10.16	29,933	10.04
Exclusions: Basic										
Non-MB residents	1,095	4.04	1,271	4.32	1,259	4.32	1,296	4.43	1,295	4.33
Outside fiscal year	369	1.36	415	1.41	379	1.30	445	1.52	430	1.44
Nonsurgical daycare	2,779	10.24	3,069	10.43	3,107	10.65	3,423	11.71	3,558	11.89
Subtotal	22,944	15.64	24,720	16.16	24,498	16.27	24,178	17.66	24,737	17.66
Exclusions: Income										
Out-of-province	6		8		10		10		13	
Personal care home	403		411		414		375		340	
Other institutions	134		196		177		182		201	
No income for PC	105		78		81		174		143	
No income for MC	14		17		12		13		12	
Nonlinkable PC	5		6		6		25		100	
Subtotal	667	2.91	716	2.90	700	2.86	779	3.22	809	3.27
TOTAL ACS CLAIMS AFTER EXCLUSIONS	22,277		24,004		23,798		23,399		23,928	
Rural	9,517	42.72	10,127	42.19	10,155	42.67	9,948	42.51	10,138	42.37
Urban	12,760	57.28	13,877	57.81	13,643	57.33	13,451	57.49	13,790	57.63

NOTE: Records can occur in more than one exclusion category; for example, in fiscal 1990/91, 59 of the 369 fiscal year exclusions had also been flagged as non-surgical day care.

NOTE also that one additional record was excluded from the 29,171 ACS claims for 1992/93; this was the only congenital syphillis ACS condition found in all five years of data. Several more records were excluded for regions: in fiscal 90/91, 91/92, and 93/4, 2 records for each year were unassignable to a region. Fiscal 1992/93 had 3 such records and there were none in 1994/95.

APPENDIX E: TABLES FOR LOW/MODERATE VARIATION (LMV)DIAGNOSIS RELATED GROUPS (DRGs)

1. Rates of Hospitalizations

   Table 1a. Pre-Reform Period 1990/91 to 1991/92
   Table 1b. Reform Period 1992/93 to 1994/95

2. Rates of Hospitalizations by Income Quintile

   Tables 2a through 2e. Urban 1990/91 to 1994/95
   Tables 2f through 2j. Rural 1990/91 to 1994/95

3. Rates of Hospital Days

   Table 3a. Pre-Reform Period 1990/91-1991/92
   Table 3b. Reform Period 1992/93-1994/95

4. Rates of Hospital Days by Income Quintile

   Tables 4a through 4e. Urban 1990/91 to 1994/95
   Tables 4f through 4j. Rural 1990/91 to 1994/95

5. Resource Use: 1990/91 to 1994/95

6. Demographics: Ratios to Manitoba Population

   Tables 6a through 6e. 1990/91 to 1994/95

Table E1a. Low/Moderate Variation (LMV) Diagnosis Related Groups: Hospitalizations for Pre-Reform Period 1990/91-1991/92

	Direct Age- and Sex-Adjusted Rates per 10,000 MB Population				
	1990/91			1991/92	
	N	Rate		N	Rate
Low Variation					
Hernia procedures	1,854	16.55		1,941	17.17
AMI	1,779	16.11	***	1,963	17.48
Stroke	1,634	14.93	*	1,766	15.78
Bowel procedures	1,112	9.98		1,148	10.16
Hip repair	846	7.78		886	7.94
Sub-total	7,225	65.35		7,704	68.53
Moderate Variation					
GI Bleeding	1,226	11.10		1,248	11.12
Appendectomy	1,111	9.67	*	1,027	8.95
Sub-total	2,337	20.77		2,275	20.07
TOTAL	9,562	86.12		9,979	88.61

* Significantly different from 1991/92 at P<=.05.

** Significantly different from 1991/92 at P<=.01.

*** Significantly different from 1991/92 at P<=.001

Table E1b. Low/Moderate Variation (LMV) Diagnosis Related Groups: Hospitalizations for Reform Period 1992/93-1994/95

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population

	1992/93		1993/94		1994/95			
	N	Rate	N	Rate	N	Rate	P-Value+	Adj.P+
Low Variation								
Hernia procedures	2,036	17.90	2,099	18.36 **	1,965	17.09	0.118	0.039
AMI	1,981	17.42	2,009	17.51	1,932	16.64	0.002	0.000
Stroke	1,859	16.34	1,949	16.97 ***	1,922	16.47	0.002	0.000
Bowel procedures	1,196	10.51	1,141	9.98	1,051	9.13 ***	0.001	0.000
Hip repair	881	7.75	943	8.19	967	8.23	0.282	0.094
Sub-total	7,953	69.92	8,141	71.01	7,837	67.56		
Moderate Variation								
GI Bleeding	1,465	12.88 ***	1,454	12.68 ***	1,479	12.71 ***	0.000	0.000
Appendectomy	1,019	8.96	1,027	9.08	1,125	10.00 ***	0.002	0.000
Sub-total	2,484	21.84	2,481	21.75	2,604	22.71		
TOTAL	10,437	91.76	10,622	92.76	10,441	90.27		

+ P-value represents overall value of 3-year reform period compared against 1991/92. Adjusted P-value (Adj.P) based on Bonferroni method.

* Significantly different from 1991/92 at P<=.05.
** Significantly different from 1991/92 at P<=.01.
*** Significantly different from 1991/92 at P<=.001.

Table E2a. Urban Low/Moderate (LMV) Diagnosis Related Groups: Pre-Reform Hospitalizations by Income Quintile for 1990/91

1990/91 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Hip repair	1.57	8.50	6.59	6.52	6.74	5.41	6.70	513	0.003
Bowel procedures	1.46	11.39	9.44	10.14	10.96	7.81	10.13	818	0.023
Stroke	1.26	14.65	15.17	12.28	13.42	11.63	13.39	1,035	0.006
AMI	1.22	17.24	16.38	17.51	18.39	14.07	16.51	1,304	0.172
Hernia procedures	1.01	15.96	17.75	17.98	17.19	15.77	16.98	1,366	0.768
Sub-total	1.24	67.74	65.33	64.43	66.70	54.69	63.72	5,036	
Moderate Variation									
GI Bleeding	1.83	11.13	9.85	11.61	8.32	6.07	9.72	763	0.000
Appendectomy	0.92	7.87	9.66	9.96	8.59	8.51	8.92	744	0.923
Sub-total	1.30	18.99	19.51	21.57	16.91	14.59	18.64	1,507	
TOTAL	1.25	86.74	84.84	86.00	83.61	69.28	82.36	6,543	

Table E2b. Urban Low/Moderate (LMV) Diagnosis Related Groups: Pre-Reform Hospitalizations by Income Quintile for 1991/92

1991/92 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Hip repair	2.18	8.81	5.93	7.67	5.29	4.05	6.74	854	0.000
Stroke	1.50	16.47	13.69	15.51	13.32	10.94	14.16	1,121	0.000
AMI	1.12	20.43	18.71	16.57	17.94	18.26	18.06	1,450	0.120
Bowel procedures	1.00	10.62	10.14	10.26	11.24	10.66	10.43	1,421	0.638
Hernia procedures	0.87	16.06	18.16	16.53	19.05	18.40	17.45	810	0.086
Sub-total	1.16	72.38	66.63	66.53	66.84	62.31	66.85	5,656	
Moderate Variation									
GI Bleeding	1.75	12.12	12.16	9.87	7.98	6.91	10.05	721	0.000
Appendectomy	0.95	9.04	7.86	8.58	7.77	9.53	8.60	529	0.696
Sub-total	1.29	21.16	20.02	18.45	15.75	16.44	18.65	1,250	
TOTAL	1.19	93.54	86.65	84.98	82.59	78.75	85.50	6,906	

Table E2c. Urban Low/Moderate (LMV) Diagnosis Related Groups: Reform Hospitalizations by Income Quintile for 1992/93

1992/93 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Stroke	1.31	16.69	17.09	15.73	12.14	12.74	15.14	1,216	0.000
Bowel procedures	1.25	11.39	12.04	11.75	11.10	9.14	11.31	932	0.037
AMI	1.21	18.91	17.74	19.23	18.66	15.61	18.04	1,471	0.085
Hip repair	1.13	7.96	6.33	7.16	6.23	7.06	6.76	541	0.347
Hernia procedures	1.01	17.34	19.93	18.11	19.08	17.16	18.47	1,508	0.717
Sub-total	1.17	72.29	73.12	71.97	67.21	61.71	69.71	5,668	
Moderate Variation									
GI Bleeding	1.88	14.40	13.45	11.75	9.99	7.65	11.65	947	0.000
Appendectomy	1.05	8.05	9.52	7.43	8.26	7.66	8.20	680	0.359
Sub-total	1.47	22.46	22.97	19.18	18.25	15.31	19.85	1,627	
TOTAL	1.23	94.75	96.09	91.14	85.46	77.02	89.56	7,295	

Table E2d. Urban Low/Moderate (LMV) Diagnosis Related Groups: Reform Hospitalizations by Income Quintile for 1993/94

1993/94 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
AMI	1.45	20.95	18.60	18.39	18.91	14.50	18.27	1,487	0.000
Stroke	1.38	17.67	17.91	15.65	12.45	12.83	15.75	1,275	0.000
Bowel procedures	1.28	11.65	8.81	10.42	10.49	9.11	10.19	840	0.177
Hip repair	1.20	8.15	8.50	7.39	5.60	6.78	7.42	593	0.008
Hernia procedures	0.68	15.39	17.28	20.02	17.61	22.49	18.56	1,513	0.000
Sub-total	1.12	73.81	71.11	71.86	65.06	65.70	70.19	5,708	
Moderate Variation									
GI Bleeding	1.56	14.86	12.06	10.42	10.02	9.51	11.40	926	0.000
Appendectomy	1.20	8.96	9.19	7.64	8.32	7.45	8.32	681	0.082
Sub-total	1.40	23.82	21.25	18.06	18.34	16.96	19.72	1,607	
TOTAL	1.18	97.64	92.35	89.92	83.40	82.66	89.91	7,315	

Table E2e. Urban Low/Moderate (LMV) Diagnosis Related Groups: Reform Hospitalizations by Income Quintile for 1994/95

1994/95 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Hip repair	1.31	9.08	7.79	6.36	7.23	6.93	7.52	615	0.025
Stroke	1.26	18.59	14.23	10.75	15.14	14.79	15.65	1,276	0.034
AMI	1.24	18.94	18.20	18.04	15.39	15.33	17.03	1,397	0.002
Bowel procedures	1.14	9.99	11.06	8.18	9.55	8.78	9.55	788	0.101
Hernia procedures	0.66	13.29	17.64	17.08	17.99	19.99	17.28	1,413	0.000
Sub-total	1.06	69.89	68.91	60.40	65.30	65.83	67.03	5,489	
Moderate Variation									
GI Bleeding	1.42	13.12	13.35	10.92	9.26	9.27	11.29	928	0.000
Appendectomy	1.12	8.48	10.52	9.77	8.09	7.59	8.88	720	0.067
Sub-total	1.28	21.60	23.87	20.69	17.35	16.85	20.18	1,648	
TOTAL	1.11	91.50	92.78	86.42	82.65	82.68	87.20	7,137	

Table E2f. Rural Low/Moderate (LMV) Diagnosis Related Groups: Pre-Reform Hospitalizations by Income Quintile for 1990/91

1990/91 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Hip repair	1.56	7.28	7.80	6.84	6.10	4.68	6.90	170	0.044
Stroke	1.35	18.66	21.03	18.21	15.41	13.81	17.82	479	0.005
Bowel procedures	0.86	9.57	8.65	7.82	13.06	11.11	9.78	271	0.060
Hernia procedures	0.79	11.87	11.12	16.80	20.32	15.05	15.35	462	0.002
AMI	0.78	13.86	16.73	12.67	13.45	17.78	14.90	418	0.044
Sub-total	0.98	61.24	65.33	62.34	68.34	62.43	64.75	1,800	
Moderate Variation									
GI Bleeding	1.42	18.56	14.65	14.20	12.17	13.03	14.34	403	0.005
Appendectomy	1.16	11.80	8.49	13.97	13.95	10.21	11.74	360	0.579
Sub-total	1.31	30.36	23.14	28.18	26.12	23.24	26.09	763	
TOTAL	1.07	91.60	88.45	90.51	94.46	85.67	90.84	2,563	

Table E2g. Rural Low/Moderate (LMV) Diagnosis Related Groups: Pre-Reform Hospitalizations by Income Quintile for 1991/92

1991/92 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Stroke	1.38	25.69	18.78	17.82	14.66	18.61	19.11	523	0.001
Hip repair	1.10	8.16	8.28	5.42	6.18	7.45	7.09	180	0.298
AMI	0.94	16.57	18.10	12.01	14.44	17.71	16.57	465	0.769
Bowel procedures	0.81	9.22	8.34	8.61	8.17	11.42	8.91	256	0.289
Hernia procedures	0.60	11.50	15.96	17.06	18.87	19.15	16.58	502	0.001
Sub-total	0.96	71.15	69.45	60.92	62.32	74.33	68.27	1,926	
Moderate Variation									
GI Bleeding	1.56	17.27	14.54	12.50	11.54	11.10	13.23	368	0.001
Appendectomy	0.89	9.40	10.47	8.68	9.72	10.57	9.72	301	0.697
Sub-total	1.23	26.67	25.00	21.18	21.26	21.66	22.95	669	
TOTAL	1.02	97.82	94.45	82.10	83.59	96.00	90.53	2,595	

Table E2h. Rural Low/Moderate (LMV) Diagnosis Related Groups: Reform Hospitalizations by Income Quintile for 1992/93

1992/93 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Stroke	1.13	23.94	17.80	19.12	13.65	21.12	18.83	515	0.075
Bowel procedures	1.04	8.30	8.03	8.93	8.68	7.99	8.61	245	0.988
Hip repair	1.00	8.12	8.67	5.88	4.23	8.16	7.12	182	0.201
AMI	0.99	17.95	14.08	14.92	12.78	18.05	15.29	446	0.802
Hernia procedures	0.61	12.21	19.50	16.09	15.77	19.93	16.40	498	0.026
Sub-total	0.94	70.51	68.08	64.94	55.10	75.24	66.25	1,886	
Moderate Variation									
GI Bleeding	2.02	23.05	17.84	14.50	13.32	11.44	16.19	456	0.000
Appendectomy	1.34	13.25	9.99	9.48	12.05	9.87	10.85	331	0.268
Sub-total	1.70	36.30	27.83	23.98	25.37	21.31	27.04	787	
TOTAL	1.11	106.82	95.91	88.92	80.47	96.55	93.30	2,673	

Table E2i. Rural Low/Moderate (LMV) Diagnosis Related Groups: Reform Hospitalizations by Income Quintile for 1993/94

1993/94 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Bowel procedures	1.24	9.70	8.20	11.49	8.85	7.85	9.31	266	0.434
Hip repair	1.04	7.00	7.32	4.87	8.71	6.70	7.03	176	0.797
AMI	0.97	16.44	17.74	12.95	17.15	16.99	16.01	466	0.908
Stroke	0.96	21.59	19.10	17.92	15.56	22.60	18.80	518	0.767
Hernia procedures	0.59	12.23	18.31	20.06	20.70	20.80	18.53	561	0.000
Sub-total	0.89	66.96	70.67	67.29	70.96	74.94	69.68	1,987	
Moderate Variation									
GI Bleeding	2.74	22.95	18.59	17.26	11.69	8.37	16.32	453	0.000
Appendectomy	1.15	12.80	10.75	8.98	11.99	11.12	11.12	339	0.636
Sub-total	1.83	35.75	29.34	26.24	23.68	19.49	27.44	792	
TOTAL	1.09	102.72	100.01	93.54	94.64	94.43	97.11	2,779	

Table E2j. Rural Low/Moderate (LMV) Diagnosis Related Groups: Reform Hospitalizations by Income Quintile for 1994/95

1994/95 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N	Trend P-Value
Low Variation									
Hip repair	2.92	10.98	7.46	7.11	6.19	3.77	7.56	194	0.000
Stroke	2.01	26.52	18.01	21.49	15.68	13.18	18.94	517	0.000
AMI	1.26	16.77	18.25	14.67	16.09	13.34	15.96	464	0.082
Bowel procedures	0.99	7.44	8.04	9.03	8.68	7.51	8.30	233	0.830
Hernia procedures	0.85	14.70	16.41	17.60	17.98	17.36	16.88	514	0.192
Sub-total	1.39	76.41	68.17	69.90	64.61	55.16	67.64	1,922	
10									
Moderate Variation									
GI Bleeding	2.47	24.53	16.30	14.38	15.42	9.95	16.30	462	0.000
Appendectomy	1.38	14.09	15.72	12.44	13.00	10.19	12.96	394	0.192
Sub-total	1.92	38.62	32.02	26.82	28.42	20.13	29.26	856	
TOTAL	1.53	115.03	100.19	96.72	93.03	75.29	96.90	2,778	

Table E3a. Low/Moderate Variation (LMV) Diagnosis Related Groups: Hospital Days for Pre-Reform Period 1990/91-1991/92

Direct Age- and Sex-Adjusted Rates of Hospital Days per 10,000 MB Population

	1990/91			1991/92	
	N	Rate		N	Rate
Total discharges	9,431			9,811	
Low Variation					
Stroke	70,020	646.08		65,461	587.62
Hip repair	25,848	239.79		23,318	209.39
Bowel procedures	22,673	204.58		21,365	189.72
AMI	19,744	179.28		21,010	187.36
Hernia procedures	7,381	66.17		7,389	65.51
Sub-total	145,666	1,335.91		138,543	1,239.59
Moderate Variation					
GI Bleeding	7,432	67.55	*	8,431	75.35
Appendectomy	5,772	50.52	*	5,231	45.76
Sub-total	13,204	118.07		13,662	121.11
TOTAL HOSPITAL DAYS	158,870	1,453.98		152,205	1,360.71

* Significantly different from 1991/92 at P<=.05.

** Significantly different from 1991/92 at P<=.01.

*** Significantly different from 1991/92 at P<=.001

Table E3b. Low/Moderate Variation (LMV) Diagnosis Related Groups: Hospital Days for Reform Period 1992/93-1994/95

Direct Age- and Sex-Adjusted Rates
of Hospital Days per 10,000 MB Population

	1992/93			1993/94			1994/95				
	N	Rate		N	Rate		N	Rate		P-Value+	Adj.P+
Number of discharges	10,226			10,346			10,080				
Low Variation											
Stroke	77,411	680.55		82,287	714.51	**	72,288	614.83		0.001	0.000
Hip repair	23,468	206.32		25,854	224.07		26,518	224.62		0.358	0.119
Bowel procedures	22,497	197.78		19,890	173.92	*	17,608	152.42	***	0.000	0.000
AMI	20,858	183.37		19,775	172.16	*	18,709	160.37	***	0.000	0.000
Hernia procedures	6,464	56.83	***	5,847	51.03	**	4,305	37.08	***	0.000	0.000
Sub-total	150,698	1,324.84		153,653	1,335.69		139,428	1,189.31			
Moderate Variation											
GI Bleeding	9,561	84.05		8,242	71.72		8,610	73.57		0.175	0.058
Appendectomy	4,748	41.74	**	4,855	42.81		5,012	44.37		0.007	0.002
Sub-total	14,309	125.80		13,097	114.53		13,622	117.94			
TOTAL DAYS	165,007	1,450.63		166,750	1,450.22		153,050	1,307.25			

+ P-value represents overall value of 3-year reform period compared against 1991/92.
Adjusted P-value (Adj.P) based on Bonferroni method.

** Significantly different from 1991/92 at P<=.01.

*** Significantly different from 1991/92 at P<=.001

Table E4a. Urban Low/Moderate Variation (LMV) Diagnosis Related Groups: Pre-Reform Hospital Days by Income Quintile for 1990/91

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,431

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Stroke	1.73	607.74	608.07	558.95	527.67	351.44	540.91	40,696	0.000
Bowel procedure	1.61	237.94	206.69	198.48	213.27	147.47	206.19	16,523	0.000
Hip repair	1.56	296.54	199.55	185.14	212.11	189.56	219.66	16,383	0.000
AMI	1.34	207.91	163.88	175.82	244.26	154.87	186.29	14,685	0.015
Hernia procedure	1.22	65.87	73.49	71.35	61.23	53.89	66.38	5,270	0.000
Sub-total	1.58	1,416.00	1,251.68	1,189.74	1,258.54	897.23	1,219.43	93,557	
Moderate Variation									
GI Bleeding	2.33	77.53	53.95	87.59	43.34	33.22	62.58	4,878	0.000
Appendectomy	1.19	48.42	47.24	54.57	42.52	40.60	46.86	3,885	0.000
Sub-total	1.71	125.95	101.19	142.16	85.86	73.82	109.44	8,763	
TOTAL	1.59	1,541.96	1,352.87	1,331.90	1,344.40	971.04	1,328.87	102,320	

Table E4b. Urban Low/Moderate Variation (LMV) Diagnosis Related Groups: Pre-Reform Hospital Days by Income Quintile for 1991/92

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,777

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Hip repair	2.23	237.50	121.77	223.10	196.60	106.53	177.13	13,922	0.000
Stroke	1.90	678.28	435.91	500.78	512.83	357.87	516.06	40,397	0.000
Bowel procedure	1.02	217.07	176.90	236.22	187.42	213.11	200.47	16,105	0.827
Hernia procedure	0.93	63.08	71.14	60.55	73.19	67.72	65.74	5,299	0.071
AMI	0.77	210.26	195.07	168.84	218.72	271.37	199.00	15,921	0.000
Sub-total	1.38	1,406.19	1,000.78	1,189.50	1,188.76	1,016.59	1,158.40	91,644	
Moderate Variation									
GI Bleeding	1.35	77.53	85.93	65.29	57.05	57.52	71.02	5,681	0.000
Appendectomy	1.00	46.39	43.71	42.98	33.44	46.41	43.12	3,593	0.042
Sub-total	1.19	123.92	129.64	108.28	90.48	103.93	114.15	9,274	
TOTAL	1.37	1,530.11	1,130.42	1,297.78	1,279.25	1,120.53	1,272.54	100,918	

Table E4c. Urban Low/Moderate Variation (LMV) Diagnosis Related Groups: Reform Hospital Days by Income Quintile for 1992/93

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 7,122

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Bowel procedure	1.62	239.52	228.70	264.89	180.20	147.99	219.87	17,986	0.000
Hernia procedure	1.23	54.20	69.97	58.73	54.19	44.21	57.13	4,632	0.000
AMI	1.18	193.78	170.94	230.07	202.82	164.21	190.03	15,391	0.010
Stroke	1.11	573.53	745.09	603.35	361.21	515.87	586.66	46,748	0.000
Hip repair	0.91	227.15	171.62	185.25	159.40	250.31	189.92	15,065	0.001
Sub-total	1.15	1,288.18	1,386.32	1,342.29	957.82	1,122.59	1,243.61	99,822	
Moderate Variation									
GI Bleeding	2.20	86.90	83.46	97.03	56.92	39.55	75.59	6,148	0.000
Appendectomy	1.16	38.07	41.46	32.41	37.14	32.93	36.45	3,018	0.002
Sub-total	1.72	124.97	124.92	129.44	94.06	72.48	112.04	9,166	
TOTAL	1.18	1,413.16	1,511.24	1,471.72	1,051.88	1,195.06	1,355.65	108,988	

Table E4d. Urban Low/Moderate Variation (LMV) Diagnosis Related Groups: Reform Hospital Days by Income Quintile for 1993/94

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 7,093

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Bowel procedure:	1.47	235.24	165.13	161.01	158.68	160.03	178.67	14,589	0.000
AMI	1.46	215.43	175.59	177.13	216.04	147.91	186.41	15,024	0.000
Hip repair	1.26	255.18	170.35	193.43	143.84	201.84	195.78	15,509	0.000
Hernia procedure	1.20	56.59	51.88	48.92	38.25	47.28	52.55	4,222	0.000
Stroke	1.09	679.63	537.45	659.78	793.99	623.03	630.08	49,820	0.000
Sub-total	1.22	1,442.07	1,100.40	1,240.27	1,350.80	1,180.09	1,243.49	99,164	
Moderate Variation									
GI Bleeding	2.00	91.40	63.29	59.38	58.98	45.60	64.12	5,146	0.000
Appendectomy	1.17	38.53	42.53	37.54	37.87	33.01	38.02	3,113	0.001
Sub-total	1.65	129.93	105.82	96.92	96.85	78.61	102.14	8,259	
TOTAL	1.25	1,572.02	1,206.23	1,337.19	1,447.65	1,258.69	1,345.63	107,423	

Table E4e. Urban Low/Moderate Variation (LMV) Diagnosis Related Groups: Reform Hospital Days by Income Quintile for 1994/95

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,833

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Bowel procedure	1.62	189.77	180.57	124.17	155.66	116.81	157.63	12,993	0.000
Hip repair	1.57	273.86	169.86	143.07	281.95	174.84	204.17	16,602	0.000
AMI	0.92	180.50	170.58	161.84	166.91	196.69	167.93	13,725	0.004
Hernia procedure	0.73	24.92	37.99	32.45	28.08	34.00	32.04	2,605	0.075
Stroke	0.59	656.61	499.32	619.22	457.10	1,117.37	612.86	48,994	0.000
Sub-total	0.81	1,325.66	1,058.32	1,080.75	1,089.70	1,639.71	1,174.63	94,919	
Moderate Variation									
Appendectomy	1.54	42.45	43.17	40.47	37.22	27.59	38.26	3,114	0.000
GI Bleeding	1.38	71.40	68.32	71.61	65.36	51.84	64.90	5,338	0.000
Sub-total	1.43	113.85	111.49	112.08	102.58	79.43	103.16	8,452	
TOTAL	0.84	1,439.52	1,169.80	1,192.82	1,192.29	1,719.15	1,277.79	103,371	

Table E4f. Rural Low/Moderate Variation (LMV) Diagnosis Related Groups: Pre-Reform Hospital Days by Income Quintile for 1990/91

Rural Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 2,551

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Hip repair	1.81	120.98	121.66	247.9	92.43	66.84	135.01	3,136	0.000
Hernia procedure	1.05	55.48	56.89	69.19	88.29	52.6	66.26	1,995	0.009
Bowel procedure	0.79	161.94	156.05	184.28	260.36	205.55	184.38	4,922	0.000
AMI	0.73	117.02	245.62	160.4	99.85	159.68	169.78	4,430	0.000
Stroke	0.42	429.54	427.96	633.85	413.49	1021.65	546.05	14,131	0.000
Sub-Total	0.59	884.96	1,008.18	1,295.62	954.42	1,506.32	1,101.48	28,614	
Moderate Variation									
Appendectomy	1.56	72.79	40.01	72.27	69.61	46.72	60.45	1,847	0.032
GI Bleeding	1.24	98.07	81.79	80.41	60.44	78.84	79.35	2,168	0.000
Sub-Total	1.36	170.86	121.80	152.68	130.05	125.56	139.80	4,015	
TOTAL	0.65	1,055.82	1,129.98	1,448.30	1,084.48	1,631.88	1,241.26	32,629	

Table E4g. Rural Low/Moderate Variation (LMV) Diagnosis Related Groups: Pre-Reform Hospital Days by Income Quintile for 1991/92

Rural Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 2,561

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Stroke	1.50	807.28	443.35	369.90	344.71	538.48	505.25	13,618	0.000
Hip repair	1.01	176.65	146.23	124.46	83.03	175.07	139.41	3,491	0.000
AMI	0.86	145.79	147.51	189.09	154.20	169.60	159.72	4,688	0.001
Hernia procedure	0.73	49.14	59.64	78.77	75.51	67.61	66.28	2,024	0.000
Bowel procedure	0.65	158.32	150.05	118.57	159.08	243.44	156.24	4,447	0.000
Sub-Total	1.12	1,337.19	946.78	880.79	816.53	1,194.21	1,026.90	28,268	
Moderate Variation									
GI Bleeding	1.22	76.38	76.60	86.94	65.65	62.62	71.93	1,959	0.000
Appendectomy	0.82	55.26	49.41	47.58	47.26	67.70	51.47	1,583	0.018
Sub-Total	1.01	131.64	126.01	134.52	112.91	130.32	123.40	3,542	
TOTAL	1.11	1,468.83	1,072.79	1,015.30	929.44	1,324.53	1,150.30	31,810	

Table E4h. Rural Low/Moderate Variation (LMV) Diagnosis Related Groups: Reform Hospital Days by Income Quintile for 1992/93

Rural Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 2,639

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Stroke	2.11	1,162.84	337.53	1,009.68	402.53	552.00	706.78	18,570	0.000
Bowel procedure	1.30	149.39	116.04	154.30	114.70	114.54	133.81	3,818	0.000
Hip repair	0.76	127.94	173.13	102.51	56.82	168.64	126.94	3,194	0.012
AMI	0.68	155.82	124.29	149.46	101.80	227.56	144.49	4,079	0.000
Hernia procedure	0.60	47.37	65.29	51.49	49.87	79.51	56.40	1,708	0.000
Sub-Total	1.44	1,643.36	816.28	1,467.44	725.72	1,142.25	1,168.42	31,369	
Moderate Variation									
Appendectomy	1.97	84.09	50.94	49.02	50.77	42.59	55.06	1,672	0.000
GI Bleeding	1.75	135.48	94.73	73.29	63.03	77.53	89.37	2,436	0.000
Sub-Total	1.83	219.57	145.67	122.31	113.80	120.12	144.43	4,108	
TOTAL	1.48	1,862.94	961.94	1,589.75	839.52	1,262.37	1,312.86	35,477	

Table E4i. Rural Low/Moderate Variation (LMV) Diagnosis Related Groups: Reform Hospital Days by Income Quintile for 1993/94

Rural Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 2,729

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Bowel procedure	1.31	163.02	138.65	182.32	140.87	124.59	149.48	4,223	0.000
Stroke	1.28	656.01	412.43	526.39	503.82	511.24	516.64	13,728	0.000
AMI	0.83	129.59	139.04	100.69	141.60	156.28	130.40	3,748	0.000
Hernia procedure	0.75	36.66	48.52	54.73	64.85	48.80	50.74	1,540	0.000
Hip repair	0.47	99.55	88.37	80.59	141.25	210.17	111.64	2,759	0.000
Sub-Total	1.03	1,084.83	827.01	944.72	992.39	1,051.08	958.90	25,998	
Moderate Variation									
GI Bleeding	2.88	109.25	112.28	123.57	59.15	37.92	95.31	2,558	0.000
Appendectomy	1.23	74.46	59.69	44.29	45.48	60.73	56.02	1,706	0.000
Sub-Total	1.86	183.71	171.97	167.86	104.63	98.65	151.33	4,264	
TOTAL	1.10	1,268.53	998.98	1,112.58	1,097.01	1,149.74	1,110.23	30,262	

Table E4j. Rural Low/Moderate Variation (LMV) Diagnosis Related Groups: Reform Hospital Days by Income Quintile for 1994/95

Rural Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 2,726

	Ratio Low/High	1 (low)	2	3	4	5 (high)	Overall Rate	N Days	Trend P-Value
Low Variation									
Hip repair	4.44	196.91	130.62	96.87	100.29	44.37	120.59	3,026	0.000
Hernia procedure	2.09	55.79	41.37	42.31	46.10	26.71	43.16	1,319	0.000
AMI	1.49	161.58	153.82	110.61	130.55	108.69	134.64	3,874	0.000
Bowel procedure	0.99	146.25	126.35	139.57	140.88	147.10	141.71	3,970	0.294
Stroke	0.60	382.68	388.53	371.55	480.27	633.07	422.31	11,328	0.000
Sub-Total	0.98	943.21	840.69	760.91	898.09	959.94	862.41	23,517	
Moderate Variation									
GI Bleeding	2.32	111.12	82.68	125.72	75.07	47.95	90.45	2,417	0.000
Appendectomy	1.49	74.92	72.16	55.68	57.25	50.38	60.98	1,856	0.000
Sub-Total	1.89	186.04	154.84	181.40	132.32	98.33	151.43	4,273	
TOTAL	1.07	1,129.25	995.53	942.30	1,030.40	1,058.27	1,013.84	27,790	

Table E5. Low/Moderate Variation (LMV) Diagnosis Related Groups: Resource Use

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Total LMV discharges	9,562		9,979		10,437		10,622		10,441	
Region of Hospitalization										
In region residence	7,985	83.51	8,370	83.88	8,769	84.02	8,941	84.17	8,764	83.94
Outside region of residence:										
- Winnipeg	1,118	11.69	1,089	10.91	1,150	11.02	1,136	10.69	1,134	10.86
- Non-Winnipeg	459	4.80	520	5.21	518	4.96	545	5.13	543	5.20
Type of Hospital										
Teaching	2,153	22.52	2,151	21.56	2,296	22.00	2,328	21.92	2,277	21.81
Urban	4,672	48.86	4,818	48.28	5,003	47.94	5,101	48.02	5,009	47.97
Major rural	1,368	14.31	1,483	14.86	1,582	15.16	1,566	14.74	1,656	15.86
Other rural	1,151	12.04	1,276	12.79	1,333	12.77	1,347	12.68	1,256	12.03
Chronic	19	0.20	20	0.20	23	0.22	47	0.44	20	0.19
Out-of-province	199	2.08	231	2.31	200	1.92	233	2.19	223	2.14
Type of Stay										
Short-stay (<=60 days)	9,013	94.26	9,443	94.63	9,804	93.94	9,861	92.84	9,617	92.11
Long-stay	418	4.37	368	3.69	422	4.04	485	4.57	463	4.43
Outpatient	131	1.37	168	1.68	211	2.02	276	2.60	361	3.46

Table E6. Low/Moderate-Variation (LMV) Diagnosis Related Groups: Demographic Comparison of Ratios to Manitoba Population by Year

	Ratio to Manitoba Population					Current Demographics	
	Pre-Reform		Reform			1994/95	
	90/91	91/92	92/93	93/94	94/95	N	%
Age						9,681	
0 to 14	0.16	0.13	0.14	0.14	0.14	304	3.14
15 to 64	0.65	0.64	0.63	0.61	0.62	3,863	39.90
65 and older	4.16	4.22	4.24	4.26	4.22	5,514	56.96
Sex							
Male	1.22	1.23	1.22	1.22	1.21	5,783	59.74
Female	0.79	0.78	0.79	0.79	0.79	3,898	40.26
Residence						9,352	
Urban	0.99	1.01	1.01	1.00	1.00	6,854	73.29
Rural	1.02	0.99	0.97	1.00	1.00	2,498	26.71
Treaty Indian	0.67	0.58	0.68	0.63	0.68	366	3.78
Urban Income						6,688	
1-lowest quintile	1.22	1.28	1.23	1.25	1.22	1,606	24.01
2	1.19	1.14	1.22	1.17	1.18	1,624	24.28
3	1.06	1.01	1.02	1.01	1.01	1,352	20.22
4	0.83	0.80	0.80	0.79	0.80	1,066	15.94
5-highest quintile	0.69	0.76	0.73	0.77	0.78	1,040	15.55
Rural Income						2,498	
1-lowest quintile	1.02	1.06	1.10	0.96	1.08	542	21.70
2	1.14	1.21	1.22	1.21	1.22	603	24.14
3	1.01	0.95	0.95	1.01	1.07	519	20.78
4	1.01	0.91	0.90	0.99	0.95	492	19.70
5-highest quintile	0.80	0.87	0.83	0.84	0.68	342	13.69

Table E6a. Low/Moderate-Variation (LMV) Diagnosis Related Groups: Demographic Comparison with the Population of Manitoba - 1990/91

	LMV DRGs 1990/91		MB Population 1990		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	8,923		1,135,792		
Age					
0 to 14	310	3.47	249,036	21.93	0.16
15 to 64	3,894	42.63	739,667	65.12	0.65
65 and older	4,809	53.89	147,089	12.95	4.16
Sex					
Male	5,377	60.26	561,601	49.45	1.22
Female	3,546	39.74	574,191	50.55	0.79
Residence	8,633		1,129,399		
Urban	6,305	73.03	829,780	73.47	0.99
Rural	2,328	26.97	299,619	26.53	1.02
Treaty Indian	305	3.42	58,133	5.12	0.67
Urban Income Quintile	6,168		827,371		
1 - lowest	1,512	24.51	165,598	20.01	1.22
2	1,467	23.78	165,453	20.00	1.19
3	1,311	21.25	165,655	20.02	1.06
4	1,027	16.65	165,479	20.00	0.83
5 - highest	851	13.80	165,186	19.97	0.69
Rural Income Quintile	2,329		299,619		
1 - lowest	476	20.44	59,970	20.02	1.02
2	529	22.71	59,556	19.88	1.14
3	464	19.92	58,828	19.63	1.01
4	496	21.30	63,006	21.03	1.01
5 - highest	364	15.63	58,259	19.44	0.80

Table E6b. Low/Moderate-Variation (LMV) Diagnosis Related Groups: Demographic Comparison with the Population of Manitoba - 1991/92

	LV DRGs 1991/92		MB Population 1991		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	9,259		1,139,942		
Age					
0 to 14	271	2.93	249,315	21.87	0.13
15 to 64	3,860	41.69	741,099	65.01	0.64
65 and older	5,128	55.38	149,528	13.12	4.22
Sex					
Male	5,620	60.70	563,053	49.39	1.23
Female	3,639	39.30	576,889	50.61	0.78
Residence	8,948		1,133,499		
Urban	6,616	73.94	833,755	73.56	1.01
Rural	2,332	26.06	299,744	26.44	0.99
Treaty Indian	278	3.00	59,441	5.21	0.58
Urban Income Quintile	6,490		831,273		
1 - lowest	1,665	25.65	166,356	20.01	1.28
2	1,480	22.80	166,350	20.01	1.14
3	1,326	20.43	167,462	20.15	1.01
4	1,036	15.96	166,302	20.01	0.80
5 - highest	983	15.15	164,803	19.83	0.76
Rural Income Quintile	2,332		299,744		
1 - lowest	493	21.14	59,916	19.99	1.06
2	559	23.97	59,420	19.82	1.21
3	436	18.70	58,912	19.65	0.95
4	446	19.13	62,751	20.93	0.91
5 - highest	398	17.07	58,745	19.60	0.87

Table E6c. Low/Moderate-Variation (LMV) Diagnosis Related Groups: Demographic Comparison with the Population of Manitoba - 1992/93

	LV DRGs 1992/93		MB Population 1992		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	9,646		1,137,484		
Age					
0 to 14	295	3.06	247,857	21.79	0.14
15 to 64	3,921	40.65	738,434	64.92	0.63
65 and older	5,430	56.29	151,193	13.29	4.24
Sex					
Male	5,804	60.17	561,395	49.35	1.22
Female	3,842	39.83	576,089	50.65	0.79
Residence	9,352		1,130,726		
Urban	6,968	74.51	832,050	73.59	1.01
Rural	2,384	25.49	298,676	26.41	0.97
Treaty Indian	349	3.62	60,752	5.34	0.68
Urban Income Quintile	6,821		829,386		
1 - lowest	1,681	24.64	165,887	20.00	1.23
2	1,659	24.32	165,865	20.00	1.22
3	1,400	20.52	166,102	20.03	1.02
4	1,089	15.97	165,879	20.00	0.80
5 - highest	992	14.54	165,653	19.97	0.73
Rural Income Quintile	2,386		298,676		
1 - lowest	527	22.09	60,167	20.14	1.10
2	578	24.22	59,333	19.87	1.22
3	467	19.57	61,539	20.60	0.95
4	426	17.85	59,342	19.87	0.90
5 - highest	388	16.26	58,295	19.52	0.83

Table E6d. Low/Moderate-Variation (LMV) Diagnosis Related Groups: Demographic Comparison with the Population of Manitoba - 1993/94

	LV DRGs 1993/94		MB Population 1993		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	9,802		1,137,095		
Age					
0 to 14	308	3.14	248,184	21.83	0.14
15 to 64	3,893	39.72	736,544	64.77	0.61
65 and older	5,601	57.14	152,367	13.40	4.26
Sex					
Male	5,893	60.12	561,207	49.35	1.22
Female	3,909	39.88	575,888	50.65	0.79
Residence	9,465		1,125,101		
Urban	6,966	73.60	826,660	73.47	1.00
Rural	2,499	26.40	298,441	26.53	1.00
Treaty Indian	339	3.46	62,132	5.46	0.63
Urban Income Quintile	6,808		823,389		
1 - lowest	1,695	24.90	163,669	19.88	1.25
2	1,628	23.91	168,174	20.42	1.17
3	1,374	20.18	164,355	19.96	1.01
4	1,070	15.72	163,671	19.88	0.79
5 - highest	1,041	15.29	163,520	19.86	0.77
Rural Income Quintile	2,500		298,441		
1 - lowest	477	19.08	59,054	19.79	0.96
2	593	23.72	58,572	19.63	1.21
3	495	19.80	58,709	19.67	1.01
4	519	20.76	62,678	21.00	0.99
5 - highest	416	16.64	59,428	19.91	0.84

Table E6e. Low/Moderate-Variation (LMV) Diagnosis Related Groups: Demographic Comparison with the Population of Manitoba - 1994/95

	LV DRGs 1994/95		MB Population 1994		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	9,681		1,138,338		
Age					
0 to 14	304	3.14	248,161	21.80	0.14
15 to 64	3,863	39.90	736,586	64.71	0.62
65 and older	5,514	56.96	153,591	13.49	4.22
Sex					
Male	5,783	59.74	561,205	49.30	1.21
Female	3,898	40.26	577,133	50.70	0.79
Residence	9,352		1,122,369		
Urban	6,854	73.29	822,891	73.32	1.00
Rural	2,498	26.71	299,478	26.68	1.00
Treaty Indian	366	3.78	63,298	5.56	0.68
Urban Income Quintile	6,688		819,109		
1 - lowest	1,606	24.01	160,812	19.63	1.22
2	1,624	24.28	167,996	20.51	1.18
3	1,352	20.22	164,505	20.08	1.01
4	1,066	15.94	163,124	19.91	0.80
5 - highest	1,040	15.55	162,672	19.86	0.78
Rural Income Quintile	2,498		299,478		
1 - lowest	542	21.70	59,952	20.02	1.08
2	603	24.14	59,273	19.79	1.22
3	519	20.78	58,413	19.50	1.07
4	492	19.70	61,887	20.66	0.95
5 - highest	342	13.69	59,953	20.02	0.68

APPENDIX F: TABLES FOR AMBULATORY CARE SENSITIVE (ACS) CONDITIONS

1. Rates of Hospitalizations

   Table 1a. Pre-Reform Period 1990/91-1991/92
   Table 1b. Reform Period 1992/93-1994/95

2. Rates of Hospitalizations by Income Quintile

   Tables 2a through 2e. Urban 1990/91 to 1994/95
   Tables 2f through 2j. Rural 1990/91 to 1994/95

3. Rates of Hospital Days

   Table 3a. Pre-Reform Period 1990/91-1991/92
   Table 3b. Reform Period 1992/93-1994/95

4. Rates of Hospital Days by Income Quintile

   Tables 4a through 4e. Urban 1990/91 to 1994/95
   Tables 4f through 4j. Rural 1990/91 to 1994/95

5. Resource Use: 1990/91 to 1994/95

6. Demographics: Ratios to Manitoba Population

   Tables 6a through 6e. 1990/91 to 1994/95

7. Charlson Comorbidity Index (CCI) and RDRG Illness Severity by Year

8. Low Illness Level Exclusions by Year

9. Potentially Reducible Hospital Days

   Tables 9a through 9e. 1990/91 to 1994/95

Table F1a. Ambulatory Care Sensitive (ACS) Conditions: Hospitalizations for Pre-Reform Period 1990/91-1991/92

	Direct Age- and Sex-Adjusted Rates per 10,000 MB Population			
	1990/91		1991/92	
	N	Rate	N	Rate
Bacterial pneumonia	3,728	33.45 ***	4,197	37.15
Congestive heart failure	2,958	27.11 *	3,202	28.67
Asthma	2,239	19.74 ***	2,563	22.51
Chronic obstructive pulm.dis.	2,119	19.17	2,267	20.17
Gastroenteritis	1,564	13.83	1,650	14.53
Severe ENT infections	1,496	13.12	1,503	13.16
Angina	1,427	12.91	1,518	13.50
Kidney/urinary infection	1,262	11.26 ***	1,402	12.38
Cellulitis	1,085	9.66	1,081	9.55
Dehydration	781	7.08	802	7.13
Dental conditions	631	5.59	635	5.59
Diabetes "B"	618	5.57	619	5.50
Hypertension	463	4.19	516	4.60
Pelvic inflammatory disease	475	4.09	484	4.19
Grand mal/oth.epilep.convuls.	441	3.91	464	4.08
Diabetes "C"	338	3.05	339	3.01
Convulsions "B" (age >5)	285	2.54	307	2.71
Diabetes "A"	225	1.99	258	2.28
Convulsions "A" (age 0-5)	226	1.98	226	1.98
Iron deficiency anaemia	147	1.29 ***	212	1.85
Skin grafts with cellulitis	101	0.91 ***	140	1.23
Hypoglycemia	101	0.90	87	0.77
Immun.related & prev.cond.	64	0.56	69	0.60
Failure to thrive	60	0.52	54	0.47
Pulmonary tuberculosis	57	0.51	61	0.54
Nutritional deficiencies	35	0.32	34	0.30
Other tuberculosis	18	0.16 *	30	0.26
TOTAL	22,944	205.40	24,720	218.72

* Significantly different from 1991/92 at P<=.05.

** Significantly different from 1991/92 at P<=.01.

*** Significantly different from 1991/92at P<=.001.

Table F1b. Ambulatory Care Sensitive (ACS) Conditions: Hospitalizations for Reform Period 1992/93-1994/95

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population

	1992/93		1993/94		1994/95			
	N	Rate	N	Rate	N	Rate	P-Value+	Adj.P+
Bacterial pneumonia	3,756	33.02 ***	3,908	34.16 ***	4,386	37.98	0.000	0.000
Congestive heart failure	3,265	28.70	3,272	28.48	3,182	27.16 *	0.059	0.020
Asthma	2,455	21.58	2,395	21.00 **	2,150	18.83 ***	0.000	0.000
Chronic obstructive pulm.dis.	2,349	20.65	2,399	20.96	2,445	21.12	0.132	0.044
Gastroenteritis	1,643	14.44	1,521	13.34 ***	1,563	13.62 *	0.000	0.000
Angina	1,630	14.33 *	1,719	14.98 ***	1,685	14.52 *	0.000	0.000
Severe ENT infections	1,437	12.63	1,330	11.70 ***	1,243	10.94 ***	0.000	0.000
Kidney/urinary infection	1,428	12.55	1,387	12.14	1,461	12.69	0.490	0.163
Cellulitis	1,097	9.64	1,018	8.92 *	1,242	10.81 ***	0.000	0.000
Dehydration	874	7.68 *	881	7.68 *	988	8.51 ***	0.000	0.000
Diabetes "B"	657	5.78	661	5.76	489	4.23 ***	0.000	0.000
Hypertension	597	5.25 **	615	5.36 **	559	4.81	0.000	0.000
Dental conditions	560	4.93 **	481	4.22 ***	466	4.08 ***	0.000	0.000
Grand mal/oth.epilep.convuls.	558	4.91 **	438	3.84	459	4.02	0.014	0.005
Pelvic inflammatory disease	547	4.81 **	487	4.32	499	4.47	0.011	0.004
Diabetes "C"	314	2.76	306	2.68 *	477	4.14 ***	0.000	0.000
Convulsions "B" (age >5)	300	2.64	275	2.40	333	2.92	0.087	0.029
Convulsions "A" (age 0-5)	239	2.10	253	2.22	249	2.19	0.111	0.037
Diabetes "A"	223	1.96 *	258	2.26	279	2.45	0.093	0.031
Iron deficiency anaemia	167	1.47 **	125	1.10 ***	121	1.06 ***	0.000	0.000
Hypoglycemia	84	0.74	93	0.82	51	0.44 ***	0.000	0.000
Skin grafts with cellulitis	73	0.64 ***	101	0.88 ***	93	0.82 ***	0.000	0.000
Failure to thrive	69	0.61	49	0.44	55	0.48	0.306	0.102
Pulmonary tuberculosis	59	0.52	61	0.54	80	0.71	0.217	0.072
Immun.related & prev.cond.	47	0.41 **	53	0.46	101	0.89 **	0.000	0.000
Other tuberculosis	38	0.33	43	0.38	37	0.33	0.067	0.022
Nutritional deficiencies	31	0.27	49	0.42 *	44	0.39	0.048	0.016
TOTAL	24,497	215.37	24,178	211.52	24,737	214.61		

+ P-value represents overall value of 3-year reform period compared against 1991/92. Adjusted P-value (Adj.P) based on Bonferroni method.

** Significantly different from 1991/92 at P<=.01.

*** Significantly different from 1991/92 at P<=.001.

Table F2a. Urban Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospitalizations by Income Quintile for 1990/91

1990/91 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Chronic obstructive pulm.dis.	3.56	23.38	17.76	13.63	13.55	6.56	15.98	1,259	0.000
Gastroenteritis	3.16	13.47	12.63	10.09	4.61	4.26	9.19	738	0.000
Severe ENT infections	3.08	11.24	9.54	7.26	4.17	3.64	7.10	573	0.000
Kidney/urinary infection	2.41	12.64	9.72	7.88	7.10	5.24	8.66	700	0.000
Cellulitis	1.98	10.22	9.10	5.89	4.62	5.15	7.01	569	0.000
Bacterial pneumonia	1.93	34.42	27.98	21.17	18.20	17.83	24.18	1,899	0.000
Congestive heart failure	1.89	28.59	26.96	24.42	18.13	15.16	23.93	1,831	0.000
Angina	1.76	13.85	10.97	12.64	10.95	7.89	11.61	918	0.000
Asthma	1.63	20.53	17.80	23.11	17.61	12.62	18.36	1,480	0.000
TOTAL	2.15	168.34	142.47	126.08	98.94	78.35	126.02	9,967	

Table F2b. Urban Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospitalizations by Income Quintile for 1991/92

1991/92 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Chronic obstructive pulm.dis.	3.46	25.77	19.63	15.48	17.55	7.44	17.80	1,434	0.000
Severe ENT infections	2.55	11.62	10.04	7.46	4.58	4.55	7.60	615	0.000
Cellulitis	2.43	11.10	8.38	6.75	4.71	4.57	7.16	582	0.000
Bacterial pneumonia	2.26	39.28	27.21	24.08	20.80	17.39	26.25	2,092	0.000
Kidney/urinary infection	2.25	12.22	10.98	8.50	7.47	5.44	8.99	737	0.000
Gastroenteritis	2.14	12.92	11.78	11.05	5.61	6.03	9.55	769	0.000
Asthma	1.89	27.46	22.49	22.10	17.09	14.51	20.69	1,674	0.000
Angina	1.64	15.08	13.22	13.02	10.88	9.20	12.63	1,018	0.000
Congestive heart failure	1.46	27.46	29.04	25.28	22.04	18.79	25.28	1,977	0.000
TOTAL	2.08	182.91	152.77	133.72	110.73	87.92	135.95	10,898	

Table F2c. Urban Ambulatory Care Sensitive (ACS) Conditions: Reform Hospitalizations by Income Quintile for 1992/93

1992/93 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Gastroenteritis	3.81	13.69	14.44	9.28	6.61	3.59	9.71	789	0.000
Severe ENT infections	3.57	10.74	9.50	7.90	4.71	3.01	7.12	574	0.000
Cellulitis	3.30	10.65	8.14	5.84	5.56	3.23	6.72	549	0.000
Chronic obstructive pulm.dis.	3.02	26.93	20.02	18.51	17.54	8.91	19.02	1,545	0.000
Bacterial pneumonia	2.49	34.78	25.74	23.36	15.29	13.97	23.16	1,862	0.000
Kidney/urinary infection	2.12	14.40	10.81	8.01	7.64	6.79	9.50	778	0.000
Congestive heart failure	2.02	32.89	27.59	24.71	19.38	16.30	25.46	2,027	0.000
Asthma	1.97	26.21	21.89	18.28	15.21	13.32	18.89	1,531	0.000
Angina	1.53	14.87	12.03	14.04	11.69	9.74	12.76	1,042	0.000
TOTAL	2.35	185.16	150.16	129.94	103.63	78.86	132.35	10,697	

Table F2d. Urban Ambulatory Care Sensitive (ACS) Conditions: Reform Hospitalizations by Income Quintile for 1993/94

1993/94 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Chronic obstructive pulm.dis.	3.33	28.13	20.53	18.34	16.10	8.46	19.23	1,561	0.000
Bacterial pneumonia	2.75	38.34	23.71	23.91	16.26	13.92	23.53	1,886	0.000
Severe ENT infections	2.66	9.60	9.71	6.97	4.01	3.60	6.76	544	0.000
Cellulitis	2.34	9.89	7.62	6.63	4.29	4.23	6.54	536	0.000
Asthma	2.04	27.30	22.18	17.56	15.51	13.37	19.14	1,545	0.000
Congestive heart failure	2.03	32.58	26.96	27.24	18.32	16.01	25.28	2,017	0.000
Kidney/urinary infection	2.01	12.90	11.47	7.24	6.88	6.41	8.98	733	0.000
Gastroenteritis	1.95	11.00	11.29	10.18	5.91	5.65	8.81	711	0.000
Angina	1.61	16.53	14.03	13.82	12.59	10.24	13.46	1,102	0.000
TOTAL	2.27	186.27	147.50	131.89	99.86	81.89	131.74	10,635	

Table F2e. Urban Ambulatory Care Sensitive (ACS) Conditions: Reform Hospitalizations by Income Quintile for 1994/95

1994/95 Urban Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Chronic obstructive pulm.dis.	2.51	29.09	18.55	18.44	16.92	11.57	19.21	1,572	0.000
Bacterial pneumonia	2.33	38.23	28.67	27.64	18.86	16.41	26.29	2,132	0.000
Gastroenteritis	2.32	13.00	11.83	7.98	5.70	5.60	9.11	736	0.000
Cellulitis	2.00	11.15	8.89	6.86	4.48	5.57	7.50	612	0.000
Severe ENT infections	1.94	9.40	7.80	7.84	4.10	4.84	6.72	538	0.000
Kidney/urinary infection	1.88	13.51	12.14	9.22	7.09	7.17	9.96	811	0.000
Congestive heart failure	1.85	30.44	26.02	23.99	19.61	16.45	23.90	1,938	0.000
Angina	1.70	15.01	13.97	12.62	11.69	8.83	12.73	1,049	0.000
Asthma	1.70	22.56	22.62	17.94	13.51	13.28	17.89	1,439	0.000
TOTAL	2.03	182.38	150.49	132.53	101.96	89.72	133.31	10,827	

Table F2f. Rural Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospitalizations by Income Quintile for 1990/91

1990/91 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Severe ENT infections	8.43	60.14	32.93	19.20	13.17	7.14	27.69	916	0.000
Gastroenteritis	5.85	50.00	31.03	20.55	18.80	8.55	26.38	804	0.000
Cellulitis	4.51	33.04	19.95	14.93	11.23	7.33	16.95	490	0.000
Bacterial pneumonia	4.27	103.88	66.71	41.49	32.24	24.34	55.12	1,653	0.000
Kidney/urinary infection	4.08	35.81	20.24	16.60	10.81	8.79	18.64	521	0.000
Asthma	2.38	32.06	29.71	18.75	24.19	13.48	23.85	743	0.000
Congestive heart failure	2.37	60.19	37.29	35.35	30.39	25.38	38.94	1,004	0.000
Angina	2.22	23.94	19.75	17.02	13.62	10.80	17.61	485	0.000
Chronic obstructive pulm.dis.	2.19	40.98	34.39	21.71	19.65	18.76	27.89	801	0.000
TOTAL	3.53	440.04	291.98	205.59	174.10	124.55	253.07	7,417	

Table F2g. Rural Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospitalizations by Income Quintile for 1991/92

1991/92 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Severe ENT infections	6.14	52.58	34.29	21.12	13.97	8.57	27.00	880	0.000
Bacterial pneumonia	5.61	123.32	83.47	45.74	29.49	21.98	62.44	1,909	0.000
Gastroenteritis	5.37	52.58	32.65	24.51	20.07	9.80	28.79	866	0.000
Cellulitis	4.99	33.52	15.69	14.96	10.07	6.72	16.05	469	0.000
Kidney/urinary infection	3.78	41.39	26.84	18.67	12.26	10.94	22.44	625	0.000
Asthma	2.63	42.43	31.11	23.99	23.98	16.11	27.53	866	0.000
Angina	2.30	23.88	16.57	17.17	17.84	10.38	17.50	486	0.000
Chronic obstructive pulm.dis.	1.94	41.53	31.71	18.18	19.15	21.40	26.57	762	0.000
Congestive heart failure	1.60	61.25	40.46	37.27	28.66	38.36	41.24	1,085	0.000
TOTAL	3.28	472.48	312.79	221.61	175.49	144.26	269.56	7,948	

Table F2h. Rural Ambulatory Care Sensitive (ACS) Conditions: Reform Hospitalizations by Income Quintile for 1992/93

1992/93 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Severe ENT infections	7.12	52.15	39.19	16.22	12.18	7.33	26.35	854	0.000
Kidney/urinary infection	5.69	40.67	26.44	15.89	13.93	7.14	21.31	608	0.000
Gastroenteritis	4.86	49.09	33.81	23.91	15.33	10.11	27.38	832	0.000
Bacterial pneumonia	4.59	110.94	65.40	42.17	30.33	24.18	56.21	1,694	0.000
Cellulitis	3.90	35.54	22.38	13.47	9.53	9.11	18.14	524	0.000
Chronic obstructive pulm.dis.	3.33	41.82	33.20	16.26	19.64	12.55	25.80	740	0.000
Asthma	3.28	47.50	35.40	20.73	26.88	14.49	29.08	899	0.000
Angina	2.57	24.70	25.38	19.11	20.17	9.61	20.26	573	0.000
Congestive heart failure	1.52	59.43	40.23	38.32	31.92	39.01	41.55	1,104	0.000
TOTAL	3.46	461.84	321.44	206.08	179.92	133.53	266.08	7,828	

Table F2i. Rural Ambulatory Care Sensitive (ACS) Conditions: Reform Hospitalizations by Income Quintile for 1993/94

1993/94 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Severe ENT infections	8.62	50.34	33.52	15.23	11.89	5.84	24.08	769	0.000
Bacterial pneumonia	5.47	120.95	75.40	44.91	32.14	22.12	60.71	1,821	0.000
Gastroenteritis	5.29	45.30	30.67	25.92	17.05	8.57	25.93	783	0.000
Cellulitis	5.20	30.66	21.73	13.13	9.72	5.90	16.12	465	0.000
Kidney/urinary infection	4.31	42.49	28.17	16.15	12.05	9.85	22.09	608	0.000
Angina	3.18	30.66	22.63	22.05	17.69	9.65	20.87	588	0.000
Asthma	3.05	40.46	35.76	23.41	17.51	13.26	26.59	823	0.000
Congestive heart failure	2.63	62.77	42.67	38.83	32.73	23.88	41.34	1,094	0.000
Chronic obstructive pulm.dis.	2.48	39.85	34.44	20.84	17.16	16.10	26.35	759	0.000
TOTAL	4.02	463.49	325.00	220.48	167.94	115.17	264.07	7,710	

Table F2j. Rural Ambulatory Care Sensitive (ACS) Conditions: Reform Hospitalizations by Income Quintile for 1994/95

1994/95 Rural Direct Age- and Sex-Adjusted Rates per 10,000

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N	Trend P-Value
Severe ENT infections	9.33	42.94	29.65	15.48	11.20	4.60	21.60	690	0.000
Kidney/urinary infection	5.33	44.16	27.21	19.18	9.63	8.28	22.06	609	0.000
Cellulitis	5.10	40.35	26.13	18.24	10.76	7.91	20.35	598	0.000
Gastroenteritis	5.04	50.29	29.60	24.54	17.71	9.97	27.02	803	0.000
Bacterial pneumonia	4.35	139.86	77.59	53.36	33.96	32.18	68.81	2,065	0.000
Asthma	3.95	38.01	28.82	16.61	14.23	9.63	21.68	682	0.000
Congestive heart failure	3.44	67.11	46.87	37.20	29.65	19.53	41.20	1,088	0.000
Angina	2.63	26.74	25.16	22.40	19.36	10.16	21.15	612	0.000
Chronic obstructive pulm.dis.	2.10	38.87	28.58	24.03	21.18	18.51	26.67	770	0.000
TOTAL	4.04	488.33	319.63	231.03	167.68	120.77	270.54	7,917	

Table F3a. Ambulatory Care Sensitive (ACS) Conditions: Hospital Days for Pre-Reform Period 1990/91-1994/95

	Direct Age- and Sex-Adjusted Rates of Hospital Days per 10,000 MB Population				
	1990/91			1991/92	
	N	Rate		N	Rate
Total discharges	22,554			24,241	
Congestive heart failure	41,935	387.11		44,984	404.04
Bacterial pneumonia	35,742	325.84	**	42,065	375.00
Chronic obstructive pulm.dis.	34,068	309.51	***	44,570	397.92
Dehydration	16,304	150.82		17,004	152.85
Asthma	9,381	83.47	***	12,315	108.67
Kidney/urinary infection	8,161	73.86		9,139	81.18
Diabetes "B"	7,540	68.49		9,123	81.11
Angina	7,297	66.21		7,719	68.80
Cellulitis	7,294	65.36		8,076	71.73
Gastroenteritis	6,118	54.69		6,644	58.85
Severe ENT infections	4,863	42.99		4,942	43.39
Diabetes "C"	4,120	37.79		3,454	30.80
Skin grafts with cellulitis	3,531	31.84		4,057	35.72
Convulsions "B" (age >5)	3,004	27.88		2,015	17.80
Hypertension	2,783	25.59	**	3,891	34.84
Grand mal/oth.epilep.convuls.	2,811	25.34	*	3,812	33.87
Pelvic inflammatory disease	1,802	15.61	**	1,388	12.06
Pulmonary tuberculosis	1,611	14.57		1,615	14.17
Diabetes "A"	1,498	13.44	***	2,257	20.10
Nutritional deficiencies	1,448	13.11		1,468	12.98
Dental conditions	1,459	13.01		1,207	10.63
Iron deficiency anaemia	923	8.08	**	1,249	10.92
Convulsions "A" (age 0-5)	843	7.38		571	4.99
Failure to thrive	563	4.93		415	3.63
Immun.related & prev.cond.	495	4.32		514	4.49
Hypoglycemia	379	3.41		451	4.01
Other tuberculosis	336	2.96		494	4.35
TOTAL HOSPITAL DAYS	206,309	1,877.60		235,439	2,098.87

* Significantly different from 1991/92 at P<=.05.

** Significantly different from 1991/92 at P<=.01.

*** Significantly different from 1991/92 at P<=.001.

Table F3b. Ambulatory Care Sensitive (ACS) Conditions: Hospital Days for Reform Period 1992/93-1994/95

Direct Age- and Sex-Adjusted Rates of Hospital Days per 10,000 MB Population

	1992/93		1993/94		1994/95			
	N	Rate	N	Rate	N	Rate	P-Value+	Adj.P+
Total ACS Discharges	24,498		24,178		24,737			
Chronic obstructive pulm.dis.	52,342	460.16	42,997	375.37	47,261	405.79	0.210	0.070
Congestive heart failure	49,651	436.50	46,407	403.00	43,734	371.06	0.156	0.052
Bacterial pneumonia	34,605	304.22 ***	34,044	296.69 ***	37,287	319.47 ***	0.000	0.000
Dehydration	18,121	159.31	14,316	124.32 *	14,382	122.54 **	0.001	0.000
Asthma	9,983	87.76 ***	11,260	98.49	11,085	96.18	0.000	0.000
Kidney/urinary infection	9,146	80.41	8,263	72.08 *	9,126	78.39	0.039	0.013
Diabetes "B"	8,103	71.24	7,418	64.66 **	5,465	47.48 ***	0.000	0.000
Angina	7,411	65.15	8,374	72.88	7,666	65.96	0.162	0.054
Cellulitis	7,017	61.69 **	6,653	58.13 ***	7,563	65.27	0.000	0.000
Gastroenteritis	5,922	52.06 **	5,642	49.33 ***	5,748	49.56 ***	0.000	0.000
Diabetes "C"	5,088	44.73	3,229	27.99	3,997	34.68	0.159	0.053
Grand mal/oth.epilep.convuls	4,514	39.68	2,606	22.83 ***	2,714	23.79 ***	0.000	0.000
Severe ENT infections	4,356	38.30 **	3,674	32.24 ***	3,457	30.26 ***	0.000	0.000
Hypertension	3,578	31.46	3,251	28.28 **	3,210	27.54 **	0.001	0.000
Convulsions "B" (age >5)	2,479	21.79	2,394	20.79	2,094	18.06 *	0.688	0.229
Skin grafts with cellulitis	2,342	20.59 ***	3,123	27.15	3,705	32.50	0.002	0.001
Diabetes "A"	1,854	16.30	1,640	14.35 ***	2,064	17.95	0.000	0.000
Other tuberculosis	1,820	16.00 *	1,460	12.77 **	1,147	10.08	0.000	0.000
Pelvic inflammatory disease	1,524	13.40	1,172	10.36 *	1,082	9.63 ***	0.000	0.000
Pulmonary tuberculosis	1,206	10.60	1,394	12.11	1,932	17.05	0.094	0.031
Nutritional deficiencies	1,073	9.43	2,067	18.14	2,341	20.25	0.068	0.023
Dental conditions	1,027	9.03 *	685	6.03 ***	580	5.08 ***	0.000	0.000
Iron deficiency anaemia	901	7.92 **	776	6.81 ***	1,055	9.33	0.000	0.000
Convulsions "A" (age 0-5)	538	4.73	525	4.61	553	4.86	0.551	0.184
Immun.related & prev.cond.	473	4.16	315	2.77 **	554	4.86	0.007	0.002
Hypoglycemia	408	3.59	422	3.67	342	2.88	0.528	0.176
Failure to thrive	377	3.31	320	2.81	551	4.84	0.120	0.040
TOTAL HOSPITAL DAYS	235,859	2073.52	214,427	1868.89	220,695	1895.32		

+ P-value represents overall value of 3-year reform period compared against 1991/92.
Adjusted P-value (Adj.P) based on Bonferroni method.

* Significantly different from 1991/92 at P<=.05.

** Significantly different from 1991/92 at P<=.01.

*** Significantly different from 1991/92 at P<=.001.

Table F4a. Urban Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospital Days by Income Quintile for 1990/91

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 9,416

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Diabetes "B"	6.82	93.17	58.19	54.65	45.61	13.66	56.25	4,473	0.000
COPD	2.54	456.47	223.09	229.62	284.23	179.70	288.47	22,499	0.000
Kidney/urin.inf.	2.49	92.14	61.29	56.90	74.25	37.06	63.57	4,977	0.000
Cellulitis	2.03	75.64	57.38	45.69	44.44	37.25	52.01	4,212	0.000
Asthma	1.96	85.83	74.36	91.10	71.04	43.77	75.06	6,063	0.000
Bact. pneumonia	1.67	367.42	338.01	223.90	277.69	220.22	286.52	21,809	0.000
Angina	1.60	85.82	62.33	65.41	43.11	53.80	64.68	5,040	0.000
Cong. heart failur	1.39	382.15	419.51	420.85	259.88	274.07	369.23	27,606	0.000
Dehydration	0.96	156.65	135.09	84.80	116.60	163.56	126.81	9,604	0.576
TOTAL	1.75	1,795.28	1,429.26	1,272.92	1,216.85	1,023.09	1,382.61	106,283	

Table F4b. Urban Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospital Days by Income Quintile for 1991/92

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 10,319

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Diabetes "B"	8.56	111.76	80.91	60.28	64.56	13.06	70.90	5,752	0.000
Cellulitis	2.74	85.06	61.35	47.81	31.57	31.05	53.15	4,260	0.000
Asthma	2.73	129.63	101.60	101.03	68.25	47.55	92.15	7,484	0.000
Bact. pneumonia	2.09	434.18	267.65	307.67	274.16	207.29	294.72	23,020	0.000
COPD	2.08	431.75	346.54	382.62	488.59	207.41	359.27	28,473	0.000
Dehydration	1.94	169.01	122.65	116.91	204.57	86.99	142.65	10,906	0.000
Angina	1.86	79.21	65.65	67.05	58.21	42.58	64.98	5,208	0.000
Kidney/urin.inf.	1.71	77.22	61.19	57.38	59.46	45.14	60.76	4,914	0.000
Cong. heart failur	1.09	375.92	433.92	351.75	295.13	345.96	367.76	28,078	0.000
TOTAL	1.84	1,893.74	1,541.46	1,492.50	1,544.50	1,027.03	1,506.34	118,095	

Table F4c. Urban Ambulatory Care Sensitive (ACS) Conditions: Reform Hospital Days by Income Quintile for 1992/93

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 10,176

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Cellulitis	3.87	66.96	63.99	37.99	42.37	17.29	46.94	3,821	0.000
Bact. pneumonia	3.16	405.62	244.63	251.42	149.22	128.51	255.50	20,193	0.000
Asthma	2.51	108.01	87.74	78.56	70.96	43.00	78.13	6,380	0.000
Kidney/urin.inf.	2.20	99.38	71.69	62.77	65.55	45.09	68.28	5,568	0.000
Diabetes "B"	2.09	62.22	89.77	42.99	44.52	29.78	55.92	4,647	0.000
Angina	1.94	74.48	57.08	72.59	67.84	38.37	63.75	5,178	0.000
Dehydration	1.67	200.50	133.76	130.97	145.84	119.90	144.25	11,432	0.000
COPD	1.52	597.46	307.43	378.77	577.26	394.29	413.97	33,121	0.000
Cong. heart failur	1.22	493.49	461.95	425.73	403.86	403.19	439.64	34,207	0.000
TOTAL	1.73	2,108.11	1,518.04	1,481.80	1,567.41	1,219.42	1,566.39	124,547	

Table F4d. Urban Ambulatory Care Sensitive (ACS) Conditions: Reform Hospital Days by Income Quintile for 1993/94

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 10,201

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
COPD	2.91	482.73	412.54	274.75	543.67	166.07	374.71	30,004	0.000
Asthma	2.65	121.89	112.10	80.01	116.71	45.93	91.60	7,514	0.000
Cellulitis	2.49	63.82	52.35	50.98	31.18	25.63	46.14	3,739	0.000
Bact. pneumonia	2.39	398.09	248.06	219.32	143.80	166.40	246.33	19,515	0.000
Diabetes "B"	2.04	82.31	63.27	43.03	15.69	40.32	50.07	4,143	0.000
Kidney/urin.inf.	1.88	73.28	75.42	38.63	68.25	39.06	57.73	4,684	0.000
Angina	1.74	97.17	66.33	64.55	69.23	55.84	72.93	5,904	0.000
Cong. heart failur	1.59	469.77	362.55	501.64	242.63	296.37	391.08	30,389	0.000
Dehydration	1.39	137.95	97.16	80.94	99.09	99.24	104.05	8,288	0.000
TOTAL	2.06	1,927.01	1,489.78	1,353.84	1,330.25	934.86	1,434.64	114,180	

Table F4e. Urban Ambulatory Care Sensitive (ACS) Conditions: Reform Hospital Days by Income Quintile for 1994/95

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 10,335

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Kidney/urin.inf.	3.20	130.08	76.09	61.54	31.69	40.70	69.43	5,662	0.000
Diabetes "B"	2.74	68.22	29.45	21.80	37.80	24.92	34.71	2,877	0.000
Bact. pneumonia	2.57	334.22	311.65	216.09	198.65	129.98	251.10	20,200	0.000
COPD	2.56	528.05	395.24	301.29	517.26	206.21	382.49	31,315	0.000
Dehydration	2.09	148.50	108.02	116.34	121.61	70.99	112.26	9,265	0.000
Cong. heart failur	2.01	409.78	330.91	450.44	316.77	203.37	353.33	28,458	0.000
Cellulitis	1.91	60.54	54.16	36.20	24.99	31.68	43.70	3,563	0.000
Angina	1.86	69.31	64.65	63.56	53.74	37.31	59.32	4,889	0.000
Asthma	1.54	100.93	88.51	127.69	53.21	65.60	88.98	7,293	0.000
TOTAL	2.28	1,849.62	1,458.67	1,394.97	1,355.72	810.76	1,395.31	113,522	

Table F4f. Rural Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospital Days by Income Quintile for 1990/91

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,208

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Cellulitis	4.45	195.01	105.04	100.84	78.94	43.81	101.76	2,895	0.000
Kidney/urin.inf.	3.81	175.61	92.21	89.17	55.83	46.11	94.03	2,523	0.000
Bact. pneumonia	3.36	708.09	430.80	397.72	260.89	210.75	411.73	11,575	0.000
Asthma	2.66	130.33	114.02	105.48	164.50	49.02	109.05	3,195	0.000
COPD	2.66	413.65	394.11	260.15	208.43	155.72	304.38	8,501	0.000
Cong. heart failur	2.21	522.34	455.78	466.63	356.16	236.80	427.92	10,588	0.000
Diabetes "B"	1.97	169.52	71.15	107.40	100.79	86.22	97.86	2,599	0.000
Angina	1.96	105.12	84.29	76.57	69.96	53.52	79.75	2,153	0.000
Dehydration	1.01	110.54	50.25	79.10	33.81	109.86	70.41	1,975	0.041
TOTAL	2.55	2,530.20	1,797.66	1,683.04	1,329.31	991.82	1,696.88	46,004	

Table F4g. Rural Ambulatory Care Sensitive (ACS) Conditions: Pre-Reform Hospital Days by Income Quintile for 1991/92

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,703

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Diabetes "B"	9.39	214.54	97.62	46.89	97.44	22.85	93.97	2,599	0.000
Cellulitis	3.21	192.84	103.11	84.97	77.81	60.00	102.32	2,880	0.000
Kidney/urin.inf.	2.86	187.73	142.04	140.93	80.07	65.63	127.33	3,444	0.000
COPD	2.43	430.06	287.97	185.39	234.16	176.62	264.00	7,572	0.000
Angina	2.17	97.18	68.74	89.35	92.56	44.76	80.01	2,176	0.000
Cong. heart failur	1.96	856.58	396.18	451.68	537.92	437.99	532.28	13,277	0.000
Asthma	1.69	156.29	157.87	124.20	97.48	92.67	126.17	3,861	0.000
Bact. pneumonia	1.19	1,121.48	588.04	315.55	273.24	941.02	617.83	16,630	0.000
Dehydration	0.67	58.76	76.57	81.81	71.31	87.13	72.98	1,934	0.000
TOTAL	1.72	3,315.46	1,918.14	1,520.77	1,561.99	1,928.67	2,016.89	54,373	

Table F4h. Rural Ambulatory Care Sensitive (ACS) Conditions: Reform Hospital Days by Income Quintile for 1992/93

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,703

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Kidney/urin.inf.	4.77	196.51	126.84	74.58	93.06	41.21	108.82	3,012	0.000
Cellulitis	4.67	188.72	120.14	82.05	43.96	40.37	97.59	2,776	0.000
COPD	3.68	451.74	507.24	203.80	306.46	122.70	345.60	9,992	0.000
Dehydration	2.63	120.82	40.18	73.51	54.90	46.02	67.13	1,853	0.000
Bact. pneumonia	2.50	588.69	454.01	331.36	353.83	235.06	398.08	11,500	0.000
Angina	2.08	84.51	89.46	70.33	90.87	40.68	77.03	2,169	0.000
Asthma	2.05	152.36	141.02	89.08	102.85	74.46	111.25	3,378	0.000
Diabetes "B"	1.37	231.82	92.09	47.11	37.73	169.33	102.00	2,937	0.000
Cong. heart failur	0.90	513.17	364.31	434.71	299.04	571.08	412.36	10,849	0.102
TOTAL	1.89	2,528.33	1,935.28	1,406.53	1,382.70	1,340.92	1,719.87	48,466	

Table F4i. Rural Ambulatory Care Sensitive (ACS) Conditions: Reform Hospital Days by Income Quintile for 1993/94

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,748

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Diabetes "B"	6.37	170.23	100.86	63.62	135.73	26.70	98.69	2,695	0.000
Dehydration	3.91	159.03	58.46	79.31	68.89	40.63	86.15	2,248	0.000
Kidney/urin.inf.	3.69	203.64	154.80	85.24	83.24	55.17	120.04	3,176	0.000
Asthma	3.25	183.33	192.08	92.66	63.91	56.45	121.34	3,650	0.000
Bact. pneumonia	2.56	680.48	531.56	368.43	222.85	265.55	423.42	12,173	0.000
Cellulitis	2.27	190.87	109.04	68.92	82.74	84.04	100.20	2,786	0.000
Angina	2.15	98.31	90.43	90.92	90.40	45.78	84.47	2,342	0.000
Cong. heart failur	1.50	494.97	447.38	433.03	350.03	330.53	416.34	10,853	0.000
COPD	0.74	311.46	367.75	245.14	135.50	422.08	281.96	8,064	0.418
TOTAL	1.88	2,492.31	2,052.36	1,527.28	1,233.30	1,326.94	1,732.59	47,987	

Table F4j. Rural Ambulatory Care Sensitive (ACS) Conditions: Reform Hospital Days by Income Quintile for 1994/95

Direct Age- and Sex-Adjusted Rates per 10,000 MB Population
Total Hospitalizations: 6,993

	Ratio Low/High	1 (low)	2	3	4	5	Overall Rate	N Days	Trend P-Value
Cellulitis	5.20	246.59	126.68	104.95	84.66	47.45	119.91	3,431	0.000
Diabetes "B"	4.16	131.22	65.84	42.65	42.50	31.56	62.15	1,745	0.000
Bact. pneumonia	3.27	785.41	515.28	397.74	277.76	240.02	453.50	13,108	0.000
Asthma	2.76	151.07	133.52	68.53	49.36	54.73	91.70	2,818	0.000
Dehydration	2.54	101.44	109.51	70.52	100.04	39.88	89.20	2,409	0.000
Kidney/urin.inf.	2.51	175.67	130.56	88.56	50.30	70.08	104.25	2,799	0.000
Angina	2.47	95.92	94.76	103.13	84.28	38.80	85.96	2,493	0.000
Cong. heart failur	1.43	506.55	413.69	441.47	423.02	353.80	421.92	10,714	0.000
COPD	0.59	269.80	372.95	273.80	173.56	457.13	301.13	8,406	0.000
TOTAL	1.85	2,463.66	1,962.78	1,591.35	1,285.46	1,333.44	1,729.72	47,923	

Table F5. Ambulatory Care Sensitive (ACS) Conditions: Resource Use

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Total ACS discharges	22,944		24,720		24,498		24,178		24,737	
Region of Hospitalization										
In region residence	19,831	86.43	21,408	86.60	21,258	86.77	21,044	87.04	21,534	87.05
Outside region of residence										
- Winnipeg	1,362	5.94	1,430	5.78	1,402	5.72	1,326	5.48	1,388	5.61
- Non-Winnipeg	1,751	7.63	1,882	7.61	1,838	7.50	1,808	7.48	1,815	7.34
Type of Hospital										
Teaching	4,425	19.29	4,865	19.68	4,634	18.92	4,399	18.19	4,682	18.93
Urban	5,193	22.63	5,701	23.06	5,601	22.86	5,615	23.22	5,686	22.99
Major rural	4,831	21.06	5,137	20.78	5,031	20.54	5,199	21.17	5,135	20.76
Other rural	7,717	33.63	8,148	32.96	8,330	34.00	8,136	33.65	8,316	33.62
Chronic	202	0.88	245	0.99	313	1.28	321	1.33	368	1.49
Out-of-province	576	2.51	624	2.52	589	2.40	588	2.43	550	2.22
Type of Stay										
Short-stay (<=60 days)	22,174	96.64	23,826	96.38	23,548	96.12	23,091	95.50	23,688	95.76
Long-stay	380	1.66	415	1.68	416	1.70	442	1.83	410	1.66
Surgical Outpatient	390	1.70	479	1.94	534	2.18	645	2.67	639	2.58

Table F6. Ambulatory Care Sensitive (ACS) Conditions Demographic Comparison of Ratios to Manitoba Population by Year

	Ratio to Manitoba Population					Current Demographics	
	Pre-Reform		Reform			1994/95	
	90/91	91/92	92/93	93/94	94/95	N	%
Age						18,860	
0 to 14	1.06	1.09	1.02	0.95	0.93	3,835	20.33
15 to 64	0.51	0.50	0.51	0.51	0.52	6,357	33.71
65 and older	3.35	3.31	3.34	3.47	3.41	8,668	45.96
Sex							
Male	0.98	0.98	0.97	0.98	0.97	9,044	47.95
Female	1.02	1.01	1.03	1.02	1.03	9,816	52.05
Residence						18,407	
Urban	0.81	0.82	0.81	0.81	0.82	11,002	59.77
Rural	1.53	1.51	1.54	1.54	1.51	7,405	40.23
Treaty Indian	2.76	2.69	2.70	2.68	2.58	2,700	14.32
Urban Income						10,804	
1-lowest quintile	1.51	1.51	1.53	1.54	1.54	3,273	30.29
2	1.27	1.27	1.30	1.26	1.25	2,764	25.58
3	1.01	0.98	0.99	1.01	1.00	2,159	19.98
4	0.68	0.67	0.65	0.65	0.66	1,425	13.19
5-highest quintile	0.53	0.55	0.52	0.54	0.55	1,183	10.95
Rural Income						7,407	
1-lowest quintile	1.76	1.81	1.80	1.80	1.81	2,685	36.25
2	1.33	1.29	1.34	1.33	1.31	1,913	25.83
3	0.84	0.86	0.78	0.89	0.92	1,332	17.98
4	0.66	0.65	0.65	0.63	0.59	902	12.18
5-highest quintile	0.40	0.41	0.42	0.37	0.39	575	7.76
Risk Index*						18,211	
0	0.39	0.39	0.35	0.35	0.36	1,244	6.83
1	0.60	0.61	0.60	0.58	0.59	4,366	23.97
2	1.19	1.18	1.20	1.20	1.20	6,032	33.12
3	2.60	2.55	2.56	2.61	2.62	4,651	25.54
4	3.82	3.70	3.91	3.82	3.60	1,722	9.46
5	11.71	14.43	16.57	16.86	13.50	196	1.08

** The risk index assigns a value of "1" to each of the following categories; an individual can have, for example, none of the following attributes (risk index of "0") or all five of them (risk index of "5"): 1) Age 65+; 2) Female; 3) Treaty Indian; 4) Rural Manitoba ; 5) Poorest income quintile (urban or rural)*

Table F6a. Ambulatory Care Sensitive (ACS) Conditions Demographic Comparison with the Population of Manitoba - 1990/91

	ACS Conditions 1990/91		MB Population 1990		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	17,713		1,135,792		
Age					
0 to 14	4,105	23.18	249,036	21.93	1.06
15 to 64	5,930	33.48	739,667	65.12	0.51
65 and older	7,678	43.35	147,089	12.95	3.35
Sex					
Male	8,590	48.50	561,601	49.45	0.98
Female	9,123	51.50	574,191	50.55	1.02
Residence	17,352		1,129,399		
Urban	10,322	59.49	829,780	73.47	0.81
Rural	7,030	40.51	299,619	26.53	1.53
Treaty Indian	2,503	14.13	58,133	5.12	2.76
Urban Income Quintile	10,134		827,371		
1 - lowest	3,052	30.12	165,598	20.01	1.51
2	2,581	25.47	165,453	20.00	1.27
3	2,057	20.30	165,655	20.02	1.01
4	1,381	13.63	165,479	20.00	0.68
5 - highest	1,063	10.49	165,186	19.97	0.53
Rural Income Quintile	7,028		299,619		
1 - lowest	2,480	35.29	59,970	20.02	1.76
2	1,853	26.37	59,556	19.88	1.33
3	1,165	16.58	58,828	19.63	0.84
4	981	13.96	63,006	21.03	0.66
5 - highest	549	7.81	58,259	19.44	0.40
Risk Index*	17,162		1,126,990		
0	1,326	7.73	261,881	23.24	0.33
1	4,194	24.44	453,426	40.23	0.61
2	5,581	32.52	273,131	24.24	1.34
3	4,282	24.95	107,288	9.52	2.62
4	1,638	9.54	30,559	2.71	3.52
5	141	0.82	705	0.06	13.67

Table F6b. Ambulatory Care Sensitive (ACS) Conditions Demographic Comparison with the Population of Manitoba - 1991/92

	ACS Conditions 1991/92		MB Population 1991		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	19,074		1,139,942		
Age					
0 to 14	4,541	23.81	249,315	21.87	1.09
15 to 64	6,254	32.79	741,099	65.01	0.50
65 and older	8,279	43.40	149,528	13.12	3.31
Sex					
Male	9,277	48.64	563,053	49.39	0.98
Female	9,797	51.36	576,889	50.61	1.01
Residence	18,674		1,133,499		
Urban	11,200	59.98	833,755	73.56	0.82
Rural	7,474	40.02	299,744	26.44	1.51
Treaty Indian	2,669	13.99	59,441	5.21	2.69
Urban Income Quintile	11,011		831,273		
1 - lowest	3,333	30.27	166,356	20.01	1.51
2	2,797	25.40	166,350	20.01	1.27
3	2,185	19.84	167,462	20.15	0.98
4	1,487	13.50	166,302	20.01	0.67
5 - highest	1,209	10.98	164,803	19.83	0.55
Rural Income Quintile	7,480		299,744		
1 - lowest	2,706	36.18	59,916	19.99	1.81
2	1,907	25.49	59,420	19.82	1.29
3	1,258	16.82	58,912	19.65	0.86
4	1,013	13.54	62,751	20.93	0.65
5 - highest	596	7.97	58,745	19.60	0.41
Risk Index	18,491		1,131,017		
0	1,417	7.66	261,871	23.15	0.33
1	4,613	24.95	455,427	40.27	0.62
2	6,010	32.50	274,486	24.27	1.34
3	4,555	24.63	107,643	9.52	2.59
4	1,710	9.25	30,877	2.73	3.39
5	186	1.01	713	0.06	16.83

Table F6c. Ambulatory Care Sensitive (ACS) Conditions Demographic Comparison with the Population of Manitoba - 1992/93

	ACS Conditions 1992/93		MB Population 1992		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	18,517		1,137,484		
Age					
0 to 14	4,116	22.23	247,857	21.79	1.02
15 to 64	6,177	33.36	738,434	64.92	0.51
65 and older	8,224	44.41	151,193	13.29	3.34
Sex					
Male	8,850	47.79	561,395	49.35	0.97
Female	9,667	52.21	576,089	50.65	1.03
Residence	18,148		1,130,726		
Urban	10,772	59.36	832,050	73.59	0.81
Rural	7,376	40.64	298,676	26.41	1.54
Treaty Indian	2,672	14.43	60,752	5.34	2.70
Urban Income Quintile	10,559		829,386		
1 - lowest	3,239	30.68	165,887	20.00	1.53
2	2,751	26.05	165,865	20.00	1.30
3	2,099	19.88	166,102	20.03	0.99
4	1,370	12.97	165,879	20.00	0.65
5 - highest	1,100	10.42	165,653	19.97	0.52
Rural Income Quintile	7,378		298,676		
1 - lowest	2,669	36.18	60,167	20.14	1.80
2	1,961	26.58	59,333	19.87	1.34
3	1,191	16.14	61,539	20.60	0.78
4	955	12.94	59,342	19.87	0.65
5 - highest	602	8.16	58,295	19.52	0.42
Risk Index	17,937		1,128,062		
0	1,223	6.82	260,973	23.13	0.29
1	4,369	24.36	453,777	40.23	0.61
2	5,890	32.84	273,105	24.21	1.36
3	4,466	24.90	108,098	9.58	2.60
4	1,781	9.93	31,373	2.78	3.57
5	208	1.16	736	0.07	16.57

Table F6d. Ambulatory Care Sensitive (ACS) Conditions Demographic Comparison with the Population of Manitoba - 1993/94

	ACS Conditions 1993/94		MB Population 1993		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	18,560		1,137,095		
Age					
0 to 14	3,857	20.78	248,184	21.83	0.95
15 to 64	6,081	32.76	736,544	64.77	0.51
65 and older	8,622	46.45	152,367	13.40	3.47
Sex					
Male	8,973	48.35	561,207	49.35	0.98
Female	9,587	51.65	575,888	50.65	1.02
Residence	18,140		1,125,101		
Urban	10,750	59.26	826,660	73.47	0.81
Rural	7,390	40.74	298,441	26.53	1.54
Treaty Indian	2,716	14.63	62,132	5.46	2.68
Urban Income Quintile	10,554		823,389		
1 - lowest	3,231	30.61	163,669	19.88	1.54
2	2,709	25.67	168,174	20.42	1.26
3	2,117	20.06	164,355	19.96	1.01
4	1,371	12.99	163,671	19.88	0.65
5 - highest	1,126	10.67	163,520	19.86	0.54
Rural Income Quintile	7,391		298,441		
1 - lowest	2,640	35.72	59,054	19.79	1.80
2	1,936	26.19	58,572	19.63	1.33
3	1,300	17.59	58,709	19.67	0.89
4	978	13.23	62,678	21.00	0.63
5 - highest	537	7.27	59,428	19.91	0.37
Risk Index	17,945		1,121,830		
0	1,206	6.72	259,367	23.12	0.29
1	4,267	23.78	451,963	40.29	0.59
2	5,943	33.12	271,785	24.23	1.37
3	4,547	25.34	106,477	9.49	2.67
4	1,770	9.86	31,510	2.81	3.51
5	212	1.18	728	0.06	19.67

Table F6e. Ambulatory Care Sensitive (ACS) Conditions Demographic Comparison with the Population of Manitoba - 1994/95

	ACS Conditions 1994/95		MB Population 1994		Ratio: Observed/ Expected
	N	% (observed)	N	% (expected)	
Total Individuals	18,860		1,138,338		
Age					
0 to 14	3,835	20.33	248,161	21.80	0.93
15 to 64	6,357	33.71	736,586	64.71	0.52
65 and older	8,668	45.96	153,591	13.49	3.41
Sex					
Male	9,044	47.95	561,205	49.30	0.97
Female	9,816	52.05	577,133	50.70	1.03
Residence	18,407		1,122,369		
Urban	11,002	59.77	822,891	73.32	0.82
Rural	7,405	40.23	299,478	26.68	1.51
Treaty Indian	2,700	14.32	63,298	5.56	2.58
Urban Income Quintile	10,804		819,109		
1 - lowest	3,273	30.29	160,812	19.63	1.54
2	2,764	25.58	167,996	20.51	1.25
3	2,159	19.98	164,505	20.08	1.00
4	1,425	13.19	163,124	19.91	0.66
5 - highest	1,183	10.95	162,672	19.86	0.55
Rural Income Quintile	7,407		299,478		
1 - lowest	2,685	36.25	59,952	20.02	1.81
2	1,913	25.83	59,273	19.79	1.31
3	1,332	17.98	58,413	19.50	0.92
4	902	12.18	61,887	20.66	0.59
5 - highest	575	7.76	59,953	20.02	0.39
Risk Index	18,211		1,118,587		
0	1,244	6.83	257,734	23.04	0.30
1	4,366	23.97	451,163	40.33	0.59
2	6,032	33.12	271,453	24.27	1.36
3	4,651	25.54	106,056	9.48	2.69
4	1,722	9.46	31,428	2.81	3.37
5	196	1.08	753	0.07	15.43

Table F7. Ambulatory Care Sensitive (ACS) Conditions: Charlson Comorbidity Index (CCI) and RDRG Illness Severity

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Total ACS records	22,944		24,720		24,498		24,178		24,737	
Charlson Comorbidity Index										
0 comorbid conditions	13,409	58.44	14,259	57.68	13,880	56.66	13,423	55.52	14,030	56.72
1	6,831	29.77	7,553	30.55	7,397	30.19	7,456	30.84	7,586	30.67
2	1,897	8.27	2,006	8.11	2,221	9.07	2,284	9.45	1,980	8.00
3 or more	807	3.52	902	3.65	1,000	4.08	1,015	4.20	1,141	4.61
RDRG Illness Severity										
Low	15,092	65.78	16,227	65.64	16,017	65.38	15,379	63.61	15,695	63.45
Moderate	6,191	26.98	6,614	26.76	6,603	26.95	6,903	28.55	7,035	28.44
High	1,661	7.24	1,879	7.60	1,878	7.67	1,896	7.84	2,007	8.11
Illness Level										
Higher: 1+ comorbid conditions or high/ moderate RDRG	12,482	55.97	13,909	56.27	13,932	56.87	14,133	58.45	14,196	57.39
Lower: No comorbidity and low severity	10,102	44.03	10,811	43.73	10,566	43.13	10,045	41.55	10,541	42.61

Table F8. Ambulatory Care Sensitive (ACS) Conditions: Lower Illness Level Exclusions

	1990/91		1991/92		1992/93		1993/94		1994/95	
	N	%	N	%	N	%	N	%	N	%
Total	10,102		10,811		10,566		10,045		10,541	
Day surgery	384	3.80	470	4.35	525	4.97	624	6.21	614	5.82
Inhospital deaths	144	1.43	145	1.34	139	1.32	139	1.38	131	1.24
Transfers	1,001	9.91	1,021	9.44	1,060	10.03	1,088	10.83	1,095	10.39
Home care	164	1.62	197	1.82	261	2.47	194	1.93	250	2.37
Stays >60 days	6	0.06	15	0.14	12	0.11	9	0.09	17	0.16
Unassignable to income quintile	64	0.63	83	0.77	56	0.53	75	0.75	92	0.87
Total after exclusions	8,339	82.55	8,880	82.14	8,513	80.57	7,916	78.81	8,342	79.14

TableF 9a. Potentially Reducible Hospital Days: 1990/91

	Average length of stay	Number of discharges	Total Days	Expected Total Days	Potentially Reducible Days
Risk Index					
0	3.45	609	2,104	2,104	0
1	3.97	2,037	8,079	7,028	1,051
2	4.61	2,461	11,347	8,490	2,857
3	4.96	2,162	10,733	7,459	3,274
4	4.55	999	4,541	3,447	1,094
5	4.80	71	341	245	96
TOTAL	4.45	8,339	37,145	28,773	8,373

Table F9b. Potentially Reducible Hospital Days: 1991/92

	Average length of stay	Number of discharges	Total Days	Expected Total Days	Potentially Reducible Days
Risk Index					
0	3.60	615	2,215	2,215	0
1	4.05	2,202	8,928	7,927	1,001
2	4.63	2,703	12,513	9,731	2,782
3	5.20	2,226	11,580	8,014	3,566
4	4.67	1,053	4,921	3,791	1,130
5	4.74	81	384	292	92
TOTAL	4.57	8,880	40,541	31,969	8,572

Table F9c. Potentially Reducible Hospital Days: 1992/93

Risk Index	Average length of stay	Number of discharges	Total Days	Expected Total Days	Potentially Reducible Days
0	3.41	537	1,832	1,832	0
1	3.82	2,018	7,718	6,881	837
2	4.23	2,580	10,922	8,798	2,124
3	4.87	2,182	10,626	7,441	3,185
4	4.43	1,097	4,865	3,741	1,124
5	4.10	99	406	338	68
TOTAL	4.27	8,513	36,369	29,030	7,339

Table F9d. Potentially Reducible Hospital Days: 1993/94

Risk Index	Average length of stay	Number of discharges	Total Days	Expected Total Days	Potentially Reducible Days
0	3.43	502	1,723	1,723	0
1	3.69	1,765	6,517	6,054	463
2	4.44	2,401	10,653	8,235	2,418
3	4.60	2,153	9,896	7,385	2,511
4	4.24	993	4,214	3,406	808
5	3.99	102	407	350	57
TOTAL	4.22	7,916	33,410	27,153	6,257

Table F9e. Potentially Reducible Hospital Days: 1994/95

Risk Index	Average length of stay	Number of discharges	Total Days	Expected Total Days	Potentially Reducible Days
0	3.32	584	1,937	1,937	0
1	3.76	1,910	7,186	6,341	845
2	3.99	2,531	10,111	8,403	1,708
3	4.76	2,192	10,427	7,277	3,150
4	4.35	1,033	4,491	3,430	1,061
5	4.73	92	435	305	130
TOTAL	4.15	8,342	34,587	27,694	6,893

APPENDIX G

Ethics Approvals

* University of Manitoba

* Manitoba Health

UNIVERSITY OF MANITOBA

FACULTY COMMITTEE ON THE USE OF HUMAN SUBJECTS IN RESEARCH

NAME: Dr. Leslie Roos

OUR REFERENCE: E93:229

DATE: May 21, 1996

YOUR PROJECT ENTITLED:

Assessing Hospital Utilization: Implications of Cost Containment for Health Care.

HAS BEEN APPROVED BY THE COMMITTEE AT THEIR MEETING OF:

Approved by Dr. Gordon Grahame on behalf of the Committee on May 16, 1996.

COMMITTEE PROVISOS OR LIMITATIONS:

Protocol amendments approved as per your letter dated May 2, 1996.

You may be asked at intervals for a status report. Any significant changes of the protocol should be reported to the Chairman for the Committee's consideration, in advance of implementation of such changes.

****THIS IS FOR THE ETHICS OF HUMAN USE ONLY. FOR THE LOGISTICS OF PERFORMING THE STUDY, APPROVAL SHOULD BE SOUGHT FROM THE RELEVANT INSTITUTION, IF REQUIRED.**

Sincerely yours,

Gordon R. Grahame, M.D.,
Chairman,
Faculty Committee on the Use of
Human Subjects in Reserach.

TELEPHONE INQUIRIES:
789-3255 - Lorraine Lester

UNIVERSITY OF MANITOBA
FACULTY COMMITTEE ON THE USE OF HUMAN SUBJECTS IN RESEARCH

NAME: Dr. Leslie Roos

OUR REFERENCE: E93:229

DATE: September 30th, 1993

YOUR PROJECT ENTITLED:

Assessing Hospital Utilization: Implications of Cost Containment for Health Care.

HAS BEEN APPROVED BY THE COMMITTEE AT THEIR MEETING OF:

September 27th, 1993.

COMMITTEE PROVISOS OR LIMITATIONS:

None.

You may be asked at intervals for a status report. Any significant changes of the protocol should be reported to the Chairman for the Committee's consideration, in advance of implementation of such changes.

**THIS IS FOR THE ETHICS OF HUMAN USE ONLY. FOR THE LOGISTICS OF PERFORMING THE STUDY, APPROVAL SHOULD BE SOUGHT FROM THE RELEVANT INSTITUTION, IF REQUIRED.

Sincerely yours,

Gordon R. Grahame, M.D.,
Chairman,
Faculty Committee on the Use of
Human Subjects in Research.

GRG/ll

TELEPHONE INQUIRIES:
789-3255 - Lorraine Lester

Manitoba

Health

Financial and Management
Services Division

P.O. Box 925
599 Empress Street
Winnipeg MB R3C 2T6

October 7, 1993

Dr. L. L. Roos
National Health Scientist
Manitoba Centre for Health
Policy and Evaluation
2nd Floor - 351 Tache Avenue
Winnipeg MB R2H 2A6

Dear Dr. Roos:

RE: Assessing Hospital Utilization:
Implications of Cost-Containment for Health Care

The Access and Confidentiality Committee has considered the request in your letter of September 3, 1993, addressed to Mr. G. Bormann, for access to Manitoba Health's hospital and medical services databases held at the University of Manitoba by Ms Ruth Bond for her Master's thesis.

The Committee has recommended to Manitoba Health that we respond favourably to your request. I am pleased to advise that we have accepted the recommendation on the understanding that you provide evidence of an ethics committee endorsement. Please forward this document to Dr. M. Dutta, Secretary of the Access and Confidentiality Committee.

Yours truly,

Glenn Alexander,
Executive Director,
Health Information Services.

GA/bsg

c.c. Dr. R. Walker, College of Physicians & Surgeons of Manitoba

5MM01/MIS/MD-LET