Seasonal Patterns of Winnipeg Hospital Use

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TABLE OF CONTENTS

LIST OF TABLES

APPENDIX TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Introduction

Hospital bed shortages and emergency room overcrowding have been reported in academic journals and the popular media both nationally and internationally. In the winter of 1998, for example, Winnipeg newspapers expressed grave concerns over the bed shortage in Winnipeg hospitals, as reflected in headlines like: “Health care is clogged everywhere”, and “Crowding forces ER patients into hallways, lengthens wait” (Winnipeg Free Press, February, 1998). The message was clear: Winnipeg hospitals were in a state of crisis in January and February of 1998.

Problems arise when all available hospital beds are occupied. Patients may therefore spend hours or even days in the observation unit of emergency departments waiting for a hospital bed or, if all observation unit beds are filled as well, they will have to wait in hallways. The stress on patients who have to spend days in hallways because there are no hospital beds available, as well as the stresses on “frontline” health care workers are real, as reflected in comments like: “There is an atmosphere of almost desperation on the wards” and “Dignity and privacy are guaranteed to patients, and yet there is a deafening silence when clear-cut transgressions of this code of ethics take place day after day” (Winnipeg Free Press, March, 1998).

Because of the concern with the winter bed pressures in Winnipeg hospitals, the Manitoba Centre for Health Policy and Evaluation was asked by Manitoba Health to work with the Winnipeg Hospital Authority to examine the patterns of hospital use in Winnipeg acute care hospitals during the past eleven years. This report, therefore, explores possible reasons for high-pressure periods in Winnipeg acute care hospitals, whether high-pressure periods are predictable, and whether similar situations could be avoided in the future.

Methods

Seasonal patterns of hospital use were examined for fiscal years 1987/88 to 1997/98 for all seven acute care hospitals in Winnipeg. For each year, the number of inpatients in all seven hospitals – or what we refer to as the inpatient census - was tracked week by week. The number of admissions to hospital was also examined on a weekly basis.

We defined high-pressure periods using statistical techniques by placing bounds around the inpatient census. More specifically, we defined the high-pressure level within a given year as the mean + two standard deviations. Census figures above this level are highly unusual and cause for concern. Thus, the term "high-pressure period" is used in the present report to refer to the weeks during which the inpatient census is at or above high-pressure levels (mean + 2 standard deviations).

Findings

- Winnipeg acute care hospitals were operating at close to maximum capacity at most times during the year, with predictable drops in the number of patients in hospital during the summer and December holiday breaks when scheduled surgery slows down.

- High-pressure periods in the hospital system were driven by emergent/urgent medical patients. No similar seasonal pressures in inpatient census was apparent for other types of patients.

- High-pressure periods occurred during nine out of the eleven years under investigation and lasted anywhere from one to three weeks. The emergent/urgent medical census rose above high-pressure levels in February of 1998, for example, the month during which the bed crisis made newspaper headlines.

- Although we cannot predict to the month or week when the hospital system will experience bed shortages, high-pressure periods consistently occurred during the winter months (any time between December and April). We estimate that between December

and April, the Winnipeg hospital system has to be able to accommodate about 70 to 80 more medical patients each day than normal for a period of about one to three weeks. In terms of *admissions*, as many as 10 to 12 more medical admissions than normal can be expected each day during this period of time.

- High-pressure periods occurred before, during, and after the downsizing of the acute hospital sector. Periods of high pressure during the winter months were apparent before 1991/92 when there were about 700 more beds in the system than in 1997/98, and in every year since 1991/92. High-pressure periods, therefore, can be expected to recur, regardless of the absolute number of beds in the system.

- The increase in emergent/urgent medical patients in hospital during the winter months corresponded to increases in influenza-associated illnesses (pneumonia and influenza and additional respiratory conditions) in all of the years in which we observed high-pressure periods. Influenza-associated illnesses, therefore, placed a great deal of pressure on the Winnipeg hospital system.

- The majority of patients in hospital with influenza-associated illnesses were 65 years and above. In 1997/98, for example, nearly three-quarters of patients in hospital with influenza-associated illnesses were 65 years and above - 53% were 75 years and above and an additional 21% were between 65 and 74 years old. During the February high-pressure period, the percentage of patients with influenza-associated illnesses aged 65 and above rose to 80%.

Possible Approaches to Consider

High-pressure periods during the winter months are a recurrent problem that has plagued Winnipeg, and most other Canadian cities, for many years. Given that high-pressure periods occurred prior to downsizing when many more beds were in the hospital system than now, the solution to the problem does not lie in simply adding beds. It appears that two major approaches should be considered in trying to deal with bed shortages: (1) preventive

measures to reduce hospital admissions, and (2) changes to how the hospital system is managed.

Clearly, the feasibility of any possible approaches to dealing with bed pressures, particularly changes in management practices, will have to be carefully evaluated. Moreover, the impact of these changes on other parts of the health care sector, especially continuing care programs, would have to be examined in consultation with these programs. The following were developed in discussion with the Seasonality Working Group of the Winnipeg Hospital Authority; they therefore echo some of the recommendations put forth by the Group (Winnipeg Hospital Authority, 1998).

- Given the substantial impact of influenza-associated illnesses on the hospital system, a major campaign to increase influenza vaccination levels among high-risk groups (people aged 65 and over and individuals with chronic conditions) seems indicated. A province-wide, systematic targeting of high-risk groups should be considered. This might include a system-based approach, perhaps with standing orders for nurses to identify and vaccinate high-risk individuals as they are discharged from hospital during the vaccination months, as well as community-based campaigns involving physicians and public health nurses. The potential for implementing a data system that allows monitoring of the immunization status of high-risk groups should also be explored.

- Increasing pneumococcal vaccination rates should be considered. In this respect, Manitoba Health could expand its pneumococcal vaccination program to include all target groups identified by the National Advisory Committee on Immunization (1998).

- Previous research shows that a large proportion of medical patients in acute care hospitals do not require acute care and could be treated in alternative settings, such as personal care homes or at home with the help of home care services (DeCoster et al., 1996). In 1993/94, approximately 50% of medical patients who had been in hospital for eight days were no longer acute. A review of the acute care requirements of all medical patients on

their eighth day of stay, and perhaps on a weekly basis thereafter, would therefore be useful, particularly during the winter months.

- Discharging patients to alternative levels of care requires that such alternative services are readily available, with sufficient funds being allocated for personal care homes, home care programs, rehabilitation services, and so forth. Moreover, efficient referral and discharge procedures have to be in place to allow timely transfer to alternative sources of care. A review of patterns of referral to alternative sources of care (e.g., personal care homes, home care) seems indicated, as avoidable delays in discharging patients to alternative services place unnecessary pressure on the acute hospital sector, particularly during the winter when a substantial influx of medical patients can be anticipated.

- Pre-admission screening (perhaps using the InterQual assessment tool) of all medical admissions that do not come through the emergency department, as well as admissions for nervous, circulatory, respiratory and digestive conditions should be considered during the winter months. DeCoster et al. (1997) showed that a considerable proportion of these patients admitted to Winnipeg hospitals in 1993/94 did not require acute care services. Pre-admission screening of these patients should help reduce occupancy rates in medicine.

- The potential for increasing the capacity to discharge patients on weekends during the winter months might also be examined. Having discharge services in place on weekends should help alleviate pressures at the beginning of the next week.

- A review of bed management procedures would also be useful, in anticipation of the predictable, short-term increase in medical inpatients during the winter months. Possibilities to consider include keeping beds in reserve to be opened as the census starts to rise to high-pressure levels or introducing medical/surgical swing beds. Any swing in beds from surgical to medical would have to occur with the knowledge that surgical versus medical nursing skills are different and that this would be a temporary adjustment for the duration of a one-week to three-week winter peak in the medical census.

- Scheduled inpatient surgery might help attenuate winter pressures by scheduling fewer elective surgical procedures during the January to April period (e.g. 5% to 10% fewer), while increasing surgical slates at times when scheduled surgery currently slows down, namely on weekends and during the December and summer (July and August) holiday breaks. Scheduling fewer inpatient procedures (e.g. 5% to 10% fewer) during the January to April period, but more outpatient surgery represents another possible approach to dealing with high-pressure periods. Clearly, the feasibility and possible ramifications of changes to existing practice patterns would have to be carefully examined with input from surgeons and nurses.

- The usefulness of implementing a standard protocol to deal with future high-pressure periods should also be examined. Such a crisis protocol might include: daily monitoring of the number of patients in hospital (either all year round or during the winter only), introduction of a trigger point when crisis procedures are initiated, and implementation of agreed-upon crisis procedures (e.g., utilization review of medical inpatients).

- Lastly, standardization of admission (and discharge) criteria across hospitals should be considered, as well as implementation of a systematic recording system that tracks, on a daily basis, the number of beds available in the Winnipeg hospital system, the number of patients waiting for beds in emergency departments and the number of patients in hallways.

1. INTRODUCTION

Hospital beds still closed (Jan. 21, 1998)[1]
Top of week hell for hospitals, ambulances (Feb. 1, 1998)
HSC squeeze hurting kids (Feb. 12, 1998)
Health care is clogged everywhere (Feb. 19, 1998)
Crowding forces ER patients into hallways, lengthens wait (Feb. 19, 1998)

[1] All articles appeared in the Winnipeg Free Press

These are just some of the newspaper headlines published in the Winnipeg Free Press in the winter of 1998 that expressed grave concerns over the bed shortage in Winnipeg hospitals. The message was clear: Winnipeg hospitals were in a state of crisis in January and February of 1998. Newspaper stories vividly described the plight of patients waiting for beds, and nurses and physicians publicly expressed their frustration with the state of the Winnipeg hospital system, as reflected in comments like "There is an atmosphere of almost desperation on the wards" and "Dignity and privacy are guaranteed to patients, and yet there is a deafening silence when clear-cut transgressions of this code of ethics take place day after day" (Winnipeg Free Press, March, 1998).

The problem of emergency department overcrowding is not unique to Winnipeg. Problems with access to hospitals have been reported in the popular media and academic journals both nationally and internationally. In Canada, such reports appeared in the 1980s when Canada had a relatively "rich" bed supply, as well as throughout the 1990s, both before and after the downsizing of the hospital sector.

The potential causes of emergency department (ED) overcrowding have been described in the research literature (e.g., Andrulis et al., 1991; Gallagher and Lynn, 1990, Tapanes and

Steel, 1994). These range from delays in access to acute care beds, to the availability of laboratory and radiology results, to coordination of services. In trying to understand ED overcrowding it becomes important to differentiate between two issues: (1) Patients may seek care from EDs, but do not require hospitalization. Delays and ED overcrowding can occur if too many patients present to the ED all at once. (2) Patients present to the ED and do require admission to hospital; if, however, all available beds in the hospital are occupied they cannot leave the ED. They may therefore spend hours or even days in the observation unit of the ED waiting for a bed or, if all observation unit beds are filled as well, they may have to wait in hallways. It was this latter issue – the problem of hospital bed shortages that results in a backlog of patients in emergency departments – that was the focus of the present report.

The costs of emergency department overcrowding have been estimated as being substantial, as overcrowding may lead to inefficiencies that increase length of hospital stay (Krochmal and Riley, 1994). Krochmal and Riley (1994) estimated the impact of overcrowding at U.S. $6.8 million over a 3-year study period for the 490-bed hospital under investigation. The stress on patients who have to spend days in hallways because there are no hospital beds available, as well as the stress on "front line" health care workers is also real and cause for concern.

Programs designed to reduce overcrowding have been tried; however, they have not always met expectations. A $176 million program introduced by the Quebec government to alleviate emergency department overcrowding in 40 hospitals by reducing the volume and length-of-stay of bedridden patients in the emergency department, was found to have only limited success (Boyle et al., 1992).

Because of the concern with the winter bed pressures in Winnipeg hospitals, the Manitoba Centre for Health Policy and Evaluation was asked by Manitoba Health to work with the Winnipeg Hospital Authority to examine the patterns of hospital use in Winnipeg during the past years. This paper, therefore, explores the reasons for the winter bed pressure and reviews various approaches that might be considered to avoid similar situations in the coming years. More specifically, the present report addresses the following questions:

1. What are the patterns of inpatient census and admissions to acute care hospitals in Winnipeg in fiscal year 1997/98[1] and, specifically, during the months of January and February, that were characterized by newspaper stories describing a severe hospital bed shortage?

2. Can we identify the reasons for winter bed pressures? For example, to what extent does influenza contribute to high-pressure periods?

3. To what extent is the pattern of inpatient census and admissions predictable? Are the peaks and dips consistent over the years?

4. Are there times when relatively fewer patients are hospitalized, which might be used to electively treat patients and, hence, potentially free beds during high-pressure periods?

[1] The fiscal year starts on April 1 and ends on March 31. 1997/98 is the most recent year for which hospital data were available at the time of the release of this report.

2. METHODS

Study Period and Data Source

Data were drawn from Manitoba Health's hospital discharge abstracts for the period of April 1, 1987 to June 30, 1998 for all seven Winnipeg acute care hospitals: Concordia Hospital, Grace General Hospital, Health Sciences Centre, Misericordia General Hospital,[2] St. Boniface General Hospital, Seven Oaks General Hospital, and Victoria General Hospital. Data from the Central Bed Registry, where the number of admitted patients waiting in emergency departments for a bed is recorded, was also obtained from Manitoba Health for fiscal years 1995/96 to 1997/98. Details regarding the methodology used in this report can be found in Appendix A.

Identifying High-Pressure Periods

In describing the peaks and dips in inpatient census, it becomes important to have some point of comparison, which allows us to determine the extent of variation across the year. We dealt with this issue in several ways: First, we used the mean of the 52 weeks (or 12 months where appropriate) as a baseline to which to compare peaks (and dips). Second, we used statistical techniques to define high-pressure periods. To this effect we calculated upper and lower bounds around census patterns. The first set of these bounds (mean +/- one standard deviation) is useful because values that are within this range reflect normal fluctuations in inpatient census that tend not to create major problems for the system. We refer to the upper of these bounds (mean + one standard deviation) as the warning level, because an inpatient census that rises above that level is potentially problematic. The second set of bounds (mean +/- two standard deviations) helps identify periods that are very unusual. We therefore refer to the upper of these bounds (mean + two standard deviations) as the high-pressure level (see Appendix A for further details). Thus, we refer to the weeks during which the census was at or above high-pressure levels as the high-pressure period.

[2] The Misericordia Hospital was an acute care hospital until 1998. In 1998 it was transformed into a community and long term care facility. The Misericordia Health Centre started to accept long term care patients in November of 1998.

An important question is how many additional patients would the system need to be able to accommodate during the winter to avoid high-pressure periods. We used the warning level (mean + one standard deviation) to estimate this "excess" of patients in the system. For example, if the warning level in a given year was 100 patients and the number of inpatients rose above high-pressure levels to 125 patients on a particular day, we would say that 25 additional patients would have to be accommodated on that day.

Weekly and Monthly Patterns

Months were adjusted to correspond to 30 days to allow meaningful comparisons across months (see Appendix A). Weeks were defined from Wednesday to Tuesday so that weekends (and holiday weekends) would remain within the same week. The methodology used to define weeks ensured that Week 1 to Week 52 in one year corresponded as closely as possible to those in other years (see Appendix A for details).

Select Study Measures[3]

Number of Admissions counts the number of inpatient admissions to the seven Winnipeg acute care hospitals on a given day. An average daily number of admissions was calculated by taking an average of the weekly admissions (i.e. weekly admissions/7).

Number of Separations counts the number of hospital discharges on a given day. As for admissions, we present an average daily number of separations for each week of the year.

Inpatient Census is a count of the number of patients in hospital on a given day. It was calculated based on admissions and separations data by counting the number of patients that had an admission date less than or equal to a chosen date *and* a separation date greater than that date. The average daily census in a given week was calculated by taking an average of the weekly inpatient census (see Appendix A for details regarding the validity of this measure).

[3] See Appendix A for other study measures

Type of Care was taken into account by differentiating between cases that fell into surgical, medical, obstetrical, psychiatric, and newborn DRG (Diagnostic Related Group) categories. Surgical and medical inpatient census and admissions were further classified as emergent/urgent or scheduled based on the admission status reported on the hospital discharge abstract.

Influenza-Associated Illnesses were defined as pneumonia and influenza and additional respiratory illnesses (ICD-9-CM codes 460-466, 480-487, 490-496, 500-508, and 510-519). Unless otherwise noted, we focused on the most responsible diagnosis only, that is, the diagnosis that was deemed, upon discharge, as most responsible for the patient's hospital stay.

The Problem with Examining Occupancy Rates

Occupancy rates are a useful measure of hospital use and the extent to which the system can absorb additional patients. Hospitals that function at near 100% occupancy rates have little room to accommodate more patients, which would increase the likelihood of patients backing up in emergency departments. Calculating occupancy rates requires information on the number of beds in the system. However, occupancy rates based on the overall number of beds set up may be misleading when tracking hospital use across the year, as they do not reflect the number of *available* beds in a given week.[4] Unfortunately, it is difficult to determine, on a weekly basis, how many beds were actually available in Winnipeg hospitals (see "Limitations" section for details). Because of this data limitation, we therefore decided not to examine occupancy rates, but focused only on patient census and admissions.

[4] The term "set up beds" is used here to refer to the overall number of beds in the hospital system, whereas the term "available" beds refers to beds that are actually available for admission to the appropriate patients, with the staff being available to provide care (Winnipeg Hospital Authority, 1998).

3. FINDINGS

Seasonal Patterns of Inpatient Census and Admissions - 1997/98

Figure 1 plots the average daily number of inpatients for each week – what we refer to as the inpatient census – for fiscal year 1997/98. As Figure 1 shows, the census displayed some variation across the year: The highest inpatient census was observed in April (2269 inpatients), the lowest in May during the flood when scheduled surgery was cancelled in Winnipeg (down to 1841 inpatients). December, during which beds were closed for the holiday season, was responsible for another noticeable dip in the number of inpatients (1882 inpatients). During the flood and in December, the inpatient census fell well below the overall average of 2124 patients in hospital per day. Also apparent in Figure 1 is that the number of patients in hospital was not unusually high in January and February, February being the month during which newspaper headlines regarding the bed crisis abounded. Figure 1 shows several of these headlines and the week in which they appeared.[5] The number of patients in hospital in February was close to the average and even slightly below the census of June, September, October, and November. That the inpatient census does not display any major peaks is not surprising, as the system has a limited, maximum capacity and operates at close to maximum capacity throughout the year. Only if the system were operating at lower occupancy rates would we be able to see a rise in inpatient census above usual levels.

A virtually identical pattern emerges when we examine weekly inpatient *admissions* and *separations*, as displayed in Figure 2. On average, 231 patients were admitted to Winnipeg hospitals per day (see Figure 2, top panel). Compared to this daily average, admissions decreased markedly in May during the flood and in December when beds were closed for the holiday break. Admissions were relatively high (compared to the average) in April, May, June, September, October, and February. Although the number of admissions was above average in February, they were not unusually high during that month, but well within the range of other months.

[5] A systematic review of the Winnipeg Free Press shows that nine articles pertaining to a bed crisis appeared in February of 1998 (see Appendix A for further details).

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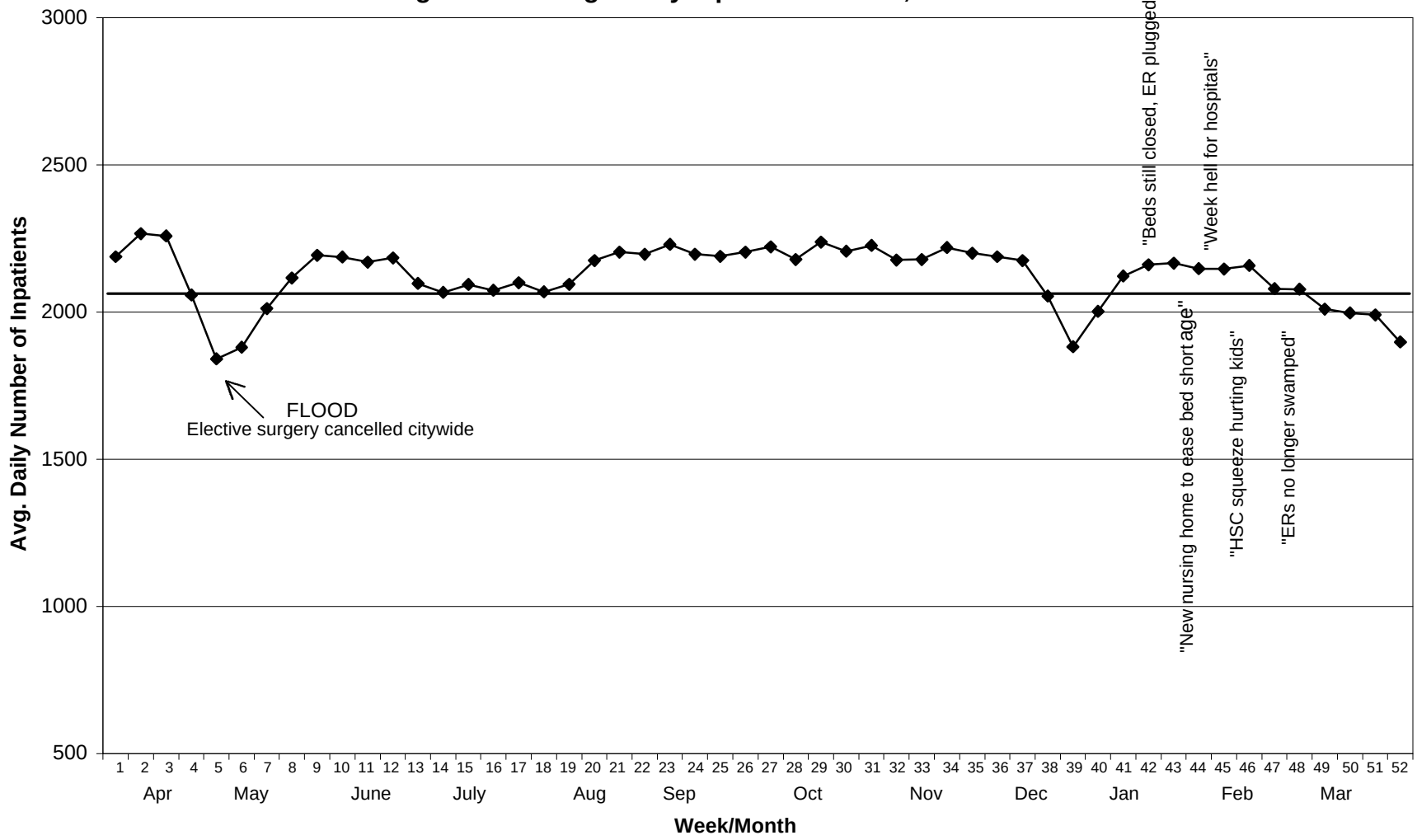
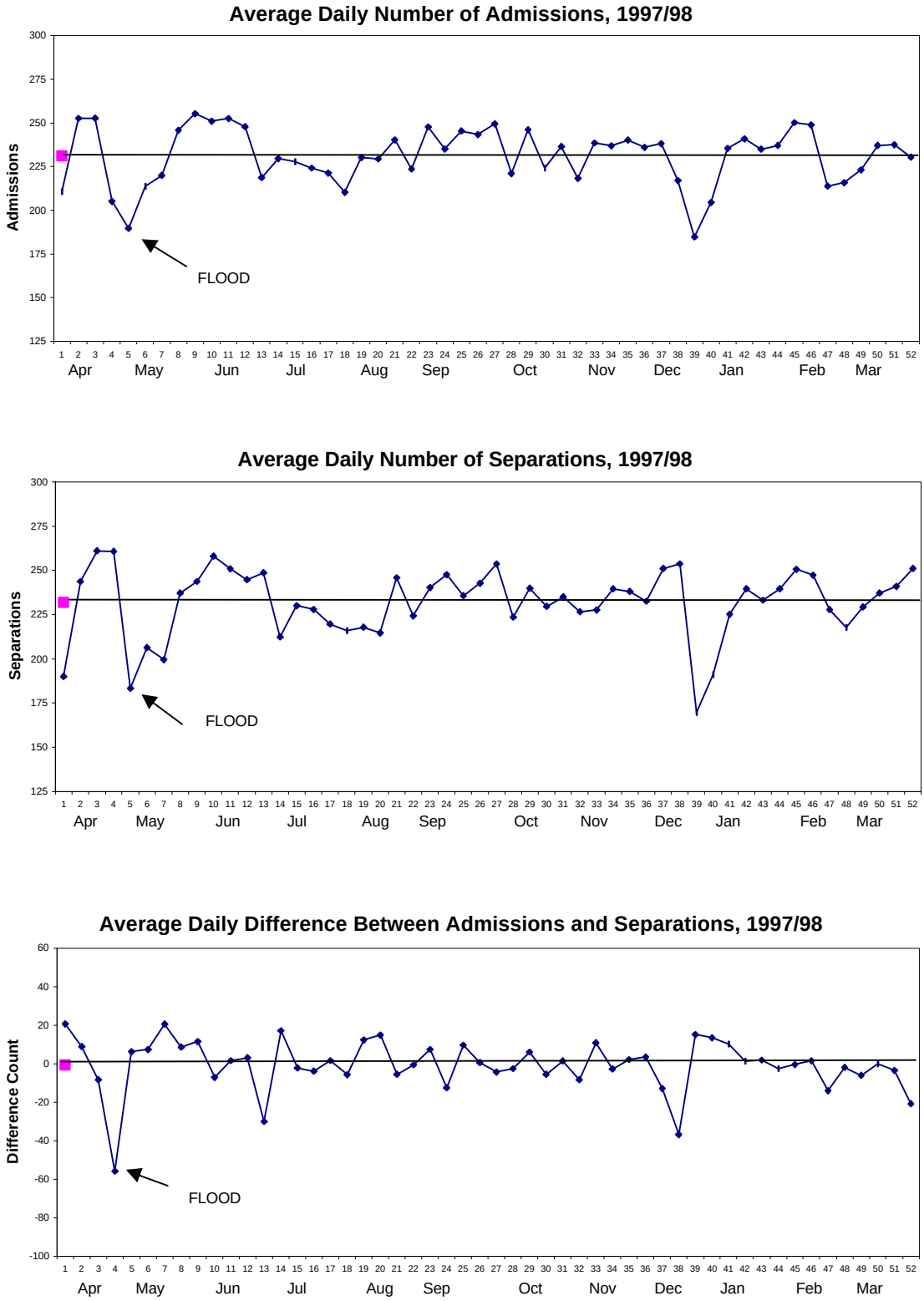
Figure 1: Average Daily Inpatient Census, 1997/98



Select newspaper headings are shown during the week they were published.

Figure 2: Admissions and Separations, 1997/98



The data for separations follow the admissions pattern quite closely (see Figure 2, second panel): the number of separations was high in April, at the end of May, in June, September, December, February, and March. Separations were particularly low at the beginning of May (during the flood) and at the end of December. When we look at the difference between admissions and separations (see third panel of Figure 2), we find that although the number of admissions exceeded the number of separations in January, the excess was comparable to that in May, July, and August, during which no reports of bed crises appeared in the headlines. The difference between admissions and separations was right around zero in February, indicating that there were about an equal number of patients being admitted as were discharged.

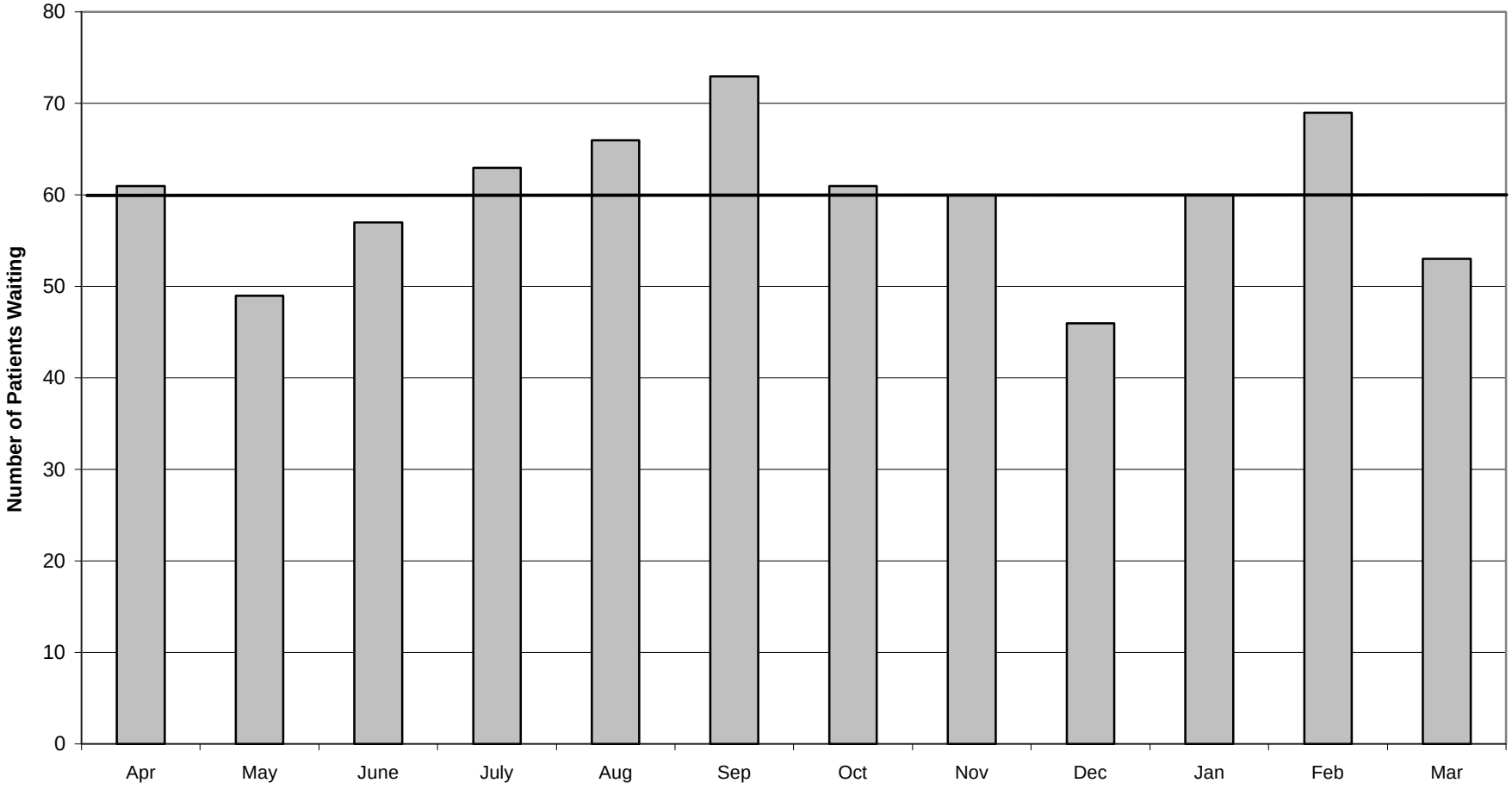
Seasonal Pressures on Emergency Departments

So far we have examined inpatient census, admissions to, and separations from hospitals. However, these data do not tell us how many patients were waiting for acute beds in emergency departments. It is this backlog of patients in emergency departments, which spilled into hallways that was so vividly described in the local newspapers, as reflected in the headline of February 19, 1998: “Crowding forces ER patients into hallways, lengthens wait”.

Hospital discharge abstracts, which are the data source for the present report, do not allow us to determine what kind of bed a particular patient occupies. Thus, we cannot differentiate between patients who have been admitted, but are still waiting in the emergency department for a bed, and patients who are on wards. In order to determine how many patients were waiting for beds in emergency departments, we therefore had to access an alternative source of data, the Central Bed Registry. The Central Bed Registry was implemented in 1995 and records, on a daily basis, the number of patients who have been admitted to hospital, but are still waiting for beds in emergency departments (see Appendix A for details and limitations of this database).

Figure 3 shows that the number of patients waiting for medical beds was indeed higher in February than on average during the year: 69 individuals were waiting for medical beds

Figure 3: Average Daily Number of Patients in Emergency Departments Waiting for Medical Beds, 1997/98



compared to an average of 60 patients. However, it is noteworthy that the number of patients waiting for beds was even higher in September when 73 patients were waiting for a bed. Similarly, 66 patients were waiting for a bed in August - only slightly below the February counts. Neither in August nor in September did the newspapers report a bed crisis.

Trying to Understand the Winter Bed Pressures

Inpatient Census by Type of Care

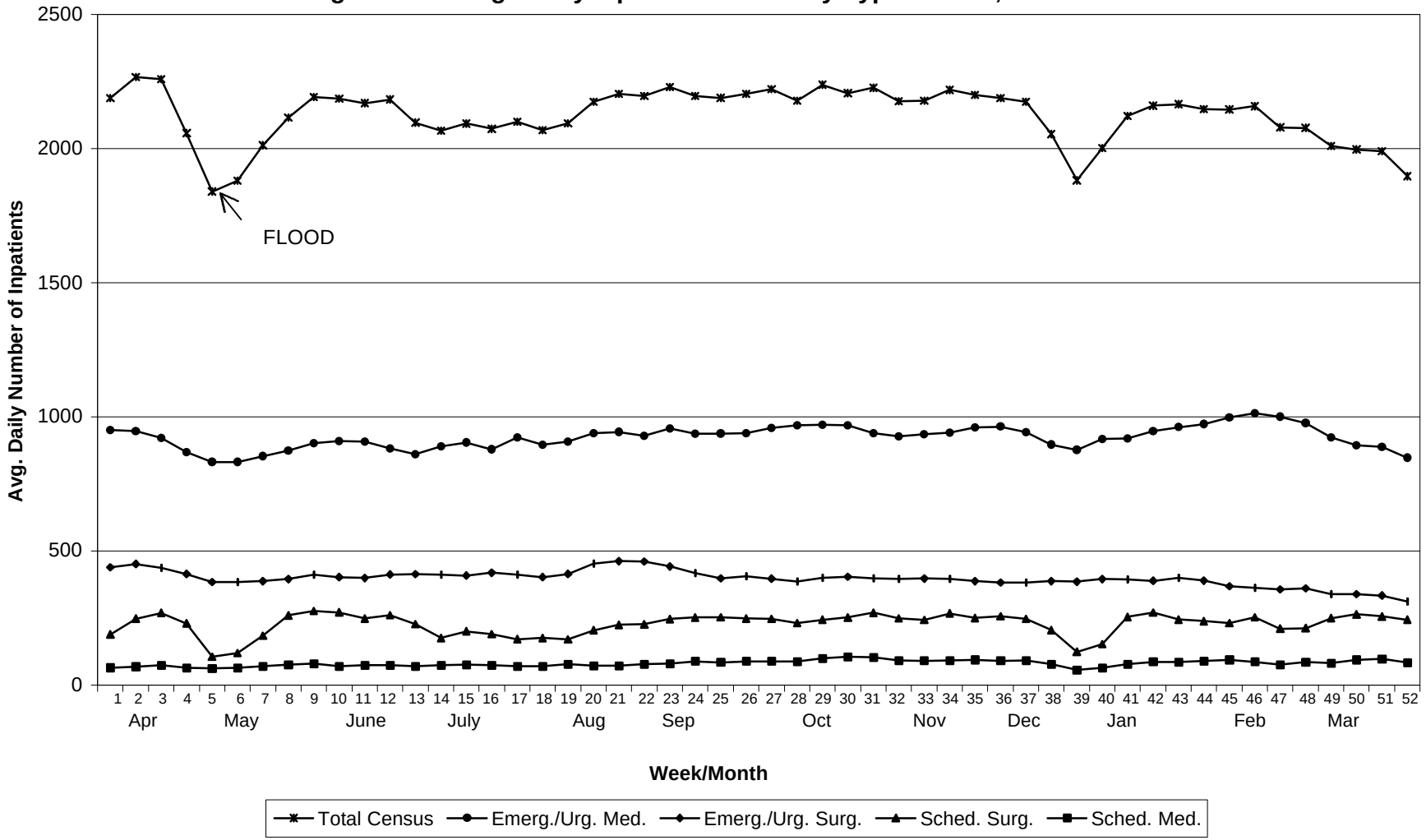
The previous graphs indicate that although February of 1998 was not unusual, relative to other months in terms of the number of overall admission and separation patterns, more patients than typical were waiting for medical beds in emergency departments. To further elucidate the pattern of patient care during the winter months, we next broke down the inpatient census by type of care: emergent/urgent medical, emergent/urgent surgical, scheduled medical, scheduled surgical, psychiatric, obstetrical, and newborns. See Table B1 in Appendix B for the eight most frequent diagnoses and procedures for medical and surgical admissions. It is important to emphasize that the distinction between medical and surgical inpatients was made based on diagnoses and procedures. Whether these patients actually occupied medical versus surgical beds cannot be determined.

Figure 4 displays the average daily inpatient census for each of these categories for 1997/98. Psychiatric, obstetric and newborn counts have been omitted from Figure 4 to simplify presentation, although they are included in the total inpatient census. Little variation across the year was apparent for these three patient categories.[6]

Emergent/urgent medical patients constituted the largest component (43.5% on average) of the total inpatient census, with an average of 924 patients per day in hospital. The emergent/urgent medical census was relatively stable from April through November, with a slight dip during the May flood. An increase in the number of emergent/urgent medical inpatients is apparent starting in January, after the December holiday season. In February,

[6] On average, 279 psychiatric patients were in hospital per day, compared to 104 obstetric patients and 111 newborns.

Figure 4: Average Daily Inpatient Census By Type of Care, 1997/98



the number of emergent/urgent medical patients peaked at 1014 individuals. There were 90 (9.7%) more emergent/urgent medical patients in hospital per day during the February peak relative to the overall daily average of 924 patients.

Seasonal variation is also evident for the scheduled surgical inpatient census. Indeed, the census for scheduled surgical inpatients closely followed the total census. The census was particularly low during the flood in May of 1997 when scheduled surgery was cancelled. Aside from this unique event, other low periods were in July, August and December, that is, during holiday breaks. During December, the number of scheduled surgical inpatients was particularly low, dropping from an average of 227 patients to 124 patients (a 45% decrease). Scheduled surgery peaked in January with 270 inpatients. The number of scheduled surgical inpatients was not unusually high in February, with the volume of scheduled surgery being at similar high levels throughout the year. The increase in the number of emergent/urgent medical patients was, therefore, pressuring hospitals already operating at full capacity.

Also evident in Figure 4 is a drop in the number of scheduled surgical inpatients during the latter half of February, with the numbers falling to 210 individuals, compared to the 252 scheduled surgical patients of the previous week (a 17% decrease). This drop can be attributed to concerted efforts to deal with the hospital crisis by expanding day surgery wherever possible, in order to take pressure off the overloaded hospital system. During February, day surgery increased by 15.7% (569 additional procedures), relative to the average number of outpatient procedures performed per month during the year.

To determine whether the increase in emergent/urgent medical patients was truly unusual, we used statistical techniques to place upper and lower bounds around the inpatient census (see Figure 5). It should be noted that by focusing only on the emergent/urgent medical census (and changing the scale of the graph), the seasonal variation is more noticeable than in the previous graph (see Figure 4 in comparison). The emergent/urgent medical inpatient census was indeed above the high-pressure level (mean + two standard deviations) in February. Moreover, the census was well above the warning level (mean + one standard deviation) throughout February.

Figure 5: Average Daily Emergent/Urgent Medical Inpatient Census, 1997/98

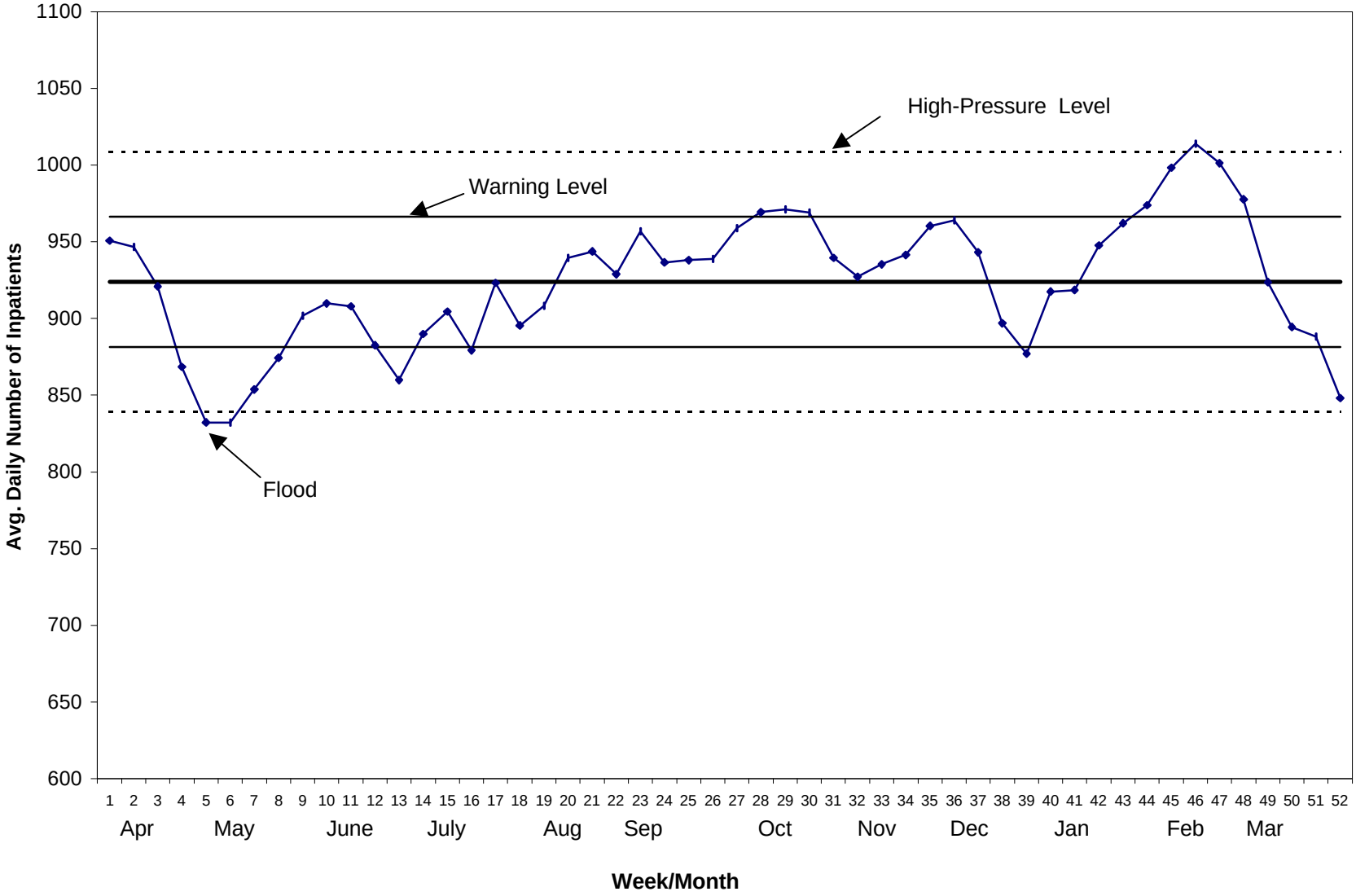


Figure 6 shows that the average daily number of emergent/urgent medical *admissions* also peaked in February, with the peak in admissions occurring one week prior to the census peak. During the February peak, 98 emergent/urgent medical patients were admitted per day, as compared to the overall average of 81 patients (a 21% increase).

Were There More Elderly Patients in Hospital?

An argument frequently heard is that the winter crisis in Winnipeg hospitals arises because of a backlog of elderly patients waiting for long-term care beds. If beds are filled with patients who do not require acute care services, then patients who do need such care cannot be transferred to wards and may end up in the hallways of overloaded emergency departments.

Figure 7 shows that the number of elderly emergent/urgent medical patients (aged 75 and above) was at a peak in February of 1998, with 547 elderly patients in hospital, compared to an overall daily average of 480 elderly individuals. Thus, the hospitals were dealing with 67 more elderly patients per day than on average (a 14% increase). Neither scheduled medicine, nor emergent/urgent surgery, nor scheduled surgery displayed a similar increase in the number of elderly inpatients during the winter months.

The number of emergent/urgent medical inpatients aged 65 to 74 also increased quite substantially in February – up by 34 patients compared to the average number of patients in that age group (a 19% increase).[7] In comparison, the census for patients aged 15 to 64 and children aged zero to 14 displayed little systematic variation across the year and did not increase in February.

The findings for admissions parallel those for inpatient census: The number of emergent/urgent medical admissions of patients 75 and over peaked in February, increasing from an average of 25 admissions per day to 35 admissions. Thus, elderly individuals aged

[7] Data available upon request.

Figure 6: Average Daily Number of Emergent/Urgent Medical Admissions, 1997/98

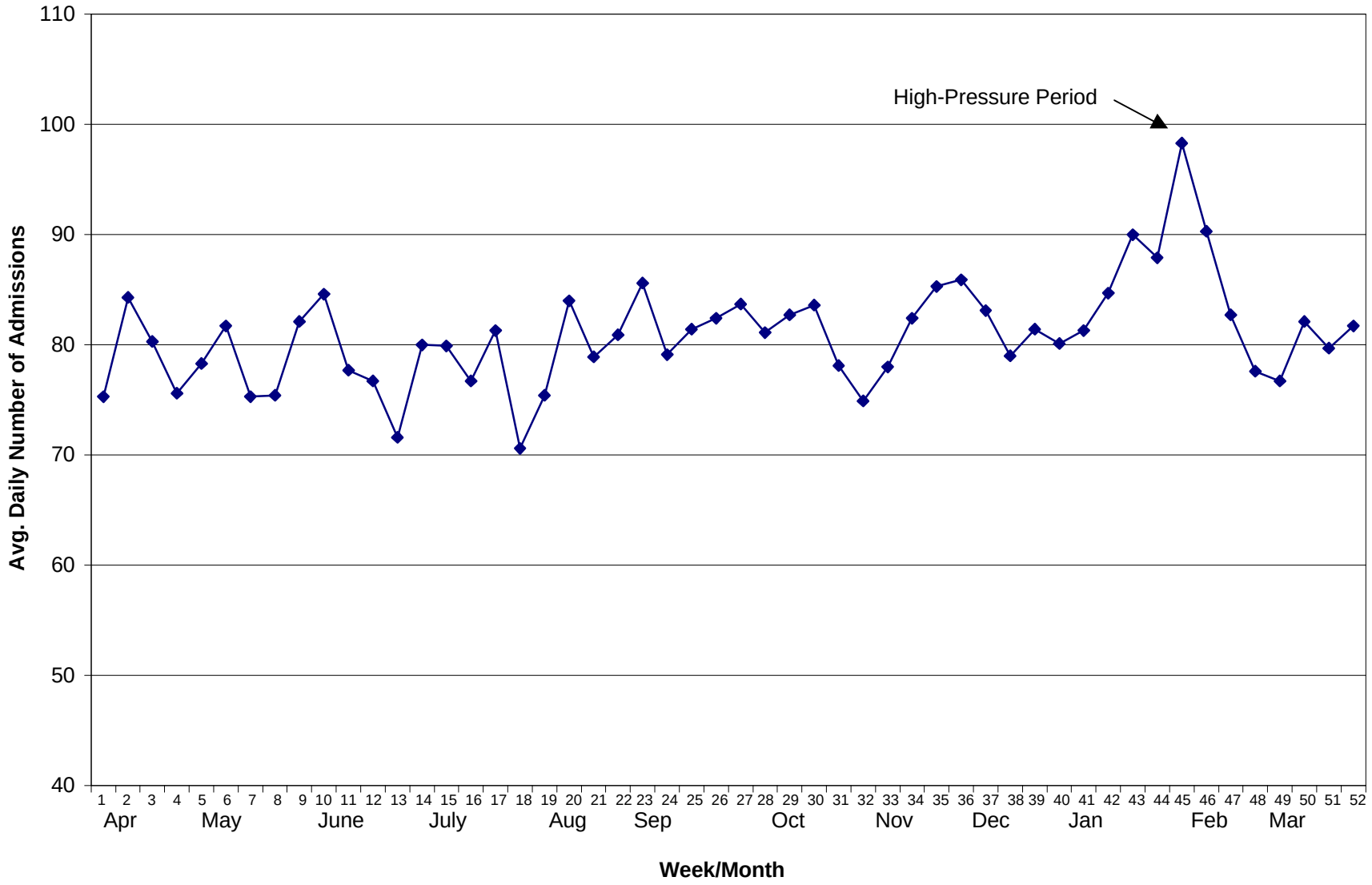
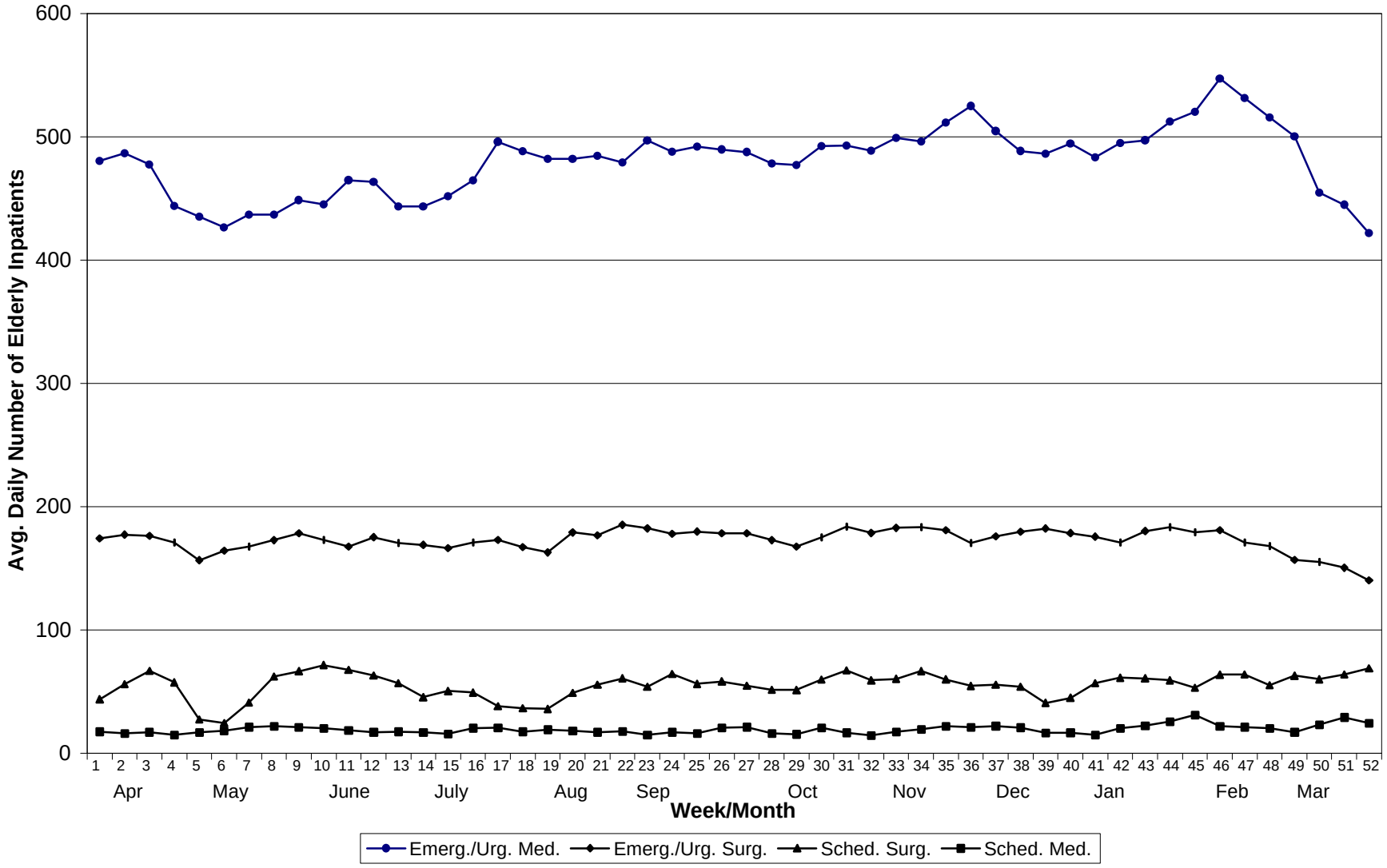


Figure 7: Average Daily Number of Elderly (75+) Inpatients by Type of Care, 1997/98



75 and over were to a large extent responsible for the increase in emergent/urgent medical inpatient census (and admissions) observed in February.

Was there a problem getting patients discharged to personal care homes (PCHs) in February? Figure 8 shows that the number of patients transferred to PCHs was in fact higher in February than at any other time during fiscal 1997/98, with 184 patients being placed in PCHs during that month. This represents a 34% increase over the average number of transfers. This may be the result of special efforts by the Continuing Care Program to speed up transfers by giving greater preference to hospital patients. At the same time, the greater number of deaths that typically occur in January and February in nursing homes may have freed up additional beds. The large majority of patients transferred were 75 years and above (80% of all transfers).

Were There More Complex Cases in Hospital?

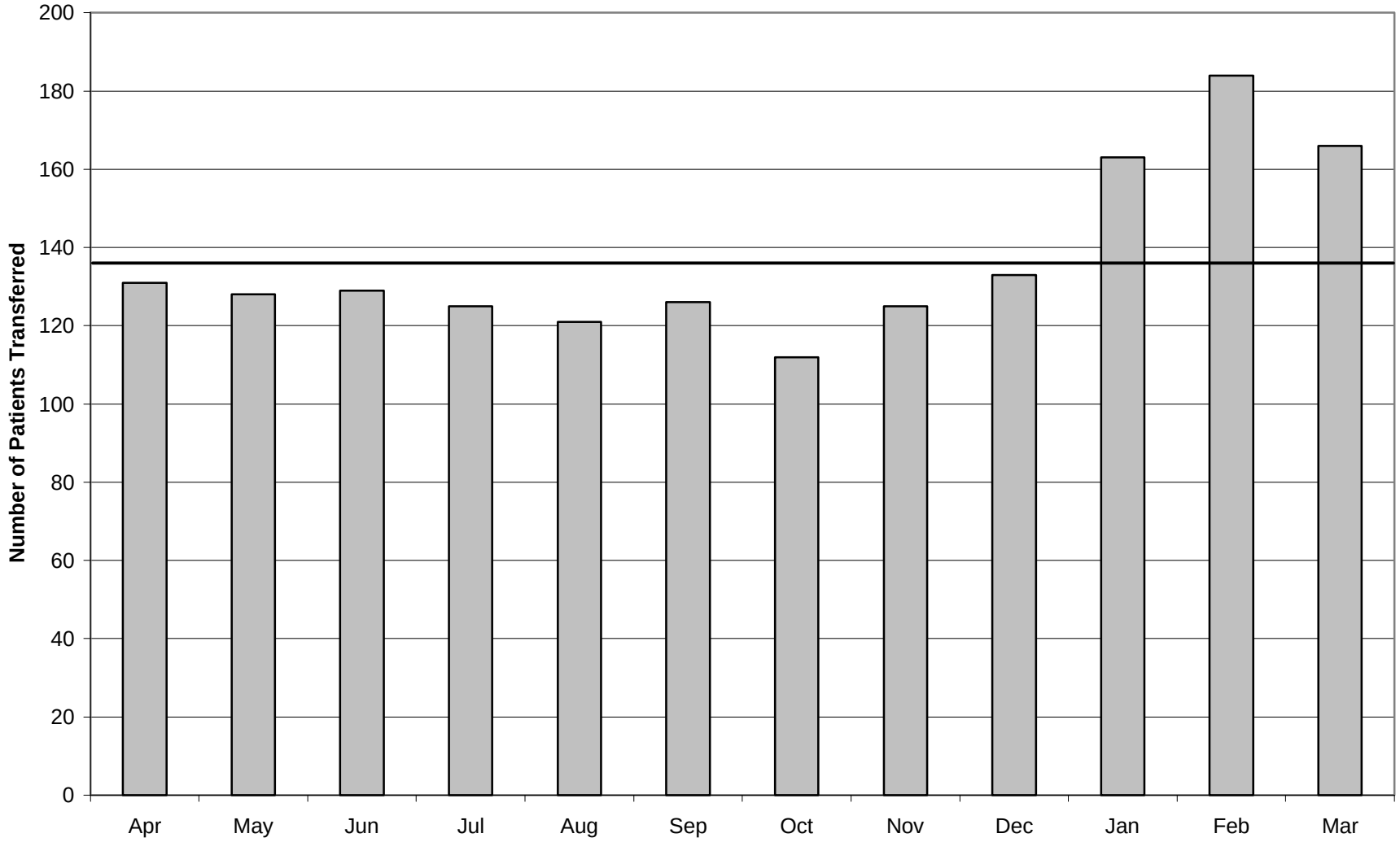
We next examined whether there were more complex cases requiring more intensive care (those associated with a high level of comorbidity and complications) in hospital during February of 1998 than at other times during the year. Figure 9 shows that the number of complex cases among emergent/urgent medical inpatients exhibited large seasonal fluctuations, with the peak occurring in February. The increase in February was quite substantial: 60 more complex cases were in hospital per day compared to the average of 271 individuals per day (a 22% increase). During May (the flood) and the summer months (June and July) the number of complex emergent/urgent medical cases was particularly low.

The number of complex emergent/urgent surgical cases also fluctuated across the year (see Figure 9). However, the peak occurred in August with 274 complex patients in hospital per day. The number of complex cases was just below average in February. Similarly, February was not an unusual month for either scheduled surgery or scheduled medicine.

The Impact of the Flu Season

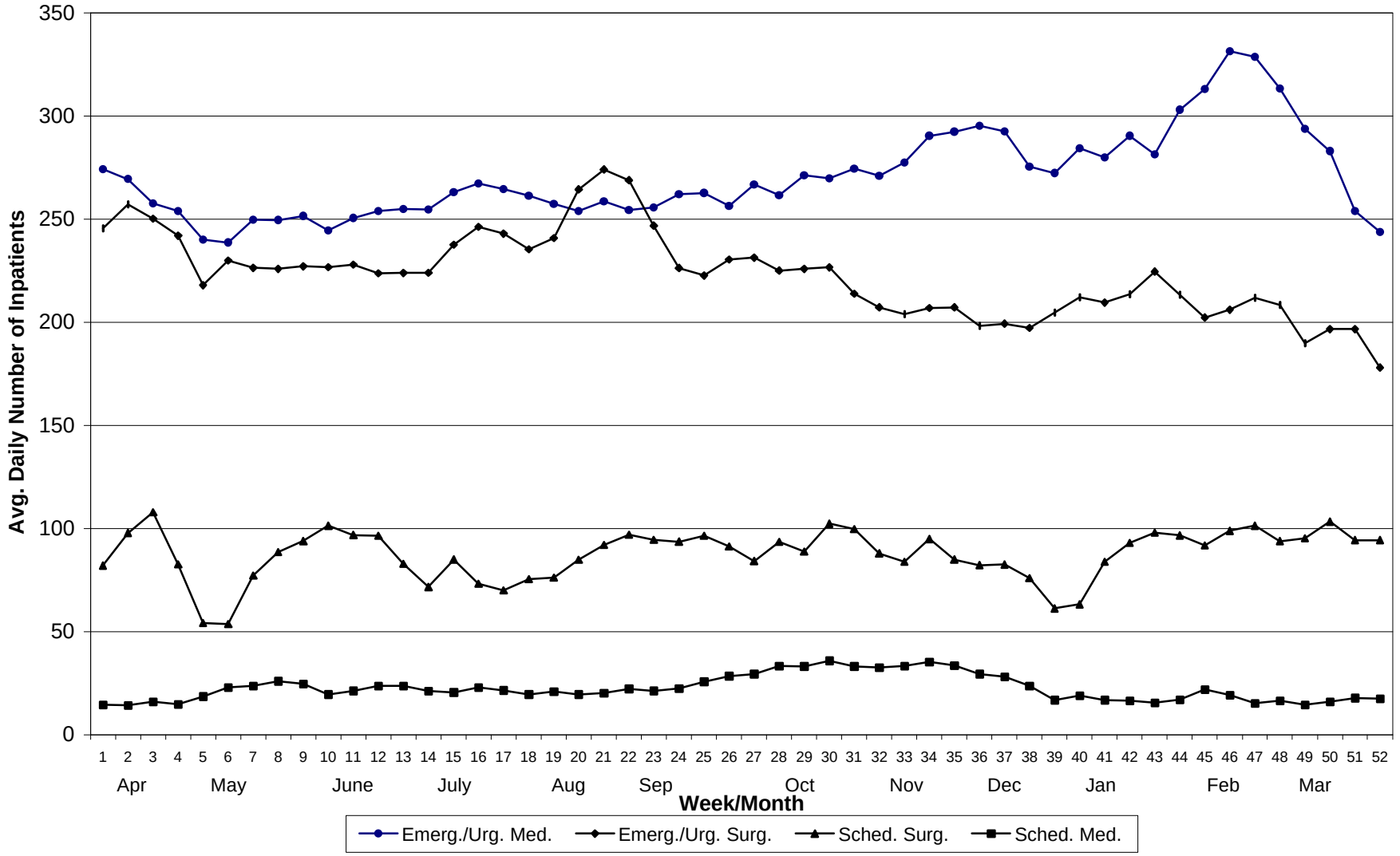
Hospital bed crises are frequently attributed to influenza. A substantial increase in admissions due to influenza-associated illnesses can create a problem if a hospital is already

Figure 8: Number of Patients Transferred from Hospital for Personal Care Homes*, 1997/98



*Includes transfer to any Personal Care Home in Manitoba

Figure 9: Average Daily Number of Complex Inpatients by Type of Care, 1997/98



functioning at near-full capacity. Figure 10 displays the number of emergent/urgent medical patients in hospital with influenza-associated illnesses (pneumonia and influenza and other respiratory conditions as the most responsible diagnosis).[8] A marked increase in patients was apparent in February when the number of patients with influenza-associated illnesses peaked at 238 - an increase of 121 patients compared to an average of 117 individuals (a 103% increase).

To provide a sense of the relative impact of influenza-associated illnesses, Figure 11 plots the census for emergent/urgent medical inpatients with influenza-associated illnesses and those with other health problems. Overall, patients with other problems constituted the majority of inpatients throughout the year. However, the proportion of patients with influenza-associated illnesses increased considerably in February. While, on average, 13% of all emergent/urgent medical inpatients were diagnosed with influenza-associated illnesses, the percentage rose to 23% in February.[9] In comparison, the number of inpatients with non-respiratory illnesses remained relatively constant throughout the year, with slight declines in December and February. Thus, influenza-associated illnesses placed a considerable strain on the hospital system during February, being largely responsible for the increase in emergent/urgent medical patients observed during that month. Reducing the number of patients with influenza-associated illnesses who required hospitalization could therefore have alleviated the February high-pressure situation quite substantially.

A peak in influenza-associated illnesses also occurred in February when we examine emergent/urgent medical *admissions*. Admissions with influenza-associated illnesses more than doubled in February when the average daily number of admissions increased to 25, up from an average of 12 admissions with influenza-associated illnesses. Expressed differently,

[8] The most responsible diagnosis is defined as the diagnosis that was considered, upon discharge, as being most responsible for the patient's hospital stay.

[9] When all diagnostic positions are used to define influenza-associated illnesses, rather than the most responsible diagnosis only, 32.5% of all emergent/urgent medical inpatients were diagnosed with influenza-associated illnesses on average. The proportion rises to 46% in February. See also Table B2, Appendix B.

Figure 10: Average Daily Number of Emergent/Urgent Medical Inpatients with Influenza-Associated Illnesses, 1997/98

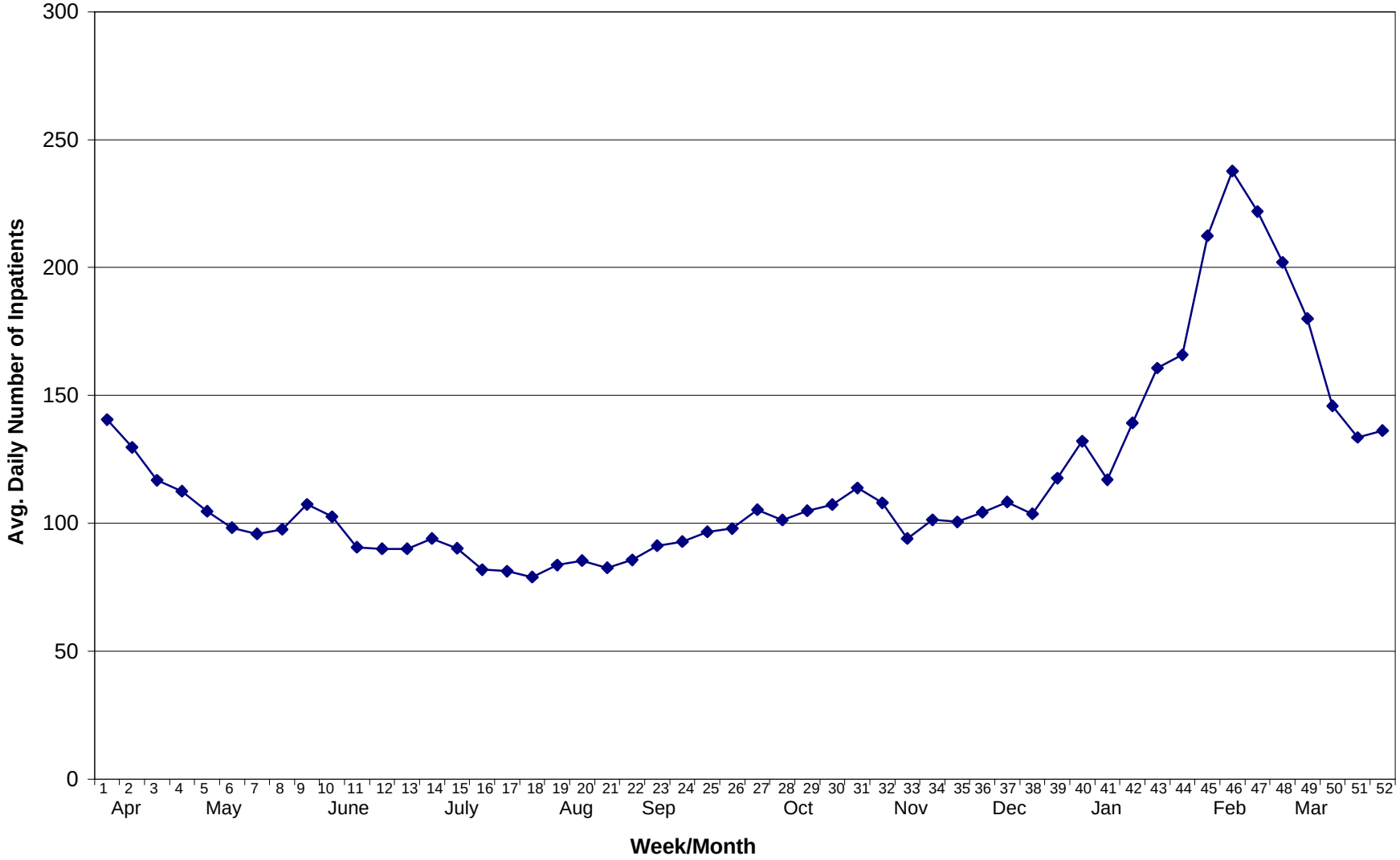
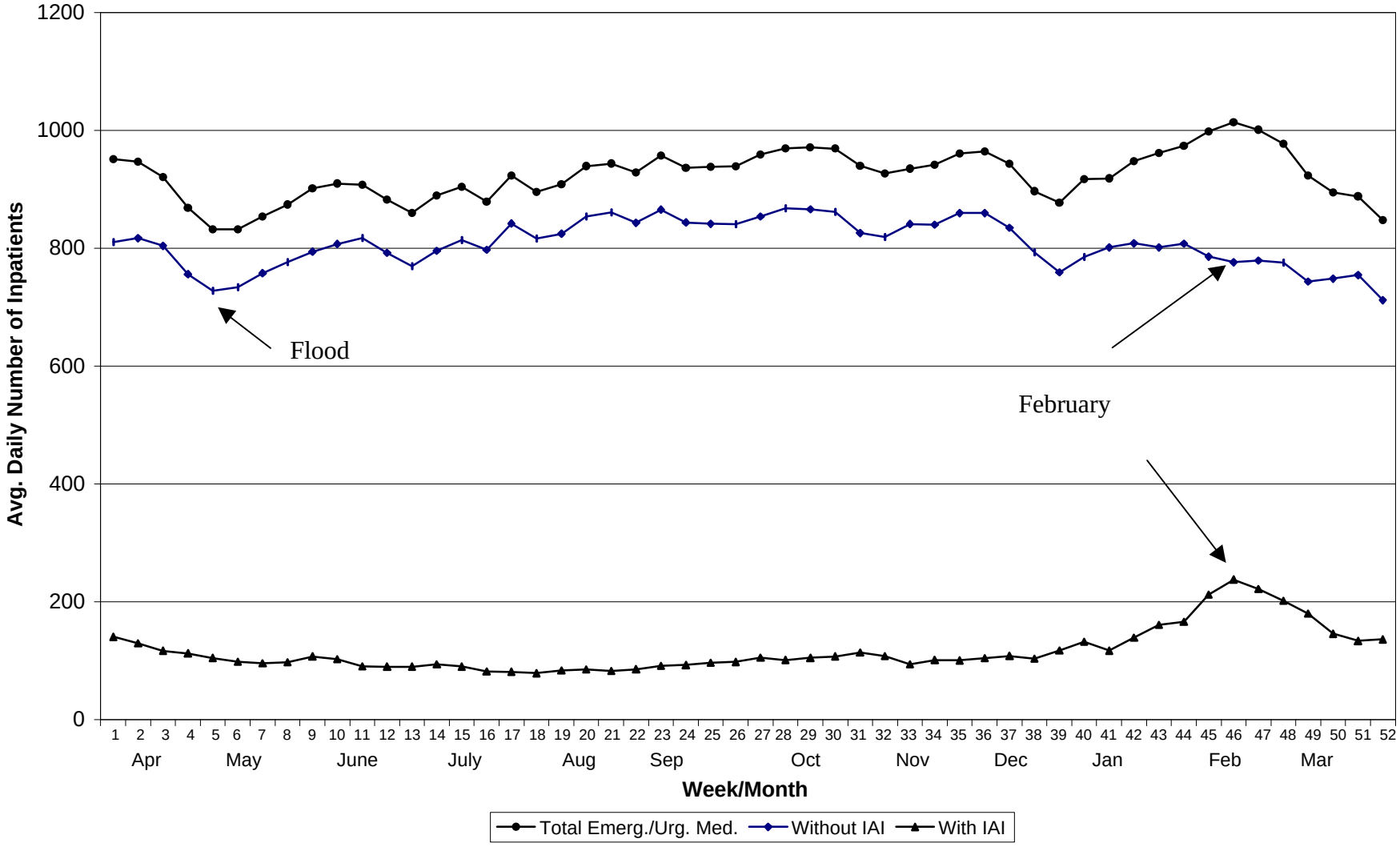


Figure 11: Average Daily Number of Emergent/Urgent Medical Inpatients with/without Influenza-Associated Illnesses (IAI), 1997/98



while 15% of *all* admissions were due to influenza-associated illnesses on average, in February that percentage rose to 28% - a considerable increase.[10]

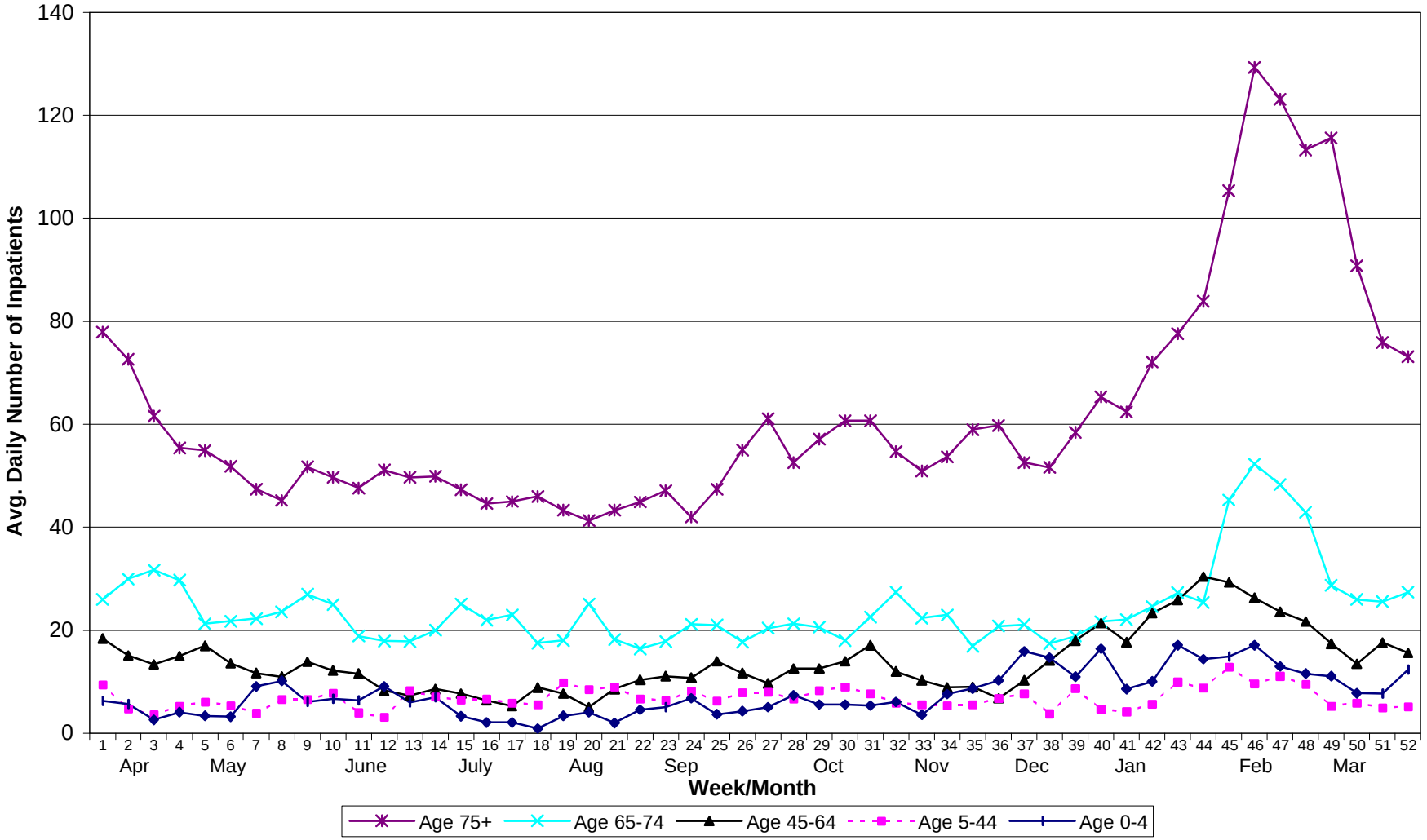
A breakdown of patients with influenza-associated illnesses by age groups shows that there was a particularly large increase in the number of elderly inpatients (aged 75 and above) with influenza-associated illnesses in February (see Figure 12). The number of elderly inpatients (75+ years old) with influenza-associated illnesses rose from an average of 67 to 129 in February (a 93% increase). The results for admissions were similar to those for the inpatient census: The increase in admissions with influenza-associated illnesses was largely due to older patients and particularly those aged 75 and older. Thus, influenza-associated illnesses account for the overall increase in elderly patients in hospital during February that we observed earlier (see Figure 7 displayed above). It should also be noted that influenza-associated illnesses were, to a large extent, responsible for the increase in complex patients during that month.

The number of patients with influenza-associated illnesses aged 65 to 74 also peaked in February, whereas the census for patients aged 45 to 64 peaked in January (see Figure 12). The number of children aged zero to four with influenza-associated illnesses doubled both in January and in February, increasing from an average of eight to 17 patients in hospital per day in both months. The census for patients aged five to 44 also increased, but to a lesser extent than in the case of patients aged 45 and above.

Overall (see Figure 13), 53% of all emergent/urgent medical patients with influenza-associated illnesses were 75 years and above. An additional 21% were between the ages of 65 and 74. Thus, seniors constituted nearly three-quarters of all patients with influenza-associated illnesses, as averaged across the year. The proportion of patients 65 and older rose to 80% in February. The majority of individuals with influenza-associated illnesses were admitted to hospital from the community (84.5%). An additional 5.6% were transferred from personal care homes and the remaining 10% were transferred from other hospitals.

[10] Select findings using a narrower definition of "flu" that includes only pneumonia and influenza (ICD9-9-CM codes 480-487) can be found in Appendix B.

Figure 12: Average Daily Number of Emergent/Urgent Medical Inpatients with Influenza-Associated Illnesses by Age Groups, 1997/98



Among individuals aged 75 and above, the proportion of patients with influenza-associated illnesses admitted from personal care homes was higher (12.8%).

Elderly patients in hospital with influenza-associated illnesses also stayed considerably longer in hospital than younger individuals (see Figure 14). The median length of hospital stay of patients aged 75 and over was eight days.[11] In comparison, the median length of stay was six days for patients 65 to 74 years old and five days for patients aged 45 to 64. The median length of stays was two to four days for patients aged zero to 44.

The finding that the majority of patients in hospital with influenza-associated illnesses were 65 years and older is entirely consistent with the research literature, which indicates that seniors are particularly susceptible to the complications of influenza, such as pneumonia, and that the risk of death is higher in this age group than for younger individuals (e.g., Liu and Kendal, 1987; McBean et al., 1993). Influenza vaccination, which has been shown to be effective in preventing hospital admissions and deaths, is therefore recommended for all individuals aged 65 and older in Canada (National Advisory Committee on Immunization, 1998) and most developed countries (Fedson, et al., 1997).

Inpatient Census Patterns Are Predictable

One of the most commonly voiced opinions for dealing with winter bed pressures is to blame them on hospital bed closures and to call for more acute hospital beds. Yet, judging by media reports, the hospital system experienced periods of crisis even prior to the bed cuts that have occurred over the past several years. The newspaper headlines "Bed shortages blamed for patient lineup" and "Shortage of beds strands patients in hallways" echoed several of the headlines published in 1998; except that the former appeared in the Winnipeg Free Press in January of 1989 and the latter in February of 1990! These articles were therefore published *before* the major downsizing of the Winnipeg hospital system started (the first major bed cuts occurred in 1992 when 306 acute care beds were permanently closed in Winnipeg). Table 1

[11] The median is the mid-point. A median length of stay of eight days means that 50% of patients had stays longer than or equal to eight days and 50% had shorter stays.

Figure 13: Emergent/Urgent Medical Inpatients with Influenza-Associated Illnesses by Age Groups, 1997/98

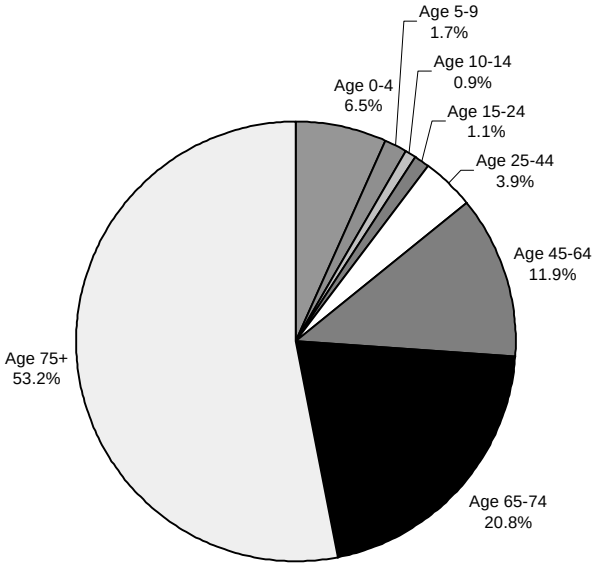
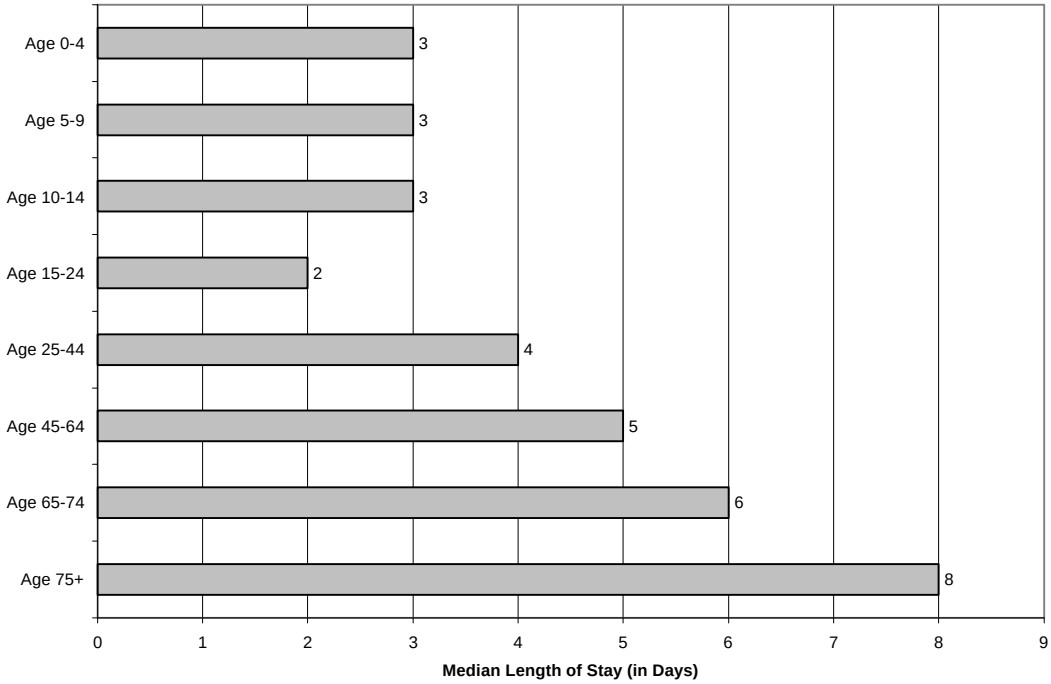


Figure 14: Median Length of Stay of Emergent/Urgent Medical Inpatients with Influenza-Associated Illnesses by Age Groups, 1997/98



shows select headlines pertaining to emergency department overcrowding and hospital bed shortages from 1988 through to 1999.

To examine the pattern of inpatient census across the years, we plotted the total inpatient census for the past eleven years (see Figure 15). The pattern of high volume and low volume periods was remarkably similar across the years, regardless of whether we look at the years prior to the downsizing of the Winnipeg acute hospital sector (top panel), during the years when the most substantial cuts to the acute hospital sector occurred (middle panel), or the years following downsizing (bottom panel): The census is relatively low in the summer months, very low in December when beds are seasonally closed, and relatively higher in spring, fall, and winter (the threatened nursing strike of 1988, the nursing strike of 1991 and the flood in the spring of 1997 being the major exceptions).[12] The inpatient census was not appreciably higher in January and February than in the fall or spring.

Also apparent in Figure 15 is that the number of inpatients has generally decreased over the years, as hospital bed cuts occurred. In 1992/93 and 1993/94, 515 acute care beds were removed from Winnipeg acute hospitals. Downsizing continued during subsequent years and between 1994/95 and 1997/98 183 additional beds were cut. Between 1992/93 and 1997/98, 698 beds were therefore removed from the hospital sector (see Appendix A for further details). Winnipeg hospitals have coped with bed closures by shortening length of hospital stays and by increasing outpatient surgery. The net effect has been that the same number of patients are being treated in Winnipeg hospitals after downsizing as there were before downsizing, even after adjusting for the aging population (See the recent Manitoba Centre for Health Policy and Evaluation report on hospital downsizing by Brownell, Roos, and Burchill, 1999).

Patterns of Emergent/Urgent Medical Inpatient Census Across the Years

Previously (see Figure 5), we saw that emergent/urgent medicine experienced a substantial increase in the number of inpatients in February of 1998. To examine whether a similar

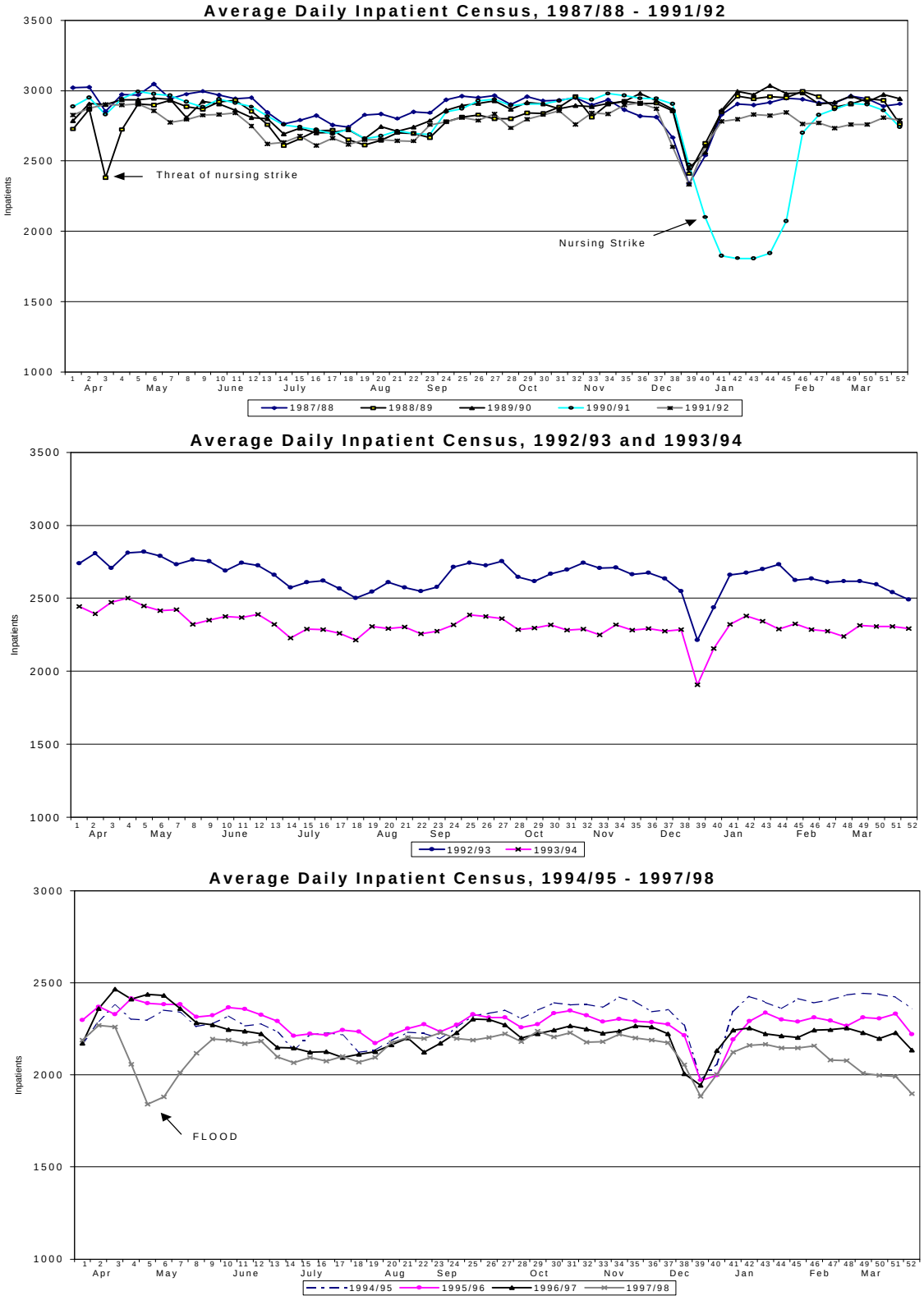
[12] A similar consistent pattern across the 11 years emerges for admissions.

Table 1: Examples of Winnipeg Free Press Headlines Related to Hospital Bed Pressure*

1988	"Bed shortage cancels cancer treatment" (Jan. 17, 1988) "Summer spells hospital emergency: Patients wait up to nine days for admission as wards overtaxed" (June 12, 1988)
1989	"Bed shortages blamed for patient lineups" (Jan. 6, 1989) "Hospital battles shortage of beds" (Jan. 7, 1989)
1990	"Miseries at Misericordia: Overcrowding worsens as Orchard awaits report" (Feb. 8, 1990) "Shortage of beds strands patients in hallways" (Feb. 8, 1990)
1991	"Grace emergency under pressure (March 13, 1991) "Respiratory patients choke up emergency ward" (Dec. 9, 1991)
1992	"Ward shut in battle to conquer overload" (Jan. 3, 1992) "Overflowing with patients, Grace closes emergency" (April 23, 1992)
1994	"We're at breaking point, HSC doctor warns" (Jan. 13, 1994) "Emergency wards swamped with patients: Grace, Seven Oaks turn people away" (April 18, 1994)
1995	"Emergency ward shut by flood of patients" (Feb. 23, 1995) "Doer wonders if shut ERs, death linked" (Oct. 28, 1995)
1996	"No bed for HSC heart patient" (Aug. 20, 1996) "Stay in hospital hallway deplored" (Dec. 23, 1996)
1997	"Emergency care strain continues" (Jan. 3, 1997) "Hospitals in critical condition: Patients on cots fill hallways outside city emergency ward" (Jan. 8, 1997)
1998	"Bed shortage, flu cancel surgery plans: City hospitals struggling to free up space" (Feb. 18, 1998) "Crowding forces ER patients into hallways, lengthens wait" (Feb. 19, 1998)
1999	"Weather floods emergency rooms, delays surgery" (Jan. 5, 1999) "No room for dignity in ERs hallways" (Jan 8, 1999)

*Only select headlines are displayed; additional articles regarding the hospital bed crisis were published in most years. In 1993 we could not find any articles pertaining to bed closures.

Figure 15: Inpatient Census, 1987/88 – 1997/98



pattern occurred in other years, Figure 16 shows the emergent/urgent medical census for the period before downsizing (top panel), during downsizing (middle panel) and following downsizing (bottom panel). Although there is considerable variability in the inpatient census across each of the years, a general trend toward a peak in December, January, February, and March is apparent, particularly in more recent years (see middle and bottom panels). April was also a peak month across several years.

The inpatient census rose to high-pressure levels (mean + two standard deviations) in nine of eleven years.[13] Although the census generally rose to high-pressure levels only once in a given year, in two years there were two high points per year (1991/92, 1993/94). The most common month during which the census reached high-pressure levels was January (in 1990, 1993, 1994, and 1997),[14] followed by April (in 1991, 1993, and 1995). High-pressure peaks occurred twice in March (1989, 1995) and once in December (1991) and in February (1998).

In Figure 17 we have plotted the emergent/urgent medical census for the most recent four years to allow more detailed examination of high-pressure periods. The upper dashed line represents the high-pressure level (mean + two standard deviations), whereas the uppermost solid line represents the warning level (mean + one standard deviation). The middle line is the mean, and the two lines below it the mean minus one standard deviation and the mean minus two standard deviations, respectively. Apparent in Figure 17 is that the bounds around the census are wider in some years. That is because standard deviations were calculated for each year separately, with greater variability in inpatient census being reflected in wider bounds.

The inpatient census rose above the high-pressure level in March of 1995 for a period of one week (top panel) and in April of 1995 for three weeks (second panel). In fiscal year 1996/97 (third panel), the emergent/urgent medical census increased markedly in January, with figures rising above the high-pressure level for a period of two weeks. It should be noted that

[13] See Appendix B, Table B3 for data.
[14] The fiscal year runs from April 1 to March 31. January of 1990, therefore, falls into fiscal year 1989/90, January of 1993 into fiscal year 1992/93, etc.

Figure 16: Emergent/Urgent Medical Inpatient Census, 1987/88 – 1997/98

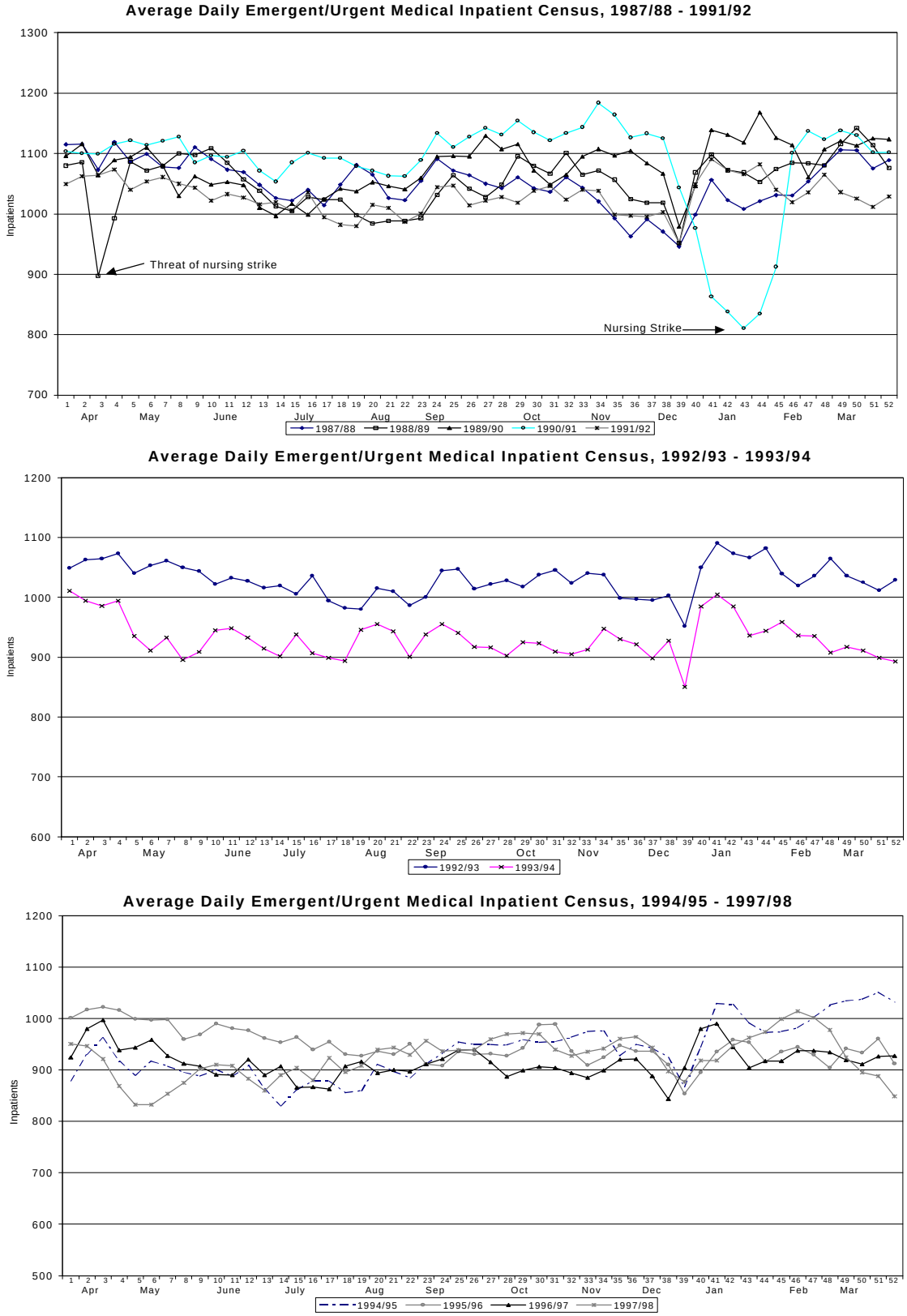
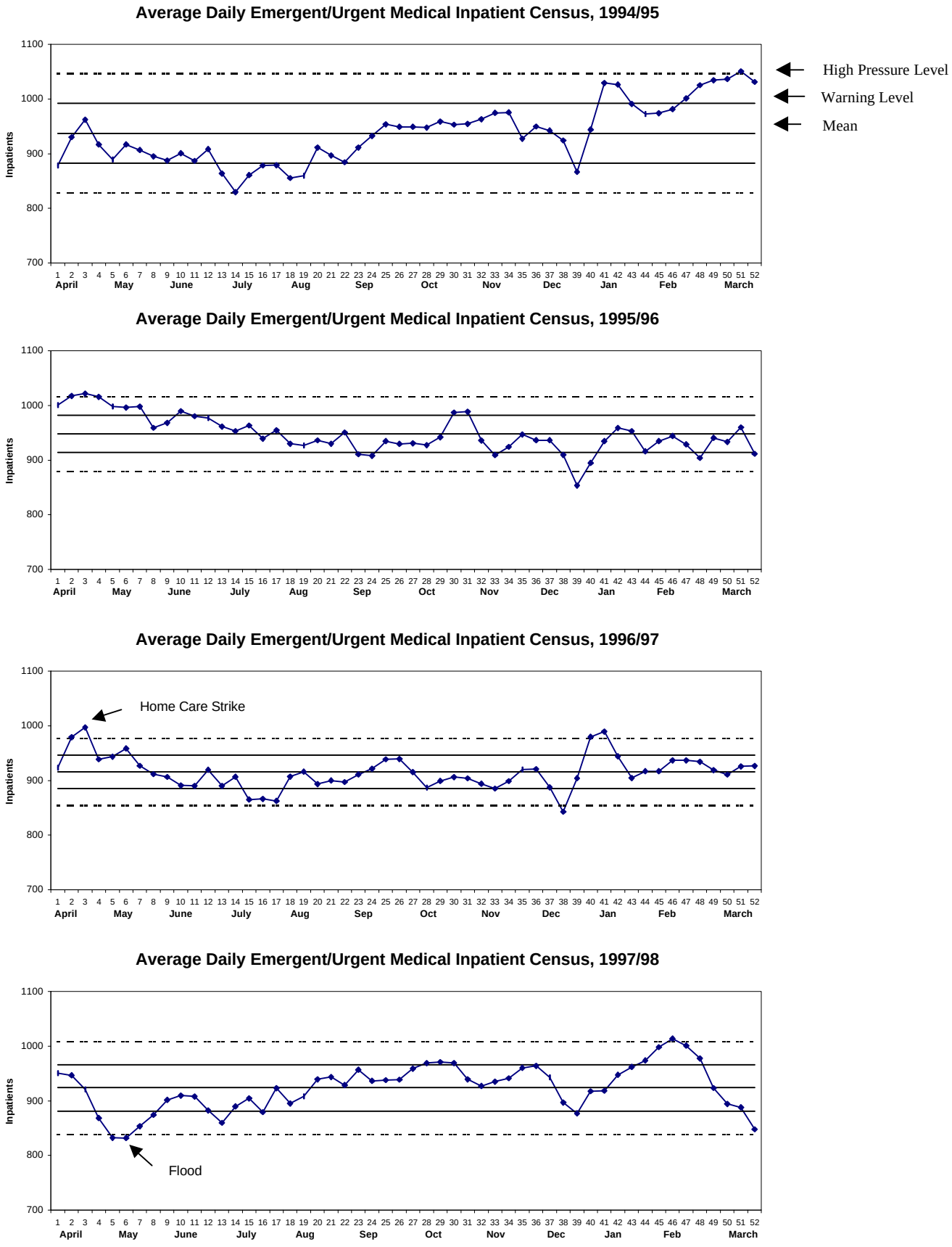


Figure 17: Emergent/Urgent Medical Inpatient Census, 1994/95 – 1997/98



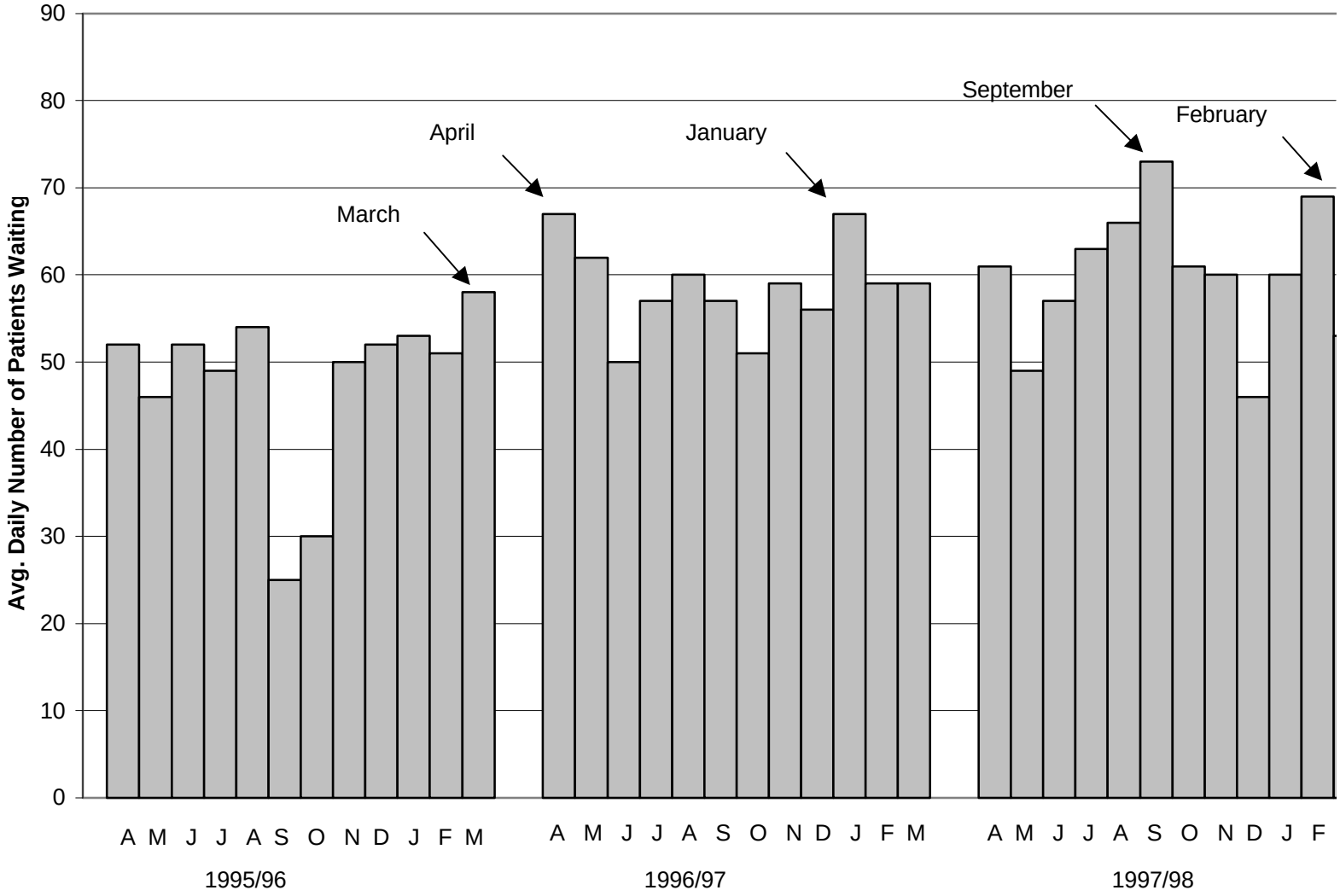
the second peak in April of 1996 was due to the home care strike, which resulted in an increased number of patients being admitted to hospital. In 1997/98 (bottom panel), the peak occurred in February, as we had seen previously.

The warning levels displayed in Figure 17 help us estimate how many more emergent/urgent medical beds would be needed to deal with the winter peak. Compared to the warning level, 59 additional beds per day would have been required in March of 1995, 40 beds in April of 1995, 44 in January of 1997, and 48 additional beds in February of 1998 to deal with the influx of patients during the January to April period.[15] It is important to note that the need for these additional beds is a short-term phenomenon, with the volume of patients rising to high-pressure levels for periods of one to three weeks. Moreover, the need for beds is unique to emergent/urgent medical patients. No similar seasonal patterns were apparent for other types of patients, although scheduled surgery showed very predictable dips in July, August and December due to short-term bed closures during the holiday seasons.

Thus, Figure 17 shows that the pattern of emergent/urgent medical inpatients cannot be predicted to the week or month. However, we consistently see peak periods during the winter months (anywhere between December and April). This suggests that potential bed pressures can be dealt with by anticipating an excess of emergent/urgent medical patients over normal levels at some point during these months. Adding into the picture the admitted patients who are waiting in emergency departments for medical beds does not change this conclusion (see Figure 18). Typically, the number of patients awaiting medical beds peaked anywhere between January and April. In 1995/96 the peak occurred in March, in 1996/97 in April and January. Fiscal 1997/98 was somewhat unusual in that a large number of patients were waiting for medical beds in September, followed by another high point in February. An upward trend is apparent in the number of patients waiting for beds: While there were 48 patients waiting on average in 1995/96, the numbers increased to 59 in 1996/97 and 60 in

[15] These estimates are calculated by subtracting the warning level value (mean + one standard deviation) from the peak value. For example, in 1998 the census peaked at 1014 and the warning level value was 966; the difference is therefore 48.

Figure 18: Average Daily Number of Patients Waiting for Medical Beds in Emergency Departments, 1995/96 - 1997/98



1997/98. Whether this increase represents a systematic trend cannot be determined, as Central Bed Registry data are available only since 1995/96.

In sum, the hospital bed shortage is a problem that depends not so much on the absolute number of patients in hospital and the absolute number of beds available, but on the increase of emergent/urgent medical inpatients relative to the average inpatient census *during that year*. The increase in patients varied across the years, ranging from 40 to 59 patients in the last four years (compared to the warning level, i.e. mean + one standard deviation). Using figures from the worst year (1994/95), the increase of approximately 60 emergent/urgent medical patients, or a 5% to 10% increase in the winter months (December to April) is quite predictable and, hence, presumably manageable. Adding to this the patients in emergency departments who were waiting for medical beds and could not adequately be accommodated, we estimate that about 70 to 80 more medical beds per day than normal will be needed at some point during the winter months for a period of one to three weeks. In terms of *admissions*, we estimate that as many as 10 to 12 more medical admissions than normal can be expected during high-pressure periods – or an approximately 10% to 15% increase in admissions relative to normal levels.[16]

The importance of this *relative* availability of beds cannot be overstated. In fiscal 1991/92, the year prior to major bed cuts, there were approximately 700 more beds in the Winnipeg acute hospital system than in 1997/98. In 1991/92, the average census of emergent/urgent medical inpatients was 1085, compared to an average of 924 inpatients in 1997/98. Nevertheless, in December of 1991 there was a surge in emergent/urgent medical inpatients, with the census rising to 1164 inpatients (a 7.3% increase; see Table B3, Appendix B for data). This peak was 19 patients above the high-pressure level, which we calculated at 1145 patients. On December 9, 1991, the headline "Respiratory patients choke up emergency ward" appeared in the Winnipeg Free Press, with the article referring to overflowing observation rooms and patients lying in hallways. In February of 1998 the census peaked at

[16] These admission estimates were derived by examining admissions relative to the warning level (mean + one standard deviation). The largest increase in emergent/urgent medical admissions occurred in 1997/98 when there were 12 more admissions than normal (peak = 98, warning level = 86).

1014 patients (a 9.7% increase relative to the average census during that year), which was also above high-pressure levels. There is every reason to believe, therefore, that permanently adding 50 to 100 medical beds to the current system would not prevent high-pressure periods from occurring in the future unless the system is *managed* differently. [17]

The Flu Revisited

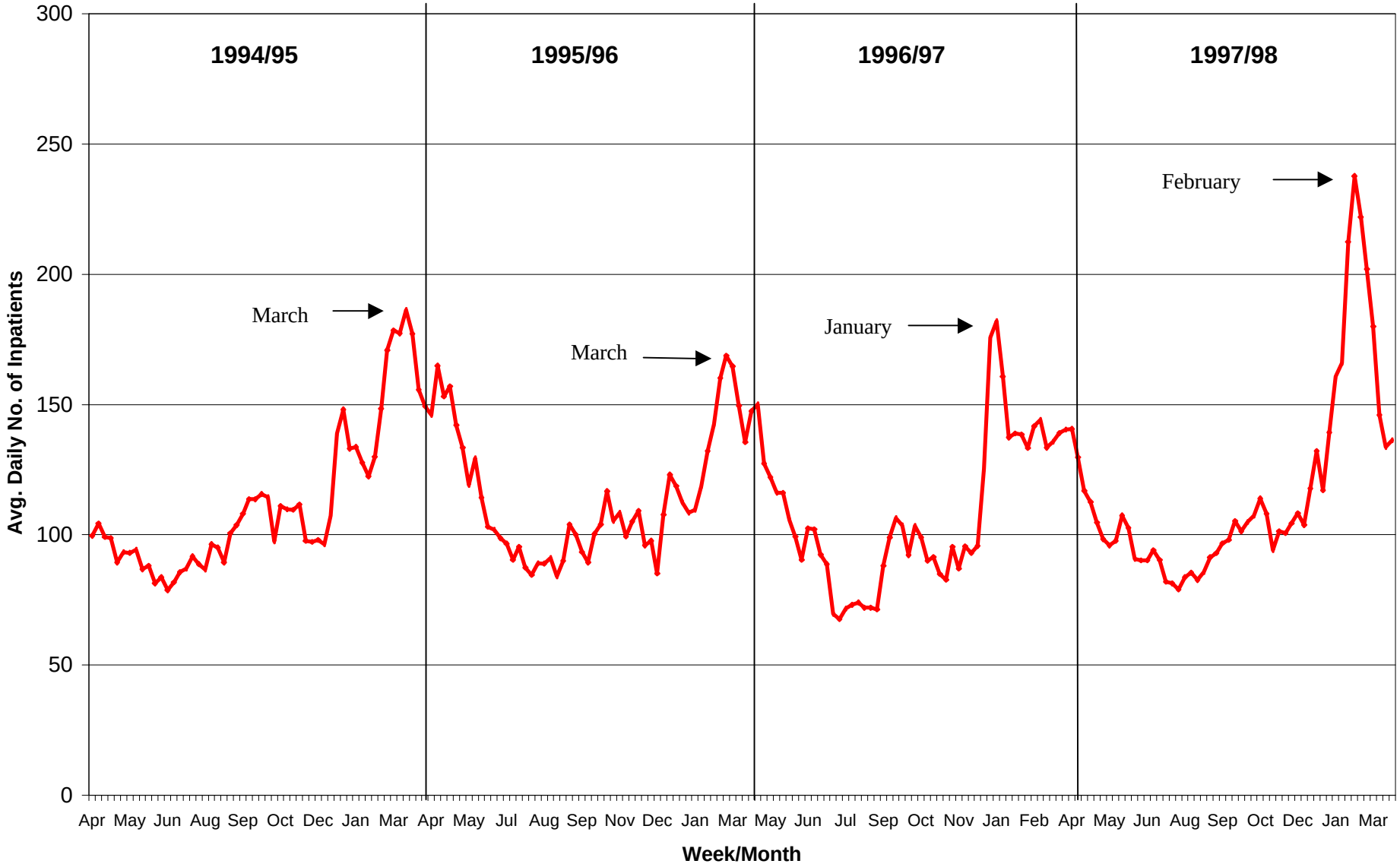
In February of fiscal year 1997/98, influenza-associated illnesses were responsible for a large increase in the emergent/urgent medical inpatient census. Figure 19 shows that the number of patients in hospital with influenza-associated illnesses also increased substantially during the winter months of the previous three years. The occurrence of these spikes corresponded quite closely to high-pressure periods (compare with Figure 17). In 1994/95, influenza-associated illnesses had a major impact in March. In 1995/96, the number of patients with influenza-associated illnesses peaked at 169 in March, although the peak in April was only minimally lower at 164 inpatients. During that year, we identified a high-pressure period in April, but not March, suggesting that the system was able to cope with the March influenza peak. In 1996/97, the peak in patients with influenza-associated illnesses occurred in January and, as we had seen previously, in 1997/98 we see a large increase in the number of inpatients with influenza-associated illnesses in February.

These "flu" patterns are consistent with Health Canada data which show that, Canada-wide, the peak of influenza-like illnesses occurred between early February and late March for the past five years (fiscal 1993/94 to 1997/98; Health Canada, 1998). When we examine data as far back as 1987/88, we find that the peak for influenza-associated illnesses (census and admissions) in Winnipeg hospitals occurred some time between December and April during the past eleven years.[18]

[17] It should be noted that newspaper stories regarding emergency overcrowding did not always appear during the high-pressure periods we identified using statistical techniques, although this was the case in some years (e.g., 1996/97 and 1997/98). This is perhaps not surprising as other events may occur on a given day that are preferentially published.

[18] Data available upon request.

Figure 19: Average Daily Number of Emergent/Urgent Medical Patients with Influenza-Associated Illnesses, 1994/95 - 1997/98



In all years in which we observed high-pressure periods, the high-pressure period corresponded to an increase in patients with influenza-associated illnesses. However, it should also be noted that in two years we see a marked increase in patients with influenza-associated illnesses, but no corresponding high-pressure period in the emergent/urgent medical census. This suggests that factors other than influenza-associated illnesses also contribute to high-pressure periods.

Figure 19 also shows that the number of inpatients with influenza-associated illnesses was considerably higher in fiscal 1997/98 than in previous years. 1997/98 was clearly an unusual year, due to an incorrect match between vaccine and influenza strain. That 1997/98 was unusual is confirmed by Health Canada's Laboratory Centre for Disease Control (Health Canada, 1998), which observed the highest number of laboratory-confirmed case-by-case influenza infections during that season of any flu season since 1978.

4. POSSIBLE APPROACHES TO CONSIDER

The high-pressure period during the winter months is a recurrent problem that has plagued Winnipeg hospitals, and hospitals in most other Canadian cities, for many years. The solution to the problem does not appear to lie in simply adding beds, as high-pressure periods occurred prior to downsizing when there were many more acute hospitals beds in the system than now. Rather, a real solution to the winter bed problem has to involve both preventive efforts to reduce hospital admissions and alternative ways of managing the hospital system.

The following are some potential approaches that should be considered in trying to prevent future high-pressure periods, keeping in mind that the feasibility of any changes to the management of the acute hospital sector will have to be carefully evaluated. Moreover, the potential impact of changes in hospital management practices on other sectors of the health care system, particularly continuing care (personal care home, home care) programs, will have to be examined. Many of the issues presented here were conceived in discussion with the Seasonality Working Group, which was struck by the Winnipeg Hospital Authority to examine possible solutions to winter bed shortages. They therefore echo some of the Working Group's recommendations (see the Final Report of the Bed Utilization Central Co-ordinating Committee, Winnipeg Hospital Authority, 1998).

Immunization

Influenza Vaccination

Influenza-associated illnesses clearly place a considerable strain on Winnipeg hospitals. In February of 1998, for example, the number of emergent/urgent medical inpatients with influenza-associated illnesses doubled, increasing from an average of 117 individuals to 238 patients in hospital per day. This increase in patients with influenza-associated illnesses brought the emergent/urgent census to above high-pressure levels.

Influenza vaccination for the correct virus strain is a highly effective preventive measure to attenuate influenza and the complications arising from it in high-risk populations. Vaccination reduces hospitalizations for pneumonia and influenza by 32% to 39% and

hospitalizations for all respiratory conditions by 15% to 34% (Fedson et al., 1993; Gross et al., 1995; Nichol et al., 1998). Among the elderly, influenza vaccination has also been found to decrease hospitalization for congestive heart failure by 27% (Nichol et al., 1998). Moreover, deaths from all causes decreased by 27% to 30% in vaccinated persons (Fedson et al., 1993; Gross et al., 1995). Influenza vaccination provides direct savings to the health care system and is recommended for all high-risk groups, including adults aged 65 and above, individuals with chronic health conditions, and people in long-term care facilities (National Advisory Committee on Immunization, 1998).

Despite the proven effectiveness of influenza vaccination, universal vaccination of high-risk groups has not yet been attained. In a study conducted during the fall/winter of 1990/91, Duclos and Hatcher (1993) found that only 39.9% of Manitobans aged 65 and above had been vaccinated, a figure that was below the overall national average of 44.8% and the rate for Ontario, the province with the highest vaccination level at 53.4%. A more recent study carried out in Manitoba's Interlake region during the fall of 1994 showed a vaccination level of nearly 50% for individuals aged 65 and over (Macdonald et al., 1996). Still, this coverage falls substantially short of the recommendations of the National Advisory Committee on Immunization (1998) that influenza vaccine programs should attain vaccination levels of at least 90% among high-risk groups.

The question of how to increase vaccination levels is a critical one that has been addressed extensively in the research literature (e.g., see Gyorkos et al., 1994 for a review). One approach that is increasingly being recognized for its potential is to offer influenza vaccination as part of any contact with health care providers and particularly during hospital stays during the vaccination season. In this respect, Fedson et al., (1992) showed that most individuals who were hospitalized for influenza-associated illnesses had contact with the health care system during the preceding vaccination season. The results of the study are striking: Among individuals aged 65 years and above, approximately 80% had contact with the health care system, be it that they had been hospitalized or had seen a physician. The number of younger individuals who had contact with the health care system and were later hospitalized with influenza-associated illnesses was also substantial (50% to 70%). These

contacts with the health care system can be viewed as missed opportunities to provide influenza vaccination.

The advantage of hospital-based vaccination programs, as well as other programs administered by health care providers (physicians and public health nurses), is that they allow targeting of high-risk groups. As individuals at high risk tend to be under medical care, they could be vaccinated when the opportunity arises with relatively little effort. Hospital-based programs have indeed been shown to be more effective than client-oriented or provider-oriented programs in getting people vaccinated (Crouse et al., 1994). An important aspect of such programs is standing orders for nurses to identify patients in need of influenza vaccination and to administer flu shots as they are discharged from hospital.

Influenza vaccination is provided free of charge to Manitobans deemed at high risk, including: people 65 years of age and older, people of any age who live in a nursing home or other chronic care facility, health care workers, and adults and children with certain medical conditions such as asthma, heart disease, diabetes, and cancer. Influenza vaccination is currently offered on a routine basis to residents of long-term care institutions. Influenza vaccination clinics by public health nurses are also being conducted in some senior citizen residences. However, province-wide, systematic targeting of high-risk groups should be considered, such as offering influenza vaccination in senior citizens residences, adult day care centres, and community centres. Table 2 provides a list developed by the National Advisory Committee on Immunization (1998) of possible strategies, hospital-based and otherwise, to improve influenza vaccination coverage among high-risk groups.

In trying to attain (and maintain) the 90% coverage target recommended by the National Advisory Committee on Immunization (1998), it may be useful to consider implementing a data system that allows ongoing tracking of the immunization status of high-risk groups, such as individuals aged 65 and above. The Manitoba Immunization Monitoring System (MIMS), which allows monitoring of immunizations among children, with “reminders” being mailed if appropriate immunizations have not been received, might represent a useful model to follow. Clearly, a thorough review of the cost-effectiveness of implementing such a system for

influenza immunization (and other appropriate vaccinations such as pneumococcal vaccination) would have to be conducted.

Table 2: Strategies to Increase Influenza Vaccination (National Advisory Committee on Immunization, 1998)

- Standing-order policies in institutions allowing nurses to administer vaccine
- Vaccinating people at high risk who are being discharged from hospital or visiting the emergency room in the autumn
- Promoting influenza vaccination in clinics which see high-risk groups (e.g., cancer clinics, cardiac clinics, pulmonary clinics)
- Simultaneous immunization of staff and patients in nursing homes and chronic-care facilities
- Using community newspapers, radio, television, flu-information lines, and collaborating with pharmacists and specialist physicians to distribute positively-framed information about the benefits and risks of immunization
- Issuing computer-generated reminders to physicians, mailing reminder letters to patients, or using other recall methods to identify outpatients at high risk
- Patient-carried reminder cards
- Increased accessibility of immunization clinics to staff in institutions and community-based elderly, including the implementation of mobile programs
- Organized activities, such as vaccination fairs and competitions between institutions
- Working with multicultural groups to plan and implement effective programs

Pneumococcal Vaccination

Pneumococcal infections are an important cause of illness, hospitalizations and death. In the United States, it is estimated that each year pneumococcal disease accounts for 500,000 cases of pneumonia and 3,000 cases of meningitis (Centers for Disease Control, 1997). Pneumococcal infections account for an estimated 30% to 50% of hospital admissions for community-acquired pneumonia among adults and 40,000 deaths per year (Fedson and Musher, 1994). Although the impact of pneumococcal infections has not been directly examined in Canada, a recent study indicates that rates of pneumococcal disease are similar to those reported in the United States (McGeer et al., 1999).

Canada's National Advisory Committee on Immunization recommends pneumococcal vaccination for high-risk groups, including individuals aged 65 and above, and persons aged 3 and above with certain conditions, such as chronic cardiorespiratory disease, chronic renal disease, and diabetes mellitus. Reviews of the research literature suggest that the effectiveness of pneumococcal vaccine in preventing invasive pneumococcal disease ranges from 55% to 80% (Centers for Disease Control, 1997).

The Canadian Consensus Conference on the prevention of pneumococcal disease (1999) recommended that by the year 2003, an 80% vaccine coverage be achieved in high-risk groups, with pneumococcal vaccine being included in publicly funded immunization programs. Publicly funded pneumococcal vaccination is provided in Manitoba for individuals with certain chronic conditions, consistent with National Advisory Committee on Immunization recommendations (1998), but not for persons aged 65 and above without other risk factors for invasive pneumococcal disease. This is reflected in the substantially lower pneumococcal vaccine distribution in Manitoba, relative to other provinces. Over a four-year period (1994 to 1998), 58 doses per 10,000 population were distributed in Manitoba, as compared to, for example, 1085 doses/10,000 population in Ontario and 645 doses/10,000 population Canada-wide (Fedson, 1999, personal communication). Given the proven efficacy of pneumococcal vaccination for preventing invasive pneumococcal disease, this suggests that Manitoba Health should consider expanding its pneumococcal vaccination to include all target groups identified by the National Advisory Committee on Immunization (1998).

Managing the System

Changes in the Use of Winnipeg Hospitals

The Winnipeg hospital system has undergone major changes since downsizing started in 1992. The most dramatic changes have occurred in surgery: Inpatient surgery decreased by 31% between 1991/92 and 1997/98 while at the same time outpatient surgery increased by 43% (Brownell et al., 1999). The *total* number of procedures performed has, therefore, actually increased (Brownell et al., 1999). Shorter lengths of stay of surgical patients,

coupled with the increase in outpatient surgery has meant that adult surgical patient days have decreased substantially (a 38% decrease; see Figure 20).

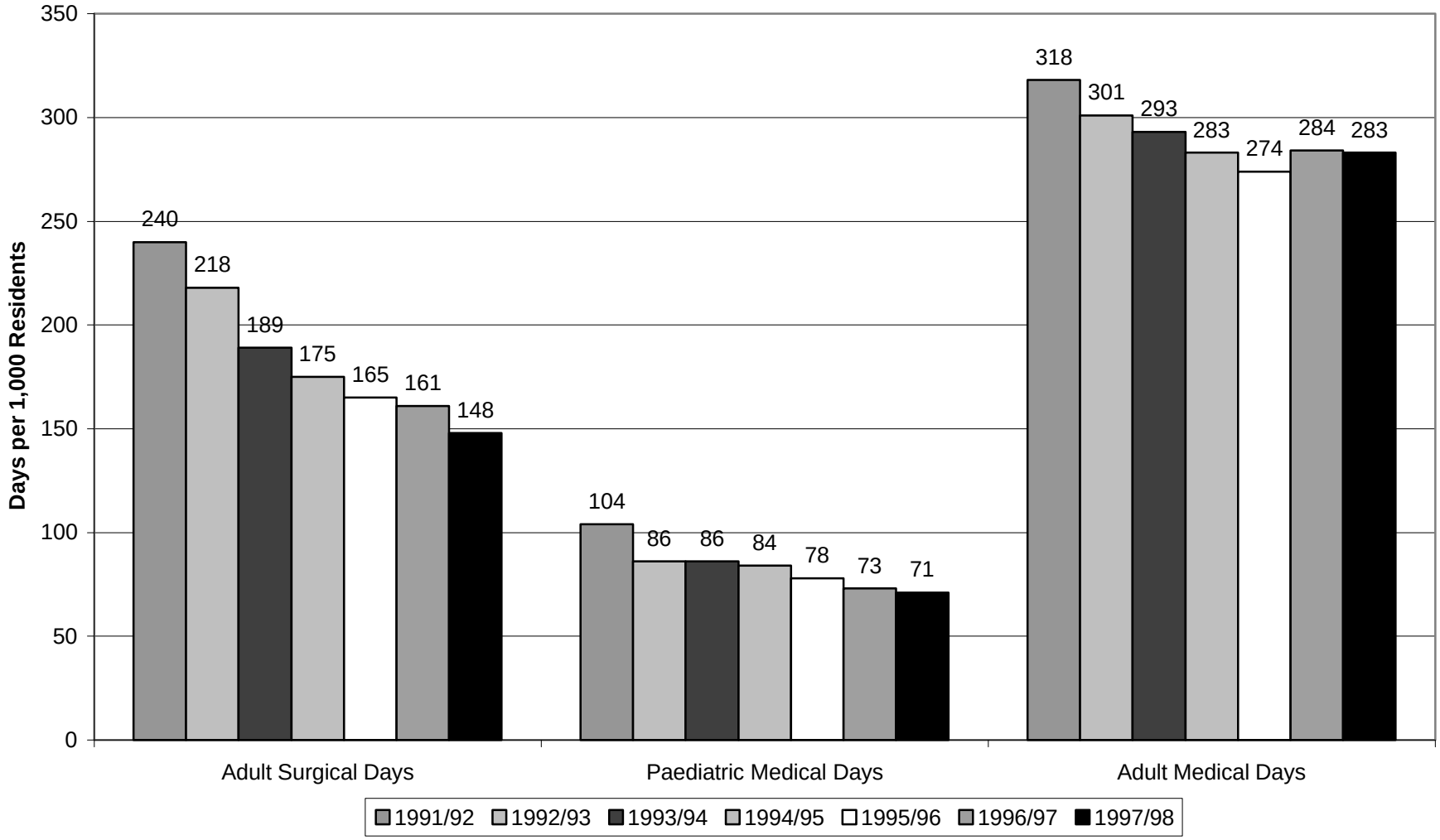
As Figure 20 shows, the number of paediatric medical patient days also declined between 1991/92 and 1997/98 – by 32%. It should be noted that the decline in paediatric medial days was likely due to changes in practice patterns and more efficient management of patients. For example, admissions for bronchitis and asthma dropped by 53%, which was likely, at least in part, due to the development of an Observation Unit in the Children's Hospital Emergency Department (Brownell et al., 1999).

The number of adult medical days also decreased (an 11% decrease), although percentage-wise less so than paediatric medical days (see Figure 20). In 1993/94, the year following initial bed closures, researchers at the Manitoba Centre for Health Policy and Evaluation (MCHPE), advised by a working group consisting of physicians and representatives from home care and long term care, reviewed the records of medical patients (adult and paediatric) in acute care hospitals to examine how many of the patients actually required acute care services and how many could have been treated with alternative levels of care (DeCoster et al., 1996). Using InterQual criteria[19] to determine whether a patient needed acute care services, DeCoster et al. (1996) showed that only about a third of all the days medical patients spent in urban acute care hospitals required acute care. Conversely, two thirds of all medical days could have been treated by alternative care services, such as long-term care institutions, home care or outpatient care, were such services readily available. MCHPE, in conjunction with the Winnipeg Hospital Authority is conducting an update of this study, which will show whether these statistics have changed since 1993/94.

In the absence of more recent data, the 1993/94 figures suggest that reviews of which medical patients indeed require acute care services could help reduce occupancy rates for

[19] InterQual criteria are a set of objective, measurable, clinical indicators and diagnostic and therapeutic services reflecting the need for hospitalization. They consider the level of illness of the patient and the services she or he requires and are thus a baseline set of criteria for all acute hospital care.

Figure 20: Change in Use of Winnipeg Hospitals Adult Surgical, Paediatric Medical and Adult Medical Days per 1,000 Residents



medicine. Moreover, surgery and paediatrics, which have successfully changed bed use patterns, may provide useful experiences for adult medicine to consider.

Alternative Levels of Care

The rationale for looking for alternatives to acute hospital care for patients who are no longer acute is simple: Hospital care is expensive and alternative services are thought to be cheaper and as effective, if not more effective, in treating convalescing or long-term care patients. A study by the Health Services Utilization and Research Commission (1998), which followed 780 patients from eight Saskatchewan hospitals, showed that it cost $830 more per patient when they remained in hospital during their post-acute phase than when they were discharged home and received home care. Patient outcomes, measured in terms of health, readmissions and satisfaction with care, were similar whether patients convalesced in hospital or received home care.

In light of the recurrent winter hospital bed shortage, the benefits of providing alternative levels of care could be substantial for patients, particularly for individuals who would otherwise have ended up in the hallway of an emergency department because of bed shortages. At the same time, it would provide more treatment alternatives for patients, as well as providing more of a cushion for accommodating medical admissions during high-pressure periods. However, it warrants cautioning that the pressures placed on the continuing care sector, which is responsible for the provision of alternative services such as home care, will have to be recognized and funding allocated accordingly. Moreover, it is important to keep in mind that discharging patients home with home care may have implications for informal care givers, such as family members. Finally, it needs to be reiterated that discharging patients to alternative services can only attenuate winter bed shortages if sufficient numbers of beds are kept in reserve, and are hence available, for the predictable winter peak in medical inpatients.

Potential Targets for Utilization Reviews

DeCoster et al.'s (1996) study provides some direction for identifying patients in hospital who could likely be discharged to make room for emergencies. These researchers found that

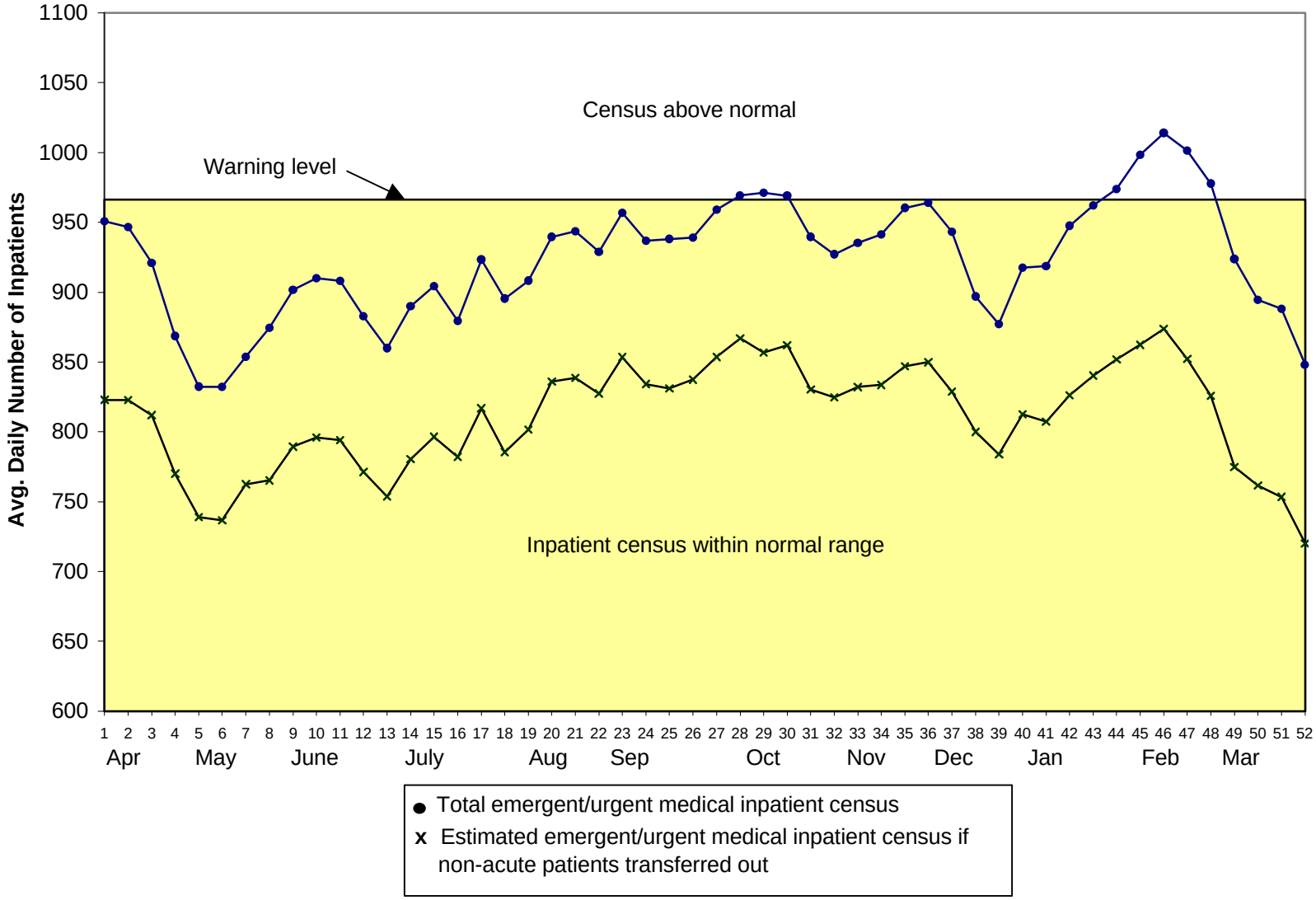
the likelihood that medical patients could be cared for with alternative services increased with length of stay. By the eighth day of stay, only 47% of patients who had been assessed as acute at admission were still evaluated as such, and by the thirtieth only 27% were still acute.

Applying these figures to our 1997/98 data, 37% of all emergent/urgent medical patient days (1577 patient days or approximately 225 inpatients) were in their eighth to thirtieth day in hospital and had a total length of stay of less than 60 days.[20] Using a conservative estimate that 50% of these patients were likely no longer acute, we can calculate the inpatient census *without* non-acute patients by subtracting non-acute patients from the total emergent/urgent medical census (see Figure 21). On average, 113 inpatients in Winnipeg hospitals per day were likely no longer acute. In February of 1998, approximately 140 of the 1014 patients in hospital per day were probably not acute anymore, as they had been in hospital for at least eight days, and could probably have been treated with alternative levels of care. As Figure 21 shows, transferring these patients out of the acute hospital sector would have brought the inpatient census to within normal levels during that month.

This assumes that utilization management programs are in place to identify patients who no longer require acute care and that such patients are transferred to alternative levels of care in a timely manner. As suggested in DeCoster et al.'s (1996) report, InterQual criteria or some other utilization management tool could be used to assess admissions to help reduce the rate of admissions and patient days requiring alternative levels of care. In Saskatchewan, a modified version of the InterQual assessment tool is already used to screen emergency medical admissions and has helped to reduce non-acute admissions (Reichert et al., 1995). Utilization reviews (using InterQual, for example) of medical inpatients and admissions might be conducted on a permanent basis throughout the year, although the costs and burden on staff would have to be carefully evaluated. Alternatively, it could be implemented on a

[20] We focused here on patients with stays less than 60 days only, because very long stays in hospital are likely due to a variety of factors, such as delays in getting patients transferred to personal care homes. In comparison to DeCoster et al.'s (1996) findings which included all patients, excluding individuals with stays of more than 60 days does not change the proportion of non-acute patients (53.2% vs. 53.6% non-acute patients, respectively).

Figure 21: What if We Could Reduce Use by Non-Acute Patients?
Emergent/Urgent Medical Inpatients, 1997/98



seasonal basis during the winter months (December to April) when an increase in the number of medical inpatients can be anticipated.

DeCoster et al.'s study (1997) provides a list of patients that should be targeted for utilization review, as large proportions among them were found to not require acute care in 1993/94:

- Patients with stays longer than one week
- Patients 75 years and older
- Patients with the following diagnoses: nervous system, circulatory, respiratory and digestive conditions
- Patients not admitted through the emergency department

Discharge Planning

Utilization reviews determine how appropriate hospitalization is for a particular patient. Efficient discharge management requires that an effective set of procedures is in place to allow timely transfer to alternative levels of care or discharge of patients to their home. Waiting times for admission to personal care homes (PCHs) have dropped substantially over the past years (Brownell et al., 1999). For example, while the median length of stay in hospital before admission to PCHs was 211 days in 1991/92, it dropped to 132 days in 1996/97 (a 37% decrease). Similarly, the median length of waiting time for admission to PCHs after paneling has decreased from 150 days in 1991/92 to 108 days in 1996/97. This drop in waiting times can, at least in part, be attributed to an increase in the number of PCH beds.

This is not to say that the system cannot be improved. Efficient discharge planning, both to get patients paneled and, after paneling, transferred to PCHs, could alleviate some of the pressures on acute care hospitals. The system could therefore benefit from a review of discharge procedures. Particular attention needs to be paid to the relatively small number of patients with very long hospital stays. DeCoster et al. (1997) found that only 5% of medical inpatients stayed longer than 28 days in hospital. However, these patients used 36% of

medical days, 76% of which were for non-acute care. MCHPE is currently examining the characteristics of patients with such very long stays.

Discharging Patients on Weekends

Figure 22 shows the average daily number of emergent/urgent medical admissions (left panel) and separations (right panel) for 1997/98. The number of admissions declined over the weekend and, even more so did the number of separations. On Sunday, the number of separations fell to 44, well below the overall average number of 81 separations per day. The reduced number of separations on the weekend and particularly on Sunday is presumably due to the lack of discharge services available on weekends. Yet, being able to discharge patients on weekends could help alleviate bed pressures at the beginning of the week.

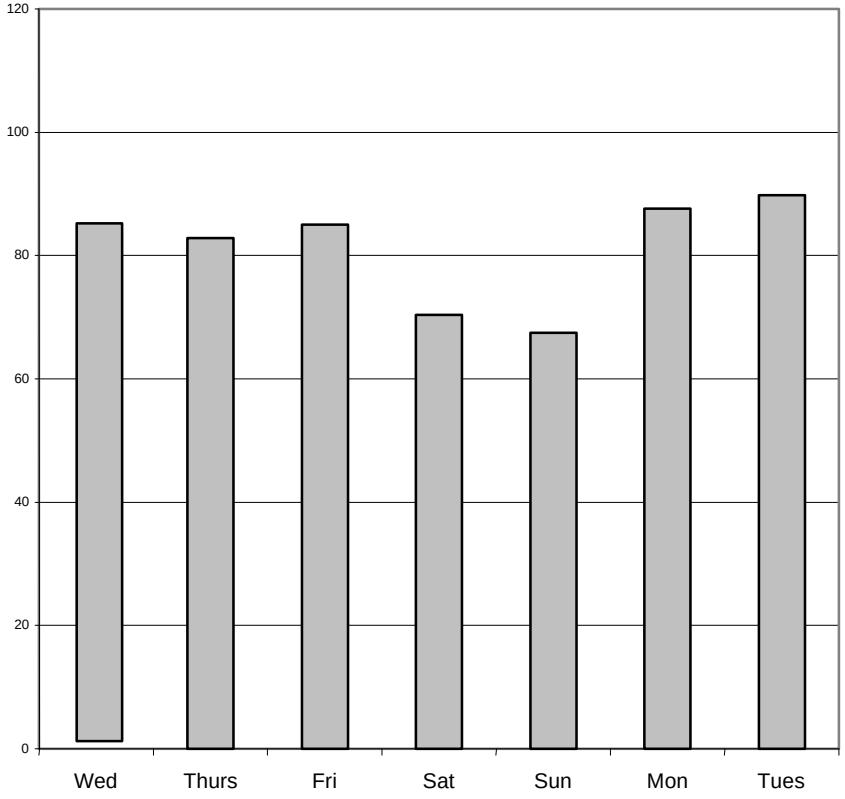
In order to discharge patients on weekends, diagnostic, consultation, and discharge services have to be available, which is not necessarily currently the case. Moreover, moving toward a seven-day a week hospital system has implications for other sectors of the health care system, particularly the Winnipeg Community and Long Term Care Authority, as some patients may require assessment for and provision of home care services before they can be discharged home. Thus, the feasibility of moving toward a seven-day a week hospital system would have to be studied. However, it is noteworthy that the Winnipeg Hospital Authority has now enhanced occupational therapist and physiotherapist coverage to support seven-day a week care, thereby facilitating discharge of patients on weekends.

Bed Management

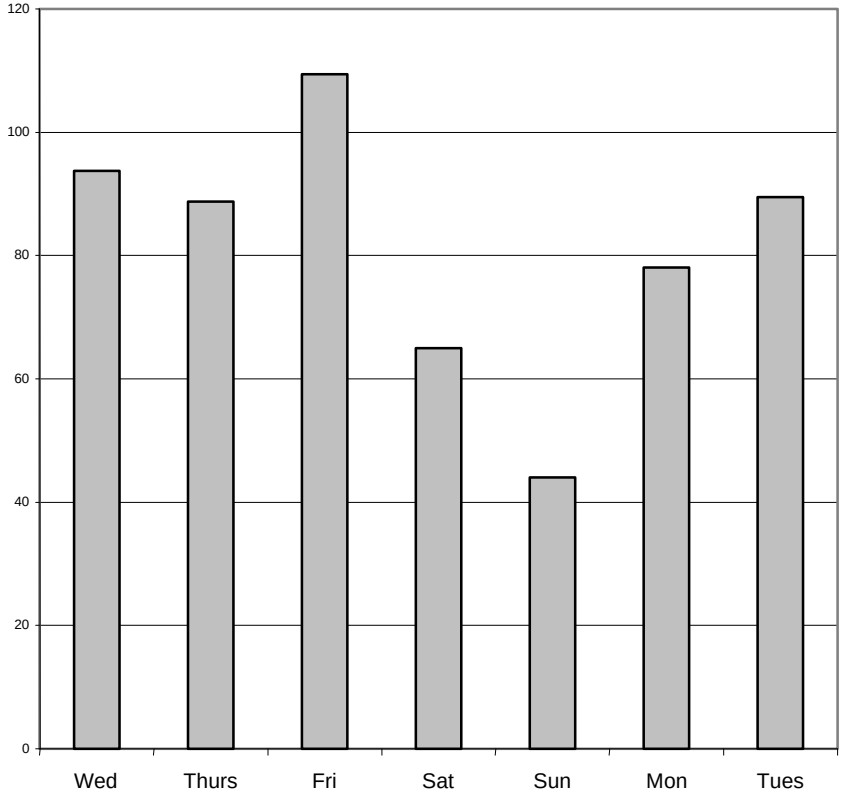
We estimate that about 70 to 80 “new” medical beds each day need to be available across the Winnipeg hospital system to absorb the predictable peak in emergent/urgent medical admissions. These beds might be kept in reserve, to be opened only when the inpatient census rises to high-pressure levels. Alternatively, introducing swing beds (either on a temporary or permanent basis) that can be used as either surgical or medical beds depending on need might be a reasonable approach to dealing with short-term, high-pressure periods. For example, as suggested by the Seasonality Working Group of the Winnipeg Hospital Authority (Winnipeg Hospital Authority, 1998), the surgical beds that are closed in

Figure 22: Admissions and Separations by Day of Week

Average Daily Number of Emergent/Urgent Medical Admissions by Day of the Week, 1997/98



Average Daily Number of Emergent/Urgent Medical Separations by Day of the Week, 1997/98



December, because of the general scaling down of surgery during that month, might gradually be reopened as medical beds to anticipate the winter influx of emergent/urgent medical patients. Any swing in beds from surgical to medical would have to occur with the knowledge that surgical versus medical nursing skills are different and that this would be a temporary seasonal adjustment for the duration of a one-week to three-week winter peak in medical admissions.

Scheduled Surgery

Although the high-pressure period during the winter is driven by emergent/urgent medical patients, managing scheduled surgery might play a role in attenuating bed shortages. In February of 1998, scheduled surgery requiring overnight stays was cancelled wherever possible, while resources were channeled into outpatient surgery. As shown in Figure 23, outpatient surgery increased substantially in February, up from an average of 3619 procedures a month to 4188 procedures (a 16% increase). This approach might effectively be implemented on a routine basis during the January to April period, by scheduling approximately 5% to 10% fewer inpatient procedures and 5% to 10% more outpatient surgery.

In this respect, a systematic review of the procedures that might be postponed for a short period of time during high-pressure periods would be useful. Table 3 shows a few examples of procedures conducted during January and February of 1998. Postponement of procedures would have to occur with an understanding of the length of current waiting times. A recent study by DeCoster et al. (1998), for example, showed that both cholecystectomy procedures and hernia repairs had relatively short median waiting times of 31 days in 1996/97.

Inpatient scheduled surgery shows a highly predictable inpatient census pattern: The inpatient census is relatively low in July, August and December when surgery slows down because of holiday breaks, and relatively high during all other months of the year. Figure 24, which plots the average daily census for scheduled surgery for 1997/98, clearly shows this pattern, the exception being the May flood when scheduled surgery was cancelled citywide. Also apparent in Figure 24 (insert) is the large day-to-day variation: Anywhere from

Figure 23: Number of Day Surgery Procedures per Month, 1997/98

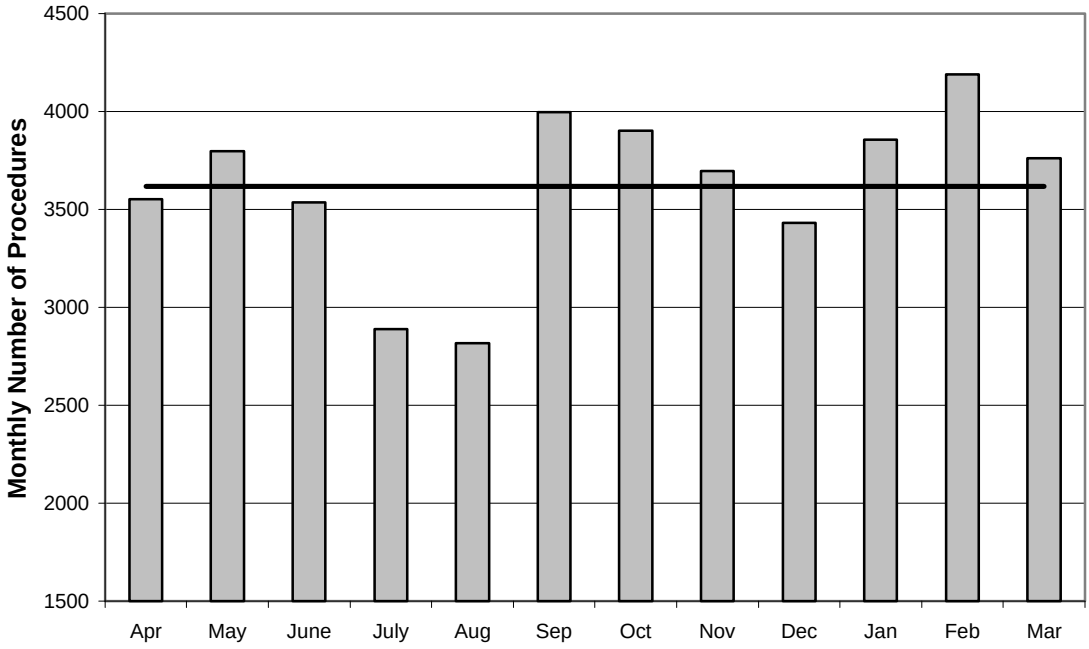
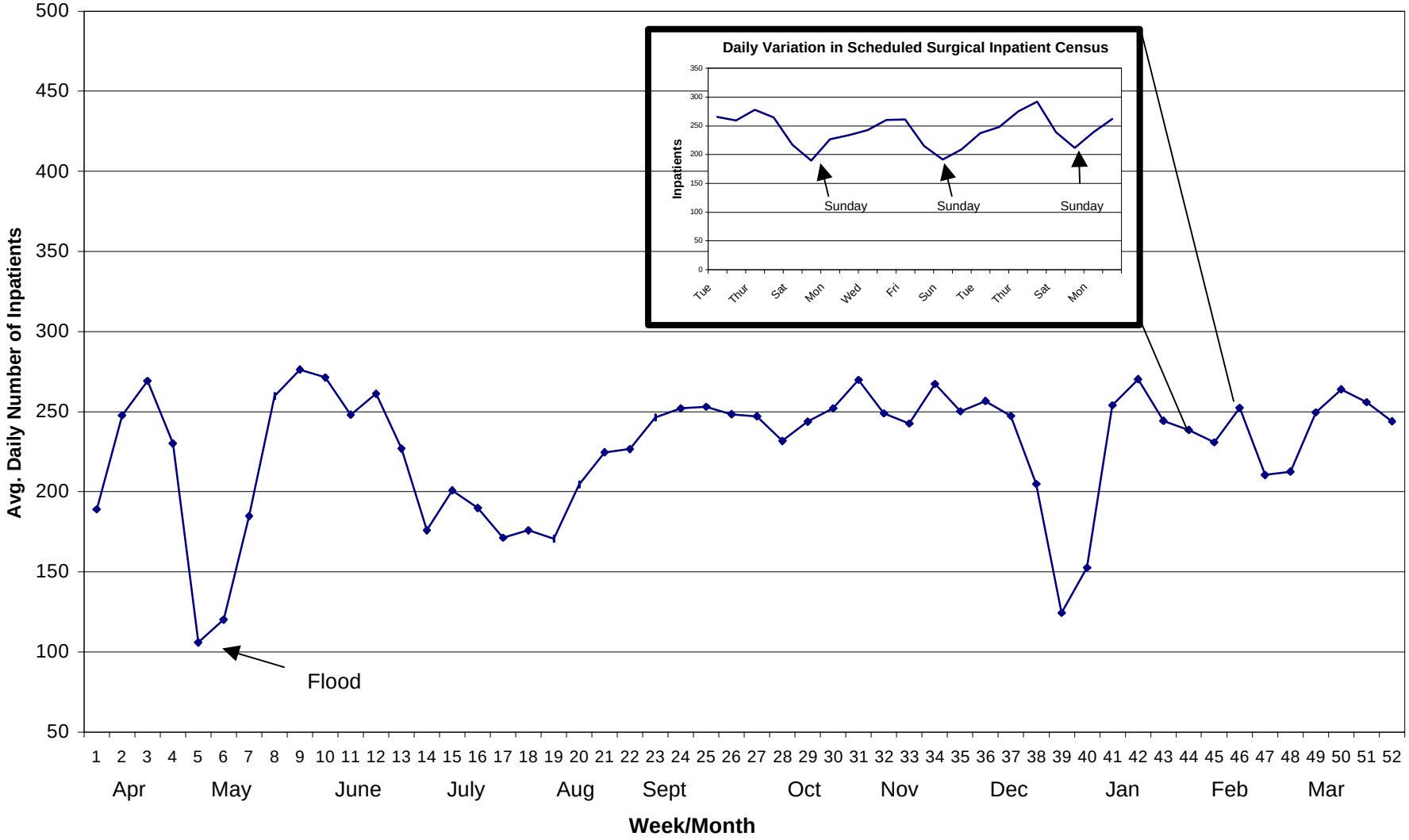


Table 3: Examples of Scheduled Surgical Procedures Conducted in January and February of 1998*

Procedure	N	ALOS	Total Days
All Scheduled Procedures	2,292	5.4	12,370
Hysterectomy	250	4.2	1,054
Total Cholecystectomy	73	2.2	160
Transurethral Prostatectomy	67	2.9	193
Hernia Repair	45	1.9	87
Reduction Mammoplasty	35	1.5	51
Hemorrhoidectomy	17	1.9	32
Dental Extraction	3	1.0	3

* For patients older than 14 years with stays less than 60 days.
ALOS = average length of stay

Figure 24: Average Daily Scheduled Surgical Inpatient Census, 1997/98



approximately 20 to 100 fewer scheduled surgical patients were in hospital on Saturday and Sunday, relative to the other days of the week. It should be noted that although daily census patterns are shown for the month of February only, similar variation is apparent throughout the year.

Thus, scheduled inpatient surgery might help attenuate winter pressures by scheduling fewer elective surgical procedures during the January to April period (e.g. 5% to 10% fewer), while increasing surgical slates at times when scheduled surgery currently slows down, namely on weekends and during the December and summer (July and August) holiday breaks. For example, by scaling up surgery during the summer (or scaling down less than is now the case), some scheduled surgical procedures may be moved ahead, thereby easing some of the load during the winter. Clearly, the feasibility and possible ramifications of changes to existing practice patterns would have to be carefully examined with input from surgeons and nurses.

Crisis Protocol

It might also be useful to consider implementing a specific contingency plan to deal with potential bed pressures in the future. Aspects of a crisis protocol could include: daily monitoring of the inpatient census and beds available, establishment of a trigger point for initiating crisis procedures, and automatic implementation of agreed-upon crisis procedures once the trigger point is exceeded, such as a mandatory review of medical admissions using standard procedures.

5. LIMITATIONS

The present report indicates that high-pressure periods occurred prior to, during, and following the downsizing of the acute hospital sector. Moreover, the magnitude of the problem, as quantified in terms of the "excess" of patients over normal levels, does not appear to have systematically increased over the years. Yet, according to "frontline" workers, the crises are now worse than they were in the past. Our analyses cannot capture the stresses placed on health care workers and patients during high-pressure periods.

In the present report we examined hospital use by tracking the number of patients in hospital week by week. Missing from our analysis is information on occupancy rates. Hospitals that function at an occupancy rate of close to 100% will be unable to accommodate additional patients, potentially leading to a backlog of patients having to wait in emergency wards until a bed becomes available.

Although Manitoba Health has statistics on the number of beds set up in each hospital, and we know how many patients were in hospital on a given day, calculating occupancy rates based on the overall number of beds in the system may be misleading as it does not take into account how many beds were actually *available*.[21] Unfortunately, it is not easy to determine how many beds are actually available on a given day or in a given week. Reports of seasonal bed closures exist, but these data are not collected in a rigorous fashion. Hospitals prospectively indicate the number of beds they anticipate closing, but no procedures are in place to check whether these beds were actually closed. Discrepancies can therefore occur if beds remain open. Some hospital beds may also be closed on weekends. These closures are not reflected in the seasonal bed closure data. Moreover, beds in the observation units associated with emergency departments are not included in the bed count. This creates problems for calculating weekly occupancy rates as patients who are in the observation unit are included in our inpatient census (if an official admit order has been issued), but the corresponding beds they occupy are not counted.

[21] The term "available beds" is used here to refer to beds that are actually open on a given day or in a given week. This is in contrast to the beds set up, that is, the total number of beds in the hospital system in a particular year (Winnipeg Hospital Authority, 1998).

Systematic assessment of occupancy rates across the year would benefit from daily records of the number of beds available. This would allow detailed comparisons of occupancy rates across the year, with the potential of identifying problem periods when occupancy rates, even if only temporarily, reach near 100% levels.

A further data limitation is that we cannot determine what kind of bed a patient occupies. Frequently, medical patients end up in a surgical bed, particularly during the winter when the number of emergent/urgent medical admissions peaks and medicine is filled to capacity. The question of how many medical patients occupy surgical beds and for what length of time cannot be addressed.

Nor can we tell, using administrative data, whether patients are in observation units (or hallways) waiting for beds. For this information we had to rely on the Central Bed Registry where the number of patients waiting for beds in emergency departments is recorded on a daily basis. Although these data are useful, they are limited, as individual patient data are not collected. For example, we do not know how long patients were waiting for beds in emergency departments and whether they were waiting in the observation unit or in a hallway.[22]

It should also be noted that there are currently no standard procedures in place across all hospitals for admitting patients in observation units. While some hospitals admit patients only after a written admit order has been issued, others automatically admit patients after a specific period of time (usually after 24 hours). As patients are counted in our inpatient census only if they have been admitted to hospital, some variation will therefore exist across hospitals in whether patients in observation units are included in our patient count.

In order to examine patterns of hospital use for 1997/98, we obtained a first quarter file for fiscal 1998/99, which includes hospital discharge abstracts to the end of June of 1998. As hospital discharge abstracts are submitted to Manitoba Health only upon patients' discharge

[22] See Appendix A for additional concerns regarding the Central Bed Registry.

from hospital, this file was critical for completing the end of fiscal 1997/98. Individuals admitted to hospital before March 31, 1998 with very long hospital stays beyond June of 1998 will not be captured in our data, however. This end-of-the-year problem is unlikely to affect our February 1998 results in any substantive way, as only patients who spent more than 168 days in hospital would be omitted (assuming they were admitted on February 1). Based on previous years, we know that only 1% of all admissions have length of stays of 60 to 90 days, and an additional 1.3% of admissions stay longer than three months. However, it should be acknowledged that we underestimate the inpatient census toward the end of fiscal year 1997/98, particularly towards the end of March.

Lastly, we were not able to examine how many of the patients in hospital for influenza-associated illnesses had in fact received influenza vaccination. MCHPE is currently conducting a comprehensive study of influenza that will address this question. The study, among other issues, will investigate the data capabilities in Manitoba to determine vaccination coverage, particularly among individuals who receive vaccination through public health programs. Moreover, the study will examine the effect of influenza-associated illnesses on other parts of the health care system, such as emergency departments.

6. SUMMARY

In sum, the present study suggests several possible approaches that should be considered in trying to prevent future bed pressures. As noted earlier, these suggestions were informed by discussions with the Seasonality Working Group of the Winnipeg Hospital Authority (WHA) and several are already being implemented by the WHA and the Winnipeg Community and Long Term Care Authority.

- Given the substantial impact of influenza-associated illnesses on the hospital system, a major campaign to increase influenza vaccination levels among high-risk groups (people aged 65 and over and individuals with chronic conditions) seems indicated. A province-wide, systematic targeting of high-risk groups should be considered. This might include a system-based approach (perhaps with standing orders for nurses to identify and vaccinate high-risk individuals as they are discharged from hospital during the vaccination months), as well as community-based campaigns involving physicians and public health nurses. The potential for implementing a data system that allows monitoring of the immunization status of high-risk groups should also be explored.

- Increasing pneumococcal vaccination rates should be considered. In this respect, Manitoba Health could expand its pneumococcal vaccination program to include all target groups identified by the National Advisory Committee on Immunization (1998).

- Previous research demonstrates that a large proportion of medical patients in acute care hospitals do not require acute care and could be treated in alternative settings, such as personal care homes or at home with the help of home care services (DeCoster et al., 1996). In 1993/94, approximately 50% of medical patients who have been in hospital for eight days were no longer acute. The proportion of non-acute patients rose to 70% for patients in their thirtieth day in hospital. A review of acute care requirements of all medical patients on their eighth day of stay, and perhaps on a weekly basis thereafter, should therefore be considered. Such a review could be implemented when the potential for a high-pressure period is most immediate (December to April). Alternatively, a

utilization review may be introduced on a permanent, year-round basis, recognizing that the costs and burden on staff associated with a year-round approach would have to be determined.

- Discharging patients to alternative levels of care requires that such alternative services are readily available, with sufficient funds being allocated to personal care homes, home care programs, rehabilitation services, and so forth. Moreover, efficient referral and discharge procedures have to be in place to allow timely transfer to alternative sources of care. A review of patterns of referral to alternative sources of care (e.g., personal care homes, home care) should be considered. Avoidable delays in discharging patients to alternative levels of care place unnecessary pressure on the acute hospital sector, particularly during the winter when a substantial influx of medical patients can be anticipated.

- Pre-admission screening of all medical admissions that do not come through the emergency department and admissions for nervous, circulatory, respiratory and digestive conditions is another possibility that should be explored, as considerable proportions of these patients were found to not require acute care (DeCoster et al. 1997). Several hospitals in Saskatchewan, for example, use a modified version of the InterQual assessment tool to screen medical admissions (Reichert et al., 1995). Screening has resulted in a reduction in the number of admissions.

- The potential for increasing the capacity to discharge patients on weekends might be examined. Having discharge services in place on weekends should help alleviate pressures at the beginning of the week.

- The potential feasibility of various bed management procedures might also be considered, such as keeping beds in reserve to be gradually opened during the winter months in anticipation of an increase in medical admissions or introducing medical/surgical swing beds.

- Scheduled inpatient surgery might help attenuate winter pressures by scheduling fewer elective surgical procedures during the January to April period (e.g. 5% to 10% fewer), while increasing surgical slates at times when scheduled surgery currently slows down, namely on weekends and during the December and summer (July and August) holiday breaks. Scheduling fewer inpatient procedures (e.g. 5% to 10% fewer) during the January to April period, but more outpatient surgery represents another possible approach to dealing with high-pressure periods. Clearly, the feasibility and possible ramifications of changes to existing practice patterns would have to be carefully examined with input from surgeons and nurses.

- Implementation of specific contingency plans to deal with future high-pressure periods might also be useful, including for instance: daily monitoring of the number of patients in hospital and beds available (either on a year-round basis or during the winter only), introduction of a trigger point when crisis procedures are initiated, and implementation of agreed-upon crisis procedures.

- Standardization of admission (and discharge) criteria across hospitals should also be considered. Moreover, the current system used to monitor the number of patients waiting in emergency departments for beds could benefit from systematic recording practices. Useful information to be collected would include the date when patients presented to the emergency department, the date of admission, date of transfer to the ward, and so forth. Such information would allow a systematic evaluation of length of stay in emergency departments and could help identify potential delays in transferring patients to wards.

7. CURRENT DEVELOPMENTS IN WINNIPEG

With the establishment of the Winnipeg Hospital Authority (WHA) and the Winnipeg Community and Long Term Care Authority (WCA) in 1998, the hospital and long term care systems have undergone and will continue to undergo considerable changes. As some of these changes are relevant to the issue of winter pressures, it warrants highlighting a few of them.

The Misericordia hospital, which was one of the acute care hospitals included in the present report, has now been transformed into a long term care facility. The Misericordia Health Centre started to accept long term care patients in November 1998. As personal care home patients were moved from acute care hospitals to the Misericordia Health Centre, an approximately equal number of hospital beds were returned from long-term care to acute care. As they become available, more hospital beds that are now occupied on an interim basis by patients eligible for personal care homes will be converted back to acute care. A substantial number of personal care home beds and supportive housing beds are also being opened. For example, four new personal care homes are currently under construction, which will add 456 new personal care beds to the system (Winnipeg Community and Long Term Care Authority, 1999).

Moreover, the WHA, with support from Manitoba Health, has initiated a variety of bed management strategies (Winnipeg Hospital Authority, 1998). For example, the enhancement of occupational therapist and physiotherapist coverage on weekends should facilitate discharge of patients on weekends. Similarly, the development of consistent admission/discharge criteria across the Winnipeg hospital system, implementation of a central bed registry to facilitate bed access, and recruitment of a bed manager to facilitate the discharge of patients should all help reduce the pressures on Winnipeg acute care hospitals.

REFERENCES

Andrulis DP, Kellermann A, Hintz EA, Hackman BB, Weslowski VB. Emergency departments and crowding in United States teaching hospitals. *Ann Emerg Med* 1991;20:980-986.

Boyle P, Pineault R, Roberge D. Assessing Quebec's multi-component program to reduce emergency room overcrowding. *Can Public Policy* 1992;18:189-202.

Brownell MD, Roos NP, Burchill NA. *Monitoring the Winnipeg hospital system: 1990/91 through 1996/97*. Manitoba Centre for Health Policy and Evaluation. Winnipeg, 1999.

Canadian Consensus Conference on Preventing Pneumococcal Disease. *Canada Communicable Disease Report* 1999;25-4:1-10.

Centers for Disease Control. Prevention of pneumococcal disease: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 1997;46:1-24.

Crouse BJ, Nichol K, Peterson DC, Grimm MB. Hospital-based strategies for improving influenza vaccination rates. *J Fam Practice* 1994;38:258-261.

DeCoster C, Carriere KC, Peterson S, Walld R, MacWilliam L. *Surgical waiting times in Manitoba*. Manitoba Centre for Health Policy and Evaluation. Winnipeg, 1998.

DeCoster C, Peterson S, Kasian P. *Alternatives to acute care*. Manitoba Centre for Health Policy and Evaluation. Winnipeg, 1996.

DeCoster C, Roos NP, Carriere KC, Peterson, S. Inappropriate hospital use by patients receiving care for medical conditions: Targeting utilization review. *Can Med Assoc J* 1997;157:889-896.

Duclos P, Hatcher J. Epidemiology of influenza vaccination in Canada. *Can J Public Health* 1993;84:311-315.

Fedson DS, Hirota Y, Shin H, Cambillard P, Kiely J, Ambrosch F, Hannoun C, Leese J, Sprenger MJW, Hampson AW, Bro-Jorgensen K, Ahlbom AM, Nokleby H, Valle M, Olafsson O, Salmeron F, Cloetta J, de Andrade HR, Snacken R, Donatelli I, Jennings LC, Strikas, RA. Influenza vaccination in 22 developed countries: an update to 1995. *Vaccine* 1997;15:1506-1511.

Fedson DS, Musher DM. Pneumococcal vaccine. In: Plotkin SA, Mortimer EA Jr, eds. *Vaccines*. 2nd ed. Philadelphia: WB Saunders, 1994:517-64.

Fedson DS, Wajda A, Nicol J, Hammond GW Kaiser DL, Roos LL. Clinical effectiveness of influenza vaccination in Manitoba. *JAMA* 1993;270:1956-1961.

Fedson DS, Wajda A, Nicol J, Roos LL. Disparity between influenza vaccination rates and risks for influenza-associated hospital discharge and death in Manitoba in 1982-1983. *Ann Int Med* 1992;116:550-555.

Fetter R, Freeman J. *DRG refinement with diagnostic specific comorbidities and complications: A synthesis of current approaches to patient classification. Final report.* The Health Care Financing Administration Cooperative Agreement, Numbers 15-C-98930/1-01 and 17-C-98930/1-0251. Health Systems Management Group. New Haven, 1989.

Gallagher EJ, Lynn SG. The etiology of medical gridlock: Causes of emergency department overcrowding in New York City. *J Emerg Med* 1990;8:785-790.

Gross PA, Hermogenes AW, Sacks HS, Lau J, Levandowski RA. The efficacy of influenza vaccine in elderly persons: A meta-analysis and review of the literature. *Ann Int Med* 1995;123:518-527.

Gyorkos TW, Tannenbaum TN, Abrahamowicz M, Bedard L, Carsley J, Franco ED, Delage G, Miller MA, Lamping DL, Grover SA. Evaluation of the effectiveness of immunization delivery methods. *Can J Public Health* 1994;Supplement:S14-S30.

Health Canada. Influenza in Canada – 1997-1998 season. *Canada Communicable Disease Report* 1998;24-21:1-10.

Health Services Utilization and Research Commission. *Hospital and home care study*. Summary Report No. 10 1998; March.

Krochmal P, Riley TA. Increased health care costs associated with emergency overcrowding. *Am J Emerg Med* 1994;12:265-266.

Lui K, Kendal AP. Impact of influenza epidemics on mortality in the United States from October 1972 to May 1985. *Am J Public Health* 1987;77:712-716.

Macdonald AJ, Roberecki SA, Cosway NL. Influenza immunization surveillance in rural Manitoba. *Can J Public Health* 1996;87:163-165.

McBean AM, Babish JD, Warren JL. The impact and cost of influenza in the elderly. *Arch Int Med* 1993;153:2105-2111.

McGeer A, Green K, Landry L, Talbot J, Goldenberg E. Assessing the potential impact of vaccination programs on invasive pneumococcal disease: data from population-based surveillance. *Can J Infect Dis* 1999;10(Supplement A):24A-26A.

National Advisory Committee on Immunization. Statement on Influenza vaccination for the 1998-1999 season. *Canada Communicable Disease Report* 1998;24:1-12.

National Advisory Committee on Immunization. *Canadian immunization guid*e. 5th ed. Ottawa: Health Canada, 1998.

Nichol KL, Wourenma J, von Sternberg T. Benefits of influenza vaccination for low-, intermediate-, and high-risk senior citizens. *Arch Int Med* 1998;158:1769-1776.

Reichert E, Bazylewski S, Padmanabh S. Teamwork, narrow focus keys to reducing non-acute admissions. *A Closer Look* 1995; Fall:5.

Tapanes DP, Steele R. The team approach to emergency department overcrowding. *J Emerg Nurs* 1994;20:405-406.

Winnipeg Community and Long Term Care Authority. *Healthy Interactions* 1999;March:3.

Winnipeg Hospital Authority. *Final report of the Bed Utilization Central Co-ordinating Committee*. Winnipeg, 1998.

APPENDIX A – METHODS

Winnipeg Free Press Articles

A systematic search was conducted to find articles pertaining to the bed crisis in Winnipeg hospitals published in the Winnipeg Free Press during the years 1987 through to 1998. The Winnipeg Free Press provided access to their computerized database, which contains news stories published since 1991. A list of keywords potentially associated with news about a bed crisis (e.g., health, hospital, emergency) was used to search this database for years 1991 to 1998. Potential articles (8,362 articles) were then manually reviewed and evaluated in terms of their relevance to the issue of bed shortages. For articles published prior to 1991, the Manitoba Health clipping service was used. Articles were manually searched and selected if they focused on one of the following issues: a shortage of inpatient beds, overcrowded emergency departments, patients being kept in hallways, and hospital staff being overworked because of too many patients.

Validation of Inpatient Census Measure

In the present report we calculated an inpatient census on the basis of admission and separation data derived from the Hospital Discharge Abstract data base. For each day, patients were counted who had an admission date prior to or on that day and a discharge date later than the chosen day. In order to determine the validity of this inpatient census measure, we compared it to census data reported by Winnipeg hospitals. Each day, hospitals conduct a count of the number of patients in hospital. Daily patient counts are then summed across the year to give an overall count (census) of patient days. Hospital-reported patient days therefore correspond to a cumulative count of our daily inpatient census.

We compared hospital-reported data to our inpatient census across five years (1993/94 to 1997/98). The discrepancy between the two measures was relatively small across all years, ranging from .3% to 5.3%. The largest discrepancy occurred in 1997/98 when our inpatient census measure underestimated the hospital-reported information by 5.3%. Several factors may account for this discrepancy, including the difference in methodology used to determine

patient days. Moreover, our 1997/98 data is to some extent subject to the "end-of-the-year" problem, as hospital abstract data were available only up to June of 1998. That is, our method of calculating inpatient census, which relies on patients being discharged, therefore does not capture individuals with very long stays of more than 90 days (e.g., patients admitted at the end of March who were still in hospital by the end of June). Comparisons of the census for February and March of 1997 (when we had complete data) and February and March of 1998 shows that the end-of-the-year problem seems to affect primarily psychiatric and surgical inpatient counts. We estimate that the end-of-the-year problem accounts for about 1% of the discrepancy between hospital-reported and our patient days.

As a further means to validate our inpatient census measure, we also conducted spot checks by asking each of the seven acute hospitals to provide us with inpatient figures for 40 randomly chosen dates. For the six hospitals that were able to give this information, the correlation between the hospital patient data and ours ranged from .77 to .96 for 1996/97. Thus there appear to be systematic differences across hospitals in the way they count inpatients. An examination of the nature of these differences was beyond the scope of this report.

Identifying High-Pressure Levels

In identifying high-pressure periods, we had to deal with the fact that several unusual events occurred during the 11-year study period, that had a major impact on the hospital system: the threatened nursing strike of 1988, the nursing strike of 1990-91, the home care strike of 1996, and the flood of 1997. As these unusual events increase the variability in the inpatient census, they affect our calculation of high-pressure levels, which were defined in terms of the mean + two standard deviations. We decided to include the weeks these unusual events occurred in the calculation of standard deviations, as it becomes difficult to determine precisely which weeks they affected. By including unusual weeks in our estimates, we slightly underestimate the magnitude of bed pressures during these four years. For example, in 1997/98 we calculated the mean emergent/urgent medical census at 924 inpatients (standard deviation = 42), with the high-pressure level at 1008 patients (mean + two standard deviations). If we exclude the flood (weeks 4 to 9 – see Appendix B, Table B3 for data), the

mean is slightly higher at 932 patients, but because of the smaller standard deviation (standard deviation = 37) the high-pressure level is slightly lower at 1005 inpatients.

Patients Waiting for Medical Beds in Emergency Departments

The Central Bed Registry was implemented in 1995. Hospitals make daily reports of the following: the number of available beds (medical, surgical, psychiatric, and long-term care beds in the case of the Riverview Health Centre and Deer Lodge hospital), the number of patients admitted who are waiting for beds (medical and surgical), the number of hospital holds, that is, patients whose only reason for being in hospital is that they are waiting for home care service to be put in place, the number of patients paneled for personal care homes and chronic care, and the number of patients waiting for rehabilitation services.

Hand-calculated summary information is used by Manitoba Health to monitor the number of admitted patients waiting for medical beds in emergency departments. This summary information on the average daily number of admitted patients waiting for medical beds, which we received from Manitoba Health, is graphed in Figures 3 and 18. The quality of data is a concern prior to November of 1997, because hospitals did not always provide daily reports. This problem has been resolved in more recent months as hospitals that do not submit the required information are now contacted. The quality of the data has therefore improved substantially as of about December 1997. An additional problem with the Central Bed Registry data is that the definition of what constitutes a “medical” bed may differ across hospitals.

It should also be noted that the Central Bed Registry does not provide individual patient data. Thus it is not possible to examine how long a particular patient was waiting for a bed. Also, no distinction is made between patients waiting in the observation unit and those waiting in a hallway.

The Downsizing of the Winnipeg Acute Hospital Sector

Table A1 shows the number of acute beds in Winnipeg hospitals between 1990/91 and 1997/98 (Brownell et al., 1999). As can be seen in Table A1, the most substantial downsizing occurred in 1992/93 and 1993/94, when 515 (over 17%) of the acute beds were removed from the Winnipeg hospital system. It should be noted, however, that at the same time that 306 acute beds closed in 1992/93, 75 non-acute beds were added to the system; in 1993/94 when a further 209 acute care beds closed, 24 non-acute beds were added. Between 1990/91 and 1997/98, 727 beds were cut, a 24% decrease in the number of beds set up.

Table A1: History of Acute Bed Closures at Winnipeg Hospitals, 1990/91 – 1997/98

	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
Total acute beds*	3,042	3,042	3,013	2,707	2,498	2,460	2,384	2,311
Net change	0	-29	-306	-209	-38	-76	-73	4
Change in %	0	-1	-10.2	-7.7	-1.5	-3.1	-3	0.2

* Acute beds are reported at beginning of the fiscal year.

Additional Study Measures and Definitions

Adjusting Months to 30 Days

In order to allow meaningful comparisons of monthly data, months were adjusted to 30 days. For example, if 3000 day surgery procedures were performed in February, the adjusted value was (3000/28)*30 = 3214. Similarly, for months with 31 days, the actual number of procedures was divided by 31 and then multiplied by 30.

Age at admission was used to classify patients into eight age categories: 0-4, 5-9, 10-14, 15-24, 25-44, 45-64, 65-74, and 75 and older.

Case Complexity

The RDRG (Refined Diagnostic Related Group) classification system was used to identify complex cases, that is patients with major comorbidities and complications. The RDRG

program (Fetter and Freeman, 1989, Version 9) classifies cases into levels of severity and complexity based on the impact they are likely to have on hospital resources use: 1) those where comorbidity and complications were likely to have no or little impact on hospital resource use; 2) those for which comorbidity and complications were likely to have a moderate impact; and 3) those where comorbidity and complications were likely to have a major impact. For the present purposes, the latter "major impact" group was used to define complex cases. For surgical patients, this category also includes cases where comorbidity and complications likely had a catastrophic impact, such as a patient who had an acute myocardial infarction while undergoing surgery.

Day (Outpatient) Surgery

The DRG (Diagnostic Related Group) classification system was first used to define surgical cases. Surgical cases were then identified that were coded as day care surgery or outpatients.

Length of Hospital Stay was calculated for emergent/urgent patients with influenza-associated illnesses. Median lengths of stay are reported here, as the median, unlike the mean, is not influenced by a few very long stays. The median is the middle point. For example, if the median length of stay is eight days this means that 50% of patients had lengths of stay longer than or equal to eight days and 50% had shorter stays.

Non-Acute Patients

Based on a previous study by MCHPE researchers (DeCoster et al., 1996), we estimated the number of non-acute emergent/urgent medical patients. As DeCoster et al.'s findings show that a large proportion of medical patients who have spent eight to thirty days in hospital are no longer acute, we first identified patients in their eighth to thirtieth day in hospital during a particular week. To do so, the date corresponding to a person's first day of stay was placed in that person's Day1 variable. Similarly, the date corresponding to the second day of stay was placed in the person's Day2 variable. This process was repeated for each day of stay for each hospitalized patient. A count of patient days in their eighth to thirtieth day in hospital was then obtained by tabulating all Day8 to Day30 variables by week. For example, a patient who was admitted on January 1 and was discharged on January 14 contributed zero "8-30"

patient days to the first week of January. However, the person contributed six "8-30" patient days to the second week of January. As the patient was discharged on January 14, this day is not included in the count of patient days.

The number of "8-30" emergent/urgent medical patient days in a given week was then divided by seven to give an estimate of the average daily number of inpatients. Using a conservative estimate derived from DeCoster et al.'s (1996) findings, we identified 50% of these patients as likely no longer being acute. For example, in the second week in February 1965 patient days, or approximately 281 patients (1965/7), were in their eighth to thirtieth day in hospital. We therefore estimate that about 140 of these patients were no longer acute.

Transfers to Hospital

Transfers to hospitals were examined by differentiating between individuals who were transferred from personal care homes versus other hospitals, and those who were admitted to hospital from the community.

Transfers to Personal Care Homes

The number of patients (per month) transferred from hospital to personal care homes was determined using the "Facility Transfer To" field of the hospital discharge abstract. Transfers to any personal care home in Manitoba were included.

Weekly Patterns

To examine seasonal patterns across the year, inpatient census and admission data were presented for each of the 52 weeks of the year. Our administrative data begins on April 1st of each fiscal year. We let the first week of each fiscal year begin on the Wednesday closest to April 1st. This allowed the greatest possible correspondence of our 52 weeks across years, as Week 1, for example, in one year is as close as possible to the same period of time as Week 1 of the next year. However, choosing Week 1 to begin on the Wednesday closest to April 1st means that it included the last one to three days of March in the case of some years. Also, since the calendar year consists of 52 seven-day weeks plus one day (plus two days in the

case of a leap year), the last week of each year contained eight or nine days. Analyses were adjusted to account for these longer weeks.

APPENDIX B

Table B1: The Eight Most Frequent Diagnoses/Procedures for Medical and Surgical Admissions, 1997/98

Emergent/Urgent Medical Admissions	Number of Admissions
Congestive heart failure	1495
Pneumonia	1254
Convalescence after surgery	793
Intermediate coronary syndrome	594
Chronic bronchitis	521
Asthma	451
Chest pain	441
Acute cerebrovascular disorder	416
Scheduled Medical Admissions	
Chemotherapy	732
Convalescence	674
Hospital, but procedure not carried out	250
Other physical therapy	135
Hospital for administrative purposes	124
Holiday relief care	51
Health supervision of child/infant	47
Excessive/frequent menstruation	42
Emergent/Urgent Surgical Admissions	
Open reduction of fracture with internal fixation	1112
Removal of coronary artery obstruction (PTCA)	379
Aortocoronary bypass	323
Cholecystectomy	287
Partial hip replacement	218
Transurethral removal of obstruction from ureter/renal pelvis	142
Repair of retinal detachment	135
Scheduled Surgical Admissions	
Total abdominal or vaginal hysterectomy	1344
Total knee replacement	806
Cholecystectomy	607
Total hip replacement	607
Prostatectomy	494
Bilateral reduction mammoplasty	285
Endarterectomy	278
Tonsillectomy	278

Table B2: Additional Flu Findings, Emergent/Urgent Medical Patients, 1997/98

	Avg. Daily Census			
	Overall		February Peak	
	Mean	%	Mean	%
Pneumonia and Influenza				
Most responsible diagnosis	45	4.9	103	11.2
All diagnoses	113	12.2	200	21.6
Influenza-Associated Illnesses				
Most responsible diagnosis	117	12.6	238	23.4
All diagnoses	300	32.5	466	46.0

	Avg. Daily Number of Admissions			
	Overall		February Peak	
	Mean	%	Mean	%
Pneumonia and Influenza				
Most responsible diagnosis	4.6	5.6	12.3	15.2
All diagnoses	6.6	8.2	16.1	19.9
Influenza-Associated Illnesses				
Most responsible diagnosis	11.9	14.8	25.1	27.8
All diagnoses	20.5	25.4	36.6	40.5

Note:
Results are provided for the overall average daily census (or admissions) and the peak in February of 1998 (Week 46).
"Mean" refers to the average daily number of inpatients (or admissions) with pneumonia and influenza or influenza-associated illnesses.
"%" is the percentage of patients (or admissions) with pneumonia and influenza or influenza-associated illnesses among ALL emergent/urgent medical patients (or admissions).

Table B3: Average Daily Emergent/Urgent Medical Inpatient Census, 1987/88 – 1997/98

Month	Week	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96	1996/97	1997/98
April	1	1115	1080	1096	1104	1153	1049	1011	879	1001	924	951
	2	1116	1086	1116	1100	1125	1063	995	930	1017	979	947
	3	1073	898	1064	1099	1122	1064	985	962	1022	997	921
	4	1119	992	1089	1116	1110	1073	994	917	1016	939	869
May	5	1086	1087	1094	1122	1128	1040	935	890	998	944	832
	6	1099	1072	1110	1114	1108	1054	911	917	997	959	832
	7	1078	1079	1080	1121	1112	1061	933	907	998	927	854
	8	1076	1100	1030	1128	1090	1050	896	895	959	912	874
	9	1111	1098	1062	1085	1101	1043	909	887	968	907	902
June	10	1091	1109	1049	1096	1082	1022	945	901	990	891	910
	11	1073	1085	1053	1094	1070	1033	949	887	980	890	908
	12	1069	1057	1048	1104	1063	1027	933	909	977	920	883
	13	1048	1038	1010	1071	1046	1016	915	864	961	890	860
July	14	1026	1012	997	1053	1058	1019	902	830	953	907	890
	15	1022	1005	1017	1085	1086	1006	938	861	963	865	904
	16	1040	1028	998	1101	1073	1036	907	879	939	867	879
	17	1014	1023	1024	1093	1090	995	899	879	955	863	923
	18	1048	1024	1041	1093	1075	982	894	856	930	907	895
Aug	19	1081	998	1037	1079	1087	980	946	860	927	916	908
	20	1065	984	1052	1071	1079	1015	955	911	936	894	940
	21	1026	989	1046	1063	1069	1010	944	897	930	900	944
Sep	22	1023	988	1041	1063	1054	987	901	884	951	897	929
	23	1054	993	1059	1089	1070	1001	938	911	911	911	957
	24	1091	1031	1095	1133	1059	1044	956	933	908	922	937
	25	1072	1064	1096	1110	1061	1047	940	954	935	939	938
	26	1064	1041	1095	1127	1032	1014	917	949	930	940	939
Oct	27	1050	1028	1130	1142	1058	1022	916	949	931	915	959
	28	1042	1049	1107	1131	1053	1028	903	948	927	887	969
	29	1061	1095	1116	1154	1058	1018	925	959	942	899	971
	30	1043	1079	1072	1135	1074	1038	923	953	987	906	969
	31	1036	1067	1048	1121	1076	1046	910	955	989	904	940
Nov	32	1060	1101	1065	1133	1072	1024	905	963	936	894	927
	33	1043	1065	1095	1143	1127	1040	912	975	909	885	935
	34	1021	1072	1107	1184	1115	1038	948	976	924	899	941
	35	993	1057	1097	1164	1131	999	930	928	947	920	960
Dec	36	963	1024	1105	1126	1143	997	922	950	937	921	964
	37	991	1019	1083	1133	1164	996	898	943	937	888	943
	38	971	1019	1066	1125	1067	1003	928	924	910	843	897
	39	946	951	979	1044	1023	952	851	867	854	904	877
	40	998	1069	1046	976	1100	1050	985	944	895	980	918
Jan	41	1056	1098	1139	863	1087	1091	1005	1029	935	990	919
	42	1023	1072	1131	838	1108	1073	985	1027	959	944	948
	43	1008	1069	1118	811	1092	1066	936	991	953	904	962
	44	1021	1053	1168	835	1075	1082	944	973	916	917	974
Feb	45	1031	1074	1126	912	1100	1040	959	974	935	917	998
	46	1031	1085	1114	1101	1061	1020	936	982	944	937	1014
	47	1054	1083	1060	1137	1077	1036	935	1002	929	937	1001
March	48	1080	1080	1107	1123	1067	1065	908	1026	904	934	978
	49	1106	1116	1120	1138	1066	1036	917	1034	941	919	924
	50	1105	1142	1113	1130	1069	1025	911	1037	933	911	894
	51	1075	1114	1125	1102	1083	1011	899	1051	960	926	888
	52	1089	1076	1124	1102	1055	1029	893	1032	912	927	848
Mean		1051	1052	1078	1083	1085	1030	931	937	948	916	924
STD		40	46	41	84	30	28	32	55	34	31	42

Unusual events occurred in 1988/89 (threatened nursing strike), 1990/91 (nursing strike), 1996/97 (home care strike), 1997/98 (flood). Note that standard deviations are calculated based on all weeks, which means that they are slightly inflated during these four years.