AN ANALYSIS OF SPECIFIC FACTORS ON
THE PATIENT SERVICE DEMAND AT
EDWARD W. SPARROW HOSPITAL
IN
LANSING, MICHIGAN

Thesis for the Degree of M. A.
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ABSTRACT

The purpose of this thesis was to analyze the affect of specific factors, the school calendar, weekends, holidays, temperature, and precipitation, on the patient service demand at Edward W. Sparrow Hospital in Lansing, Michigan. It was hypothesized that an understanding of these factors may better enable hospital administration to achieve the most effective, economical and efficient utilization of the institution. A study of the patient census statistics for the year 1960 was undertaken.

The patient service demand was studied for the following patient classifications:

(1.) Total Patients
(2.) Men Surgical
(3.) Men Medical
(4.) Women Surgical
(5.) Women Medical
(6.) Women Obstetrical
(7.) Children Surgical
(8.) Children Medical
(9.) Children Nursery
(10.) Births

The census information for each separate interest area was obtained from the Edward W. Sparrow Hospital Official Census Book.

The affect of the Lansing, Lansing Parochial, and East Lansing school calendars, weekends, and holidays on the census in each of the above patient classifications was determined using an analysis of variance statistical procedure. Men Surgical patient census was found to be higher during periods when school was in session. The other patient census classifications were not affected by the school calendar. Total Patients, Men Surgicals, Women Surgicals, and Children Surgicals were higher on weekdays than

weekends. There were more births on Saturday and Sunday than on weekdays. The other patient census classifications showed no change over the seven day period. A census drop on holidays was found in the Total Patient, Men Surgical, Women Surgical, and Children Surgical classifications. The other patient census classifications showed no change over holidays.

A linear regression statistical procedure was utilized in determining the affect of temperature variable. All other patient census classifications were independent of the temperature variable. None of the patient census classifications exhibited any affect by the amount of precipitation.

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IN

LANSING, MICHIGAN

By

Frederic Boiten Plasman

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PREFACE

The purpose of this thesis was to analyze the affect of specific factors on the patient service demand at Edward W. Sparrow Hospital in Lansing, Michigan. It was hypothesized that an understanding of these factors may better enable hospital administration to achieve the most effective, economical and efficient utilization of the institution. A study of the patient census statistics for the year 1960 was undertaken.

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I. INTRODUCTION

Illness of varying forms and degrees requires patients to be hospitalized. However, it has been suggested that the need for hospitalization is apparently more acute on certain days of the week than on others; it varies with the month of the year; by specific weather conditions; by the school calendar; and according to the community's employment situation. Since no proof exists which shows that neither illness nor accidents are reduced, for example, on weekends, it is obvious that factors, as those mentioned above, other than the immediate physiological need, influence the patient's admission to the hospital. Therefore, to enable a realization and an understanding of the patient service demand, an analysis of patient census data and the comparison of hypothesized hospitalization-influencing factors was attempted.

II. REVIEW OF THE LITERAURE

It is desirable to present some preliminary considerations which will help to establish the significance of hospitalization and the magnitude of the patient service demand appreciated by hospitals. Approximately ten or eleven persons out of every 100 in any average population can be expected to be admitted for general hospital care each year.[1] The exact number of admissions and length of stay during any particular time period depends upon numerous and often nebulous

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[1]Eli Ginzberg, A Pattern for Hospital Care; Final Report of the New York State Hospital Study (New York: Columbia University Press, 1949) p. 41

inter-related factors, such as, the size of the community, age-groupings, occupations of its inhabitants as well as a myriad of other factors.[2]

The estimation of hospital bed requirements has been developed into several basic statistical formulae which may serve as a guide. Stewart[3] classifies these into three main groups:

> "1. Estimates based solely on population. It has been recommended that 4.5 or 5 general hospital beds should be provided per thousand population.
>
> 2. Estimates based on birth and death statistics. This is based on the assumption that there is a constant relationship between the number of patients requiring treatment in a hospital. The average figure commonly used is 250 days of patient care for every death that occurs among hospital patients.
>
> 3. Hospital insurance morbidity statistics for the given area."

Therefore, it can be expected that a certain portion of a given population will be hospitalized, requiring a particular number of beds, and accompaning ancillary and paramedical services and facilities. The first question that may be asked is, what amount of patient service demand is to be expected at any given hospital?

Several authors have offered hypotheses for forecasting or

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[2]Thomas R. Ponton, "Factors to be Considered in Survey of Community Hospital Needs," Hospital Management, Vol. 62. No. 3. (September 1946) pp. 40-41

[3]C. G. Stewart, "The Estimation of Hospital Bed Requirements," Canadian Journal of Public Health, Vol. 42 (July 1951) p. 283

predicting patient service demand. Bailey[4] has developed a formula for

calculating the total demand for medical care at a given hospital in a

given geographical area, accounting for the effect of another hospital

in the area. Briefly his formula is:

"Total Demand for Medical Care for 'A' Hospital = $\dfrac{a\,N}{(a+b)}$

Where, a = number of patients admitted to hospital 'A'
       b = number of patients admitted to hospital 'B'
       N = population of the geographical area in which
           hospital 'A' is located."

The Michigan Department of Health,[5] outlines a method for

estimating need in a community. The average utilization of hospital

acute beds is between 950 and 1,000 patient days per 1,000 population.

The plan recommends 1,300 patient days be made available per 1,000

population to allow for population increases, hospital occupancy

fluctuations, and varying degrees of utilization between different

areas. "Of the 1,300 patient days of care, it is expected that 1,000

days will be rendered in community hospitals, 200 days in regional

center hospitals, and 100 days in base area hospitals." The average

number of beds required is determined by using census population

figures, the 1,300 per 1,000 ratio, and dividing by 365 days. The plan

utilized an "occupancy factor" to adjust for the fact that hospitals

cannot operate at 100% occupancy. This factor is obtained by taking

$2\frac{1}{2}$ times the square root of the average number of occupied beds for

each hospital in the area. The resulting total number of beds needed

[4]Norman T. J. Bailey, "Statistics in Hospital Planning and Design," of _Applied Statistics_, ed. Donald G. Beech and Leonard H. C. Tippett. (10 Vol.; London: Oliver and Boyd Ltd, 1956) Vol. 5, p. 146-157

[5]"Michigan State Plan for Hospital and Medical Facilities Construction," (Michigan Department of Health. 1961) pp. 7-8

in a given area proposed by the plan is the sum of the average number

of occupied beds needed plus the beds provided by the occupancy factor.

Fifteen years previous to the Michigan Department of Health

study, a similar one was sponsored by the W. K. Kellogg Foundation[6]

> "Both statistical theory and study of individual
> Hospital data indicate that the extreme limits of
> occupied beds will not be greater or less than the
> average census plus or minus approximately four times
> the square root of the average daily census. That is
> to say, it is unlikely that the need for beds in the
> course of a year will exceed the average census by
> four times the square root of that average. Corre-
> spondingly, it is improbable that the minimum number
> of beds used will fall below the average census less
> four times the square root of that average."

The occupancy factor in the Kellogg study was four times, rather

than $2\frac{1}{2}$ times, the square root of the average daily census, as

suggested by the Michigan Department of Health. The difference is

considerable and can be accounted for by the advent of an "antibiotic

age".[1] Just fifteen years ago communicable diseases could and

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[6]Hospital Resources and Needs Commission on Hospital Care;
Report of the Michigan Hospital Survey, (Battle Creek: W. K. Kellogg
Foundation, 1946) p. 105

[1]As an example let us assume that community X has a popul-
ation of 100,000 and has 400 acute patient care beds. 1,300 patient
days per 1,000 population per year produces 130,000 patient days of
care. The average number of beds required will be 130,000 patient
days divided by 365 days, which equals 356 beds. The occupancy factor
is $2\frac{1}{2}$ times the square root of the average number of occupied beds,
or, 47 beds. The number of acute beds needed in community X is 356
beds plus 47 beds, or 403 beds. Using 4 times the square root of the
average number of occupied beds would yield an occupancy factor of
76 beds or, an acute bed need in comunity X of 356 beds plus 76 beds
or 432 beds. In each example community X is experiencing a shortage
of acute beds, 3 and 32 beds, respectively.

would almost double any given hospital's daily admissions overnight

thus the greater occupancy factor was needed.

Bed needs may be predicted utilizing the "D. P. F. Concept",[7]

whereby, hospital beds are grouped into Distinctive Patient Facil-

ities (D.P.F.).

> "A distinctive patient Facility may consist of one or
> many nursing units in a given hospital. Thus, three
> 15-bed pediatric wards in one hospital are equivalent
> to one 45-bed nursing unit, provided that any pediatric
> patient can equally well occupy any one of the 45 beds
> which is available. Such a unit is considered to be one
> 45-bed pediatric D.P.F.. If, however, 15 of the beds are
> set aside for infants and the rest for other children,
> then there are two D.P.F.'s. Three 15-bed pediatric units
> in three different hospitals in a community would be con-
> sidered as three different D.P.F.'s unless the choice of
> which unit a patient entered was based entirely on the
> availability of space.
>
> Beds which are unoccupied in a hospital are insurance
> against the risk of not having enough beds when the
> number of patients goes higher. The 'premiums' for
> this insurance are made up by the cost of having
> unoccupied beds and include uncompensated depreciation
> on the facilities, and the cost of staff who are partly
> idle while beds are unoccupied. The former is almost
> negligible, while the latter is substantial. The
> 'benefits' of this insurance result in preventing the
> increased disability of patients which may result from
> a shortage of beds because of (1.) delay in admission of
> those needing hospitalization, (2.) the necessity of
> placing a patient in a substitute or inadequate hospital
> facility, and (3.) the premature discharge of a patient
> to make room for a new one. [8]
>
> The provision of enough facilities to give adsolute
> protection for the largest conceivable patient load
> is not economically feasible because there is always
> the chance that some epidemic or other catastrophe

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[7]Mark S. Blumberg, "'D. P. F. Concept' Helps Predict Bed
Needs," Modern Hospital, Vol 97. No. 6. (December, 1961) p. 75

[8]ibid.

will overload facilities that are more than ample for ordinary needs. The problem is rather one of determining what chance of overloading in a given service can be tolerated. Unpublished studies of data from hospitals in several communities have indicated that daily (midnight) census figures on a D.P.F. are generally Poisson-distributed. The poisson distribution is a form of skewed bell-shaped curve in which the entire shape of the curve may be predicted when only the average is known.[9]

The daily census may be expected to be poisson-distributed when the occurrence of the condition requiring hospitalization is random, and only a small proportion of the eligible population falls sick at one time. Obstetrics is a good example, although induced labor on weekends may alter the distribution. Any service, when admissions are governed by convenience, such as elective surgery, with heavy admissions early each week, is probably not poisson-distributed."

Poisson distributions have been applied utilizing the queuing theory as they apply to the delivery suite.[11] Possion distribution means that independant events occur at random and the probability of this occurrence in an increment time interval is small, the number of such events occurring in a fixed interval of time will follow a predictable pattern known as poisson distribution. The Delivery Suite, like the Emergency Room, is not subject to the usual control that can be used to predetermine the load of the Operating Room or the X-Ray Department. Emergencies do occur in the latter departments, but, they are far outweighed by the great bulk of scheduled,

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[9]ibid. p. 76

[10]ibid. p. 78

[11]John B. Thompson, Oscar Wade Avant, and Ellawyne D. Spiker, "How Queuing Theory Works for the Hospital," The Modern Hospital, Vol. 94. No. 3, (March, 1960) p. 75.

noncritical activity that can be shifted, postponed or, if necessary,
canceled, without any serious consequences. The hospital cannot
schedule the arrival of the patient who requires the services of the
Delivery Suite, nor is it possible to admit patients selectively so
that their stays will fill a predictable length of time. Admissions
to the Delivery Suite are random and independent, and the length of
time they may stay varies a great deal. There are, however, still
limits as to the probable number of patients who will require these
facilities at any one time and, according to Thompson, et. al., these
limits and the probability of any given number of patients being in
the maternity suite at one time can be determined with reasonable
accuracy, through application of queuing theory. The queuing theory,
an extension of the law of probability which holds that the number of
people in a facility at any one time will follow a certain pattern
around the average number of people in the facility in a given period.
The curve showing the frequency with which any given number of people
will be observed in the delivery suite is known as the poisson dis-
tribution and is predictable. The delivery suite application differs
from the industrial application in that although the approximate
service demand might be predictable as to the number of patients
requiring the use of the facility, no waiting queue may ever exist
and so a certain staffing complement must always be ready to provide
the necessary service.

Joseph P. Peters points out some of the uses of time series
statistics.[12] The graphic presentation of the daily census or of the

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[12]Joseph P. Peters, "Facts at your Fingertips - Part 2:
Some Uses of Time Series Statistics in Hospital Administration,"
The Modern Hospital, Vol. 80 No. 2. (February 1953) p. 73.

average daily census during a specific period of time over a period of several years, will show that there are high points and dips in any one calendar year, and when comparing from year to year, certain recurrences can be observed. These recurrences, or seasonal variations, are important from planning and operational points of view. Because all hospital activities focus on the patient, an increase or decrease in the average daily census, for example, results in a corresponding change of over-all hospital activity. The number of meals prepared, the amount of expendable supplies and drugs issued, income earned from patients, and related happenings are affected accordingly. Time series data may reveal the recurring, wave-like increases and decreases of economic activity. These may occur with certain degree of regularity and are termed "cycles". Trends of a steady increase of patients, as have been experienced by hospitals across the nation, will also appear in time series information. In addition, there are the irregular variations, disasters, epidemics, and episodic occurrences. "However, unless one has some understanding of the behavior patterns of prospective hospital patients, forecasting future admissions or average census based solely on statistical trends can often be a seductive illusion...". "Hence, the administrator must be ever wary of over-generalizations even though they are based on well grounded statistics." "In short, time series statistics are an extremely useful tool if the administrator well realizes their capabilities and limitations."[13]

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[13]ibid. p. 76

A "reverse technique" utilized to analyze patient service demand is that of considering nonutilization of beds. As Ray E. Brown[14] points out,

> "When we remember that 'available' bed is defined as a bed fully staffed and ready for occupancy by a patient, and that payroll makes up 64% of the hospital's total operating costs, we can safely assign the major portion of the difference in cost per available bed and the cost per occupied bed to unutilized payroll.
>
> The above computations support the generalization often repeated by hospital administrators to the effect that avoidable costs represent considerably less than half the hospital's total costs. It also supports the axiom that 'the empty bed is the costly bed'. The effect of the empty beds on operating costs being so significant, the question immediately arises as to why hospitals have not done a better planning job so as to minimize unutilized beds."

Morris London and Robert M. Sigmond [15] state that, "On a typical day in the United States last year (1960) one out of every four beds was empty in nonfederal general hospitals. This represented a daily total, on the average, of 150,00 empty beds." Some of the factors suggested by the suthors, preventing a hospital from operating at an occupancy of 100 per cent are seasonal, week-end and holiday drops in census, the need to segregate beds by service, pay status of patients and accommodation, necessity to hold beds open for peaks in demard, emergencies, disasters, house cleaning and maintenance, and so forth. The authors suggest that hospital administrators should be as conscious of the "Vacancy Rate" as the rate of occupancy, if not more so.

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[14]Ray E. Brown, "The Nature of Hospital Cost," Hospitals, Vol. 30, (April 1, 1956) p. 39.

[15]Morris London and Robert M. Sigmond, "Are We Building Too Many Hospital Beds?" The Modern Hospital, Vol. 96, No. 1. (January 1961) p. 59.

As Brown suggests[16] "The average per cent of unoccupancy during a year multiplied by the hospital's bed complement equals the number of unused beds and indeed the amount of idle investment."

The above brief explanation of the various ways of ascertaining patient service demand indicates the importance and complexity of this matter. It must be noted, however, that not all of the above mentioned methods for estimating patient service demand will apply to one given hospital or community. With some hospitals or communities several methods may apply, but with others none of the methods may be suitable.

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[16]Ray E. Brown, "Let the Public Control Through Planning," Hospitals, Vol. 33 (December 1, 1959) p. 35.

III. FACTORS INFLUENCING THE PATIENT'S ADMISSION TO THE HOSPITAL

When discussing the importance and complexity of ascertaining the patient service demand it can be noticed that in each theory statistical mechanisms were present, or recognition was given to the fact that the patient service demand fluctuated in one way or another and at one time or another. Let us now look at some of the factors mentioned previously and then attempt to analyze whether or not their effect on admissions could be shown at Edward W. Sparrow Hospital.

In-school versus Out-school Factor

It has been the observation of this author, from his experiences as an Admitting Office employee at Sparrow Hospital, that the scheduling of school vacation time produces a specific effect upon the number and type of admissions. Hospital personnel[A] in contact with children surgical patients will emphatically agree that during school vacation periods there is a considerable increase in child "T & A." (tonsil and adenoid) patients. Employees on the Eye, Ear, Nose and Throat Nursing Station at Sparrow Hospital, in the Laboratory, Surgery, Recovery Room, Admitting Office and even Dietary departments, all have found this to be the case.

Seasonal Fluctuations

Seasonal fluctuations are also believed to have a great effect upon hospital admissions.

> "It must be conceded that hospitals were subject
> to great seasonal fluctuations before the discovery

[A]See Appendix A p. 47

of sulfonamides and the antibiotics. During the 1930's
one could expect a large influx of pneumonia and infectious
bacterial diseases during the winter months which would
raise the occupancy of the hospital to 100 per cent or
more. During the summer months, there would be a drop
in bacterial disease which would bring occupancy down to
as low as 50 per cent. The situation was inevitable.
Hospital people tried to cope with it as best they could.
The public and the medical profession got a great deal
of comfort from the empty beds standing by because
epidemics were frequent at the beginning of this century.
In fact there were entire hospitals for infectious
diseases which were almost vacant during a large part of
the year, but they were kept standing by. This situation
no longer remains. The disease picture in hospitals has
undergone a considerable change. The inevitability of
seasonal change can no longer be accepted as it was 25
years ago. Despite this fact, fluctuations in seasonal
occupancy sill seem to follow the pattern of 25 years
ago. Annual studies conducted by Hospital Management
magazine reveal an almost identical seasonal occupancy
pattern year after year for general hospital."[17]

Louis Block[18] concurs with the before-stated opinion regard-

ing seasonal fluctuations stating that "...this has been explained

by the increased prevalence of respiratory infections requiring hos-

pitalization during the winter months, the decreased use of hospitals

for children's services in the summer, and the drop in elective pro-

cedures during the summer vacation season."

In an article entitled "Hospitals Do Little to Level Occupancy

Rates"[19] Modern Hospital points out the results of a study whereby

"...77 per cent of the hospitals surveyed reported seasonal fluctu-

ations in occupancy, only about a third of the administrators were

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[17]C. U. Letourneau and M. Ulveling, "Vacant Hospital Bed--A
Study of Occupancy," Hospital Management. Vol. 88. (October 1959) p. 48.

[18]Louis Block, "Bed Occupancy," Hospital Topics, (October
1956) p. 42.

[19]"Hospitals Do Little to Level Occupancy Rates," Modern
Hospital Vol. 96. (July 1961) pp. 86-87.

doing anything to overcome them." This article cited vacations as the chief cause of seasonal fluctuations: "...two-thirds of the respondents attributed these seasonal fluctuations to patient or physician vacations, or both."

In the "Small Hospital Questions" section of the Modern Hospital magazine[20] the panelists answer a question, pertaining to the low average occupancy -- less than 50 percent -- in a community having a seasonal industry, by stating that if surplus cannot be earned during the high occupancy season then "... the hospital must cut costs during the low occupancy period by closing floors, departments or even services, in order to achieve a reasonable balance of expense and revenue."

To cope with the recurring problem of finding beds for the many extra patients each winter, the hospitals in the London, England, area implemented a warning system "...for reducing, in times of stress, the number of non-urgent admissions. This system depends on the proportion of patients, referred by practitioners, for whom admission is secured."[21]

Temperature Changes

In conjunction with the season it seemed only logical that there may be a correlation of the effect of change in temperature, that is divergence in temperature from the normal, upon admissions.

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[20]Jewell M. Thrasher, et.al., "Small Hospital Questions," Modern Hospital, Vol. 87. No. 6. (December 1956) p. 47.

[21]"Winter Admissions To The Hospital." Lancet, Vol. 2. (November 7, 1953) pp. 975-976.

The thinking here being, for example, that when the temperature rises above the expected normal for the summer months, the increased effort required to breathe, coupled with unaccustomed exercise or illadvised strain, precipitates a heart failure because of known or unknown cardio-vascular trouble or as a further complication of some other physiopathological disorder.[B]

Weedends and Holidays

How do weekends and holidays affect occupancy? Since there is no evidence that serious illness i.e., hospitable illness, regularly declines over weekends and holidays, why should there be a decline in the census during these periods and for that matter what group of hospital admission, i.e., what specific patient service demand classification is responsible for the decline? The Hospital Council of Western Pennsylvania[22] conducted a study of this occupancy pattern in 14 hospitals. They concluded that "...the decline during these periods reduces total occupancy by only a few percentage point." They state that personal considerations of patients and their families, established work patterns of physicians and various hospital routines have a definite effect on the timing of hospital admissions and discharges. They found that the peak census day was on Monday and Tuesday

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[B]See Appendix B. p. 53

[22]Morris London and Robert M. Sigmond, "How Weekends and Holidays Affect Occupancy," The Modern Hospital, Vol. 97. No. 2 (August 1961) pp. 79-82

and that the average daily census declined slightly Wednesday through Friday, and reached the lowest level on Saturday. Census rose again on Sunday because of the large number of admissions which characteristically occur on that day, but it was still below the average for the week as heavy weekend discharges continued. They point out that the fluctuation of the medical-surgical census by day of week was almost identical with the over-all pattern. Pediatric census had the widest fluctuation by day of week, and maternity having the narrowest range of census fluctuation by day of week, although discharges from maternity were heaviest on Sunday, which appears to reflect a variety of social and economic as well as professional considerations. It would seem that the hospitals have elective discharges as well as elective admissions.

Regarding the effect of Thanksgiving, Christmas and New Year's on the census it was shown that a 15 percent, 40 percent and 18 per cent below normal occupany, respectfully, was experienced.[23] "The holiday decline in census was not limited to the day of the holiday, but began one or more days in advance and continued for a number of days afterward. The depressant effect which holiday periods had on census was much less among hospitals with relatively high occupancy than among those with relatively low occupancy." Also it was noted that "Declines in census during holiday periods were much greater than the declines over weekends and had a greater effect on over all occupancy."

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[23]ibid.

Ray E. Brown[24] pointed out that "...almost universally the variation is downward by about 15 per cent over weekends as compared with other days of the week. This tendency of the patient to observe a five-day week is almost equalled by a similar tendency to observe holidays and vacation months. The average occupancy nationally drops more than 16 per cent during the heavy vacation month of August as compared with February."

At present it is acknowledged that occupancy fluctuation occurs at least when studied nationally or when the data of several hospitals is combined. There is apparently some advanced thinking regarding this eccentric use of facilities. M. A. Simpson[25] stated, "...obviously some patients will need inpatient care at the weekend, but. would it be beyond the powers of clever organizers to arrange for others -- I would suggest as many as two-thirds to spend the weekend at home? Will the day come when private cars and ambulances arrive at the hospital to take patients home at 5 P.M. on Fridays and return them at 9 A.M. on Mondays?"

One hospital[26] is aware of this week-end census slump and has implemented what they call a "Week-end 'Resort' Special" program,

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[24]Ray E. Brown, "Let the Public Control Thru Planning," Hospitals, Vol. 33. (December 1, 1959) p. 37

[25]M. A. Simpson, "Monday-to-Friday Wards," Lancet, Vol. 1. (April 30, 1960) p. 977

[26]Mark Berke, "Week-end 'Resort' Special," Hospitals, Vol. 28. (September, 1954) p. 75

which offers short-term treatment on the hotel plan. "It is
especially designed to accommodate busy businessmen, housewives
who profer leaving home when their husband is there to take care
of the children, working people who might lose a day's salary
during the week and persons from out-of-town who wish to make
use of the hospital's extensive therapeutic and diagnostic services.
Patients requiring short-term hospitalization for surgery or
therapeutic and diagnostic work enter this program at their
physician's request, but the unusual feature is that the patients
are free to come and go as they please, leave the hospital for
dinner or a movie or to attend any other business or social engage-
ments during their stay." This is indeed one imaginative way of
marketing hospital services to create a patient service demand
during the times when business activity is needed to cover expenses.

IV. SELECTION OF DATA

Census information for each separate interest area studied was obtained from the Edward W. Sparrow Hospital Official Census Book. The midnight patient census for each day of the year 1960 was compiled on a master form for the following patient classifications:[c]

(1.) Total Patients
(2.) Men Patients
      a. Total
      b. Surgical
      c. Medical
(3.) Women Patients
      a. Total
      b. Surgical
      c. Medical
      d. Obstetrical
(4.) Children Patients
      a. Total
      b. Surgical
      c. Medical
      d. Newborn (Nursery)
(5.) Births

The master form was arranged by month. Special entries were included to indicate weekday (Monday, Tuesday, Wednesday, Thursday, and Friday) versus weekends (Saturday and Sunday), holidays (New Years, Memorial Day, Independence Day, Labor Day, Thanksgiving, and Christmas), the variation of temperature from the normal, the amount of precipitation, and the days when school was either in session or not.

Temperature variance from normal and precipitation readings were obtained from the United States Department of Commerce, Weather Bureau's "Local Climatological Data." The official temperature and

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[c]See Appendix C. p. 56

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precipitation readings by the Bureau were made at the Capital City Airport, Lansing, Michigan.

The school calendars were obtained from the Lansing Board of Education, the East Lansing Board of Education, and the Lansing Parochial School Board of Education. The calendars were compared and found to be almost identical for the school year of 1960, with the exception of occasional Holy Days in the Parochial System. For the statistical study the calendar of the Lansing School Syetem was used.

V. STATISTICAL PROCEDURE

When analyzing the data of the different interest areas, two
statistical procedures were utilized. The first was analysis of
variance, single variable of classification. This procedure "...con-
cerns a comparison of the means of the ... populations, and the parts
of the sample variance are analyzed for this purpose."[27] The analysis
of variance is based on the fact that "...if means of subgroups are
greatly different the variance of the combined groups is much larger
than the variance of the separate groups." In the single variable of
classification all individuals, in this study patients, were classified
into exactly one of two populations. For example, in the In-school
versus Out-school interest area the various patient populations were
segregated into groups defined by the variable of school being either
in session or not. The hypothesis was that there is no difference
in the means of the two populations. The F Statistic was at the 5
per cent level of significance.

The second statistical tool utilized was that of linear
regression. In the temperature and precipitation interest areas the
variation in patient census was studied and compared with particular
changes in the temperature from normal, and the amount of precipit-
ation. They are then the "regression of patient census on temperature
effect" and, "regression of patient census on precipitation". In the
application of the linear regression theory, the mean of the dependent

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[27]Wilfrid J. Dixon and Frank J. Massey Jr., Introduction to
Statistical Analysis, 2ed Edition, (New York: McGraw-Hill Book
Company 1957) pp. 139-140

measurement, (the patient census) and the independent measurement (the temperature effect) were calculated. The variance of the means of the patient census was calculated as were the regression coefficients and the "t Statistic". The critical region was established at the 5 per cent level of significance.

VI. FINDINGS

In-school Versus Out-school Patient Census Comparison

The first interest area analyzed was the In-school versus Out-school patient census comparison. Each patient census population, e.g., Total Patients, Men Surgical, Men Medical, Women Surgical, Women Medical, Women Obstetrical, Children Surgical, Children Medical, Children Nursery, and Births was analyzed using an analysis of variance procedure and a 5 per cent level of significance. The hypothesis was that the mean of the patient census during In-school periods equaled the mean of the patient census during Out-school periods. The results, Tables I through XI, indicate, with one exception, that the hypothesis was true and therefore, the school schedule had no effect upon patient admissions. The one exception to this finding was that Men Surgical patients and their census apparently varied with the school calendar.

TABLE I.

Total Patients

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	997.56	1	997.56	1.5958
Within	9376.44	15	625.09	
Total	10374.00	16		

F RATIO STATISTIC F(1,15) F(.95) = 4.54

TABLE II.

Men Surgical

Variance	Sum of the Squared	Degrees of Freedom	Means Square	F Ratio
Means	134.67	1	134.67	4.5450
Within	444.39	15	29.63	
Total	579.06	16		

F RATIO STATISTIC F (1,15) F(.95) = 4.54

TABLE III.

Men Medical

Variance	Sum of the Squared	Degrees of Freedom	Means Square	F Ratio
Means	4.72	1	4.72	0.0515
Within	1374.22	15	91.61	
Total	1378.94	16		

F RATIO STATISTIC F(1,15) F(.95) = 4.54

TABLE IV.

Women Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	164.71	1	164.71	4.0124
Within	615.76	15	41.05	
Total	780.47	16		

F RATIO STATISTIC F(1,15) F(.95) = 4.54

TABLE V.

Women Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	179.71	1	179.71	1.9722
Within	1366.76	15	91.12	
Total	1546.47	16		

F RATIO STATISTIC $F(1,15)$ $F(.95) = 4.54$

TABLE VI.

Women Obstetrical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	23.33	1	23.33	1.5870
Within	220.43	15	14.70	
Total	243.76	16		

F RATIO STATISTIC $F(1,15)$ $F(.95) = 4.54$

TABLE VII.

Children Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	6.47	1	6.47	0.6393
Within	151.77	15	10.12	
Total	158.24	16		

F RATIO STATISTIC $F(1,15)$ $F(.95) = 4.54$

TABLE VIII.

Children Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	5.23	1	5.23	1.2482
Within	62.89	15	4.19	
Total	68.12	16		

F RATIO STATISTIC $F(1,15)$ $F(.95) = 4.54$

TABLE IX.

Children Nursery

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	84.19	1	84.19	3.1043
Within	406.87	15	27.12	
Total	491.06	16		

F RATIO STATISTIC $F(1,15)$ $F(.95) = 4.54$

TABLE X.

Births

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	.33	1	.33	0.1000
Within	49.56	15	3.30	
Total	49.89	16		

F RATIO STATISTIC $F(1,15)$ $F(.95) = 4.54$

TABLE XI.

Summary Table

Patient Populations	Hypothesis Accept/Reject	Interpretation of Comparison
Total Patients	Accept	No Effect
Men Surgicals	Reject	Higher In-school
Men Medical	Accept	No Effect
Women Surgical	Accept	No Effect
Women Medical	Accept	No Effect
Women Obstetrical	Accept	No Effect
Children Surgical	Accept	No Effect
Children Medical	Accept	No Effect
Children Nursery	Accept	No Effect
Births	Accept	No Effect

Weekend Versus Weekday Patient Census Comparison

The Weekend versus Weekday Patient Census comparison was the
second interest area analyzed. As in the before mentioned interest
area, the same patient census populations were considered. The hypo-
thesis was that the distribution of the patient census during the
weekend equaled the patient census during the weekdays. The calcul-
ation results, Tables XII. through XXII. Indicated that for half of
the patient census populations the hypothesis was accepted: that the
Men Medical, Women Medical, Women Obstetrical, Children Medical, and
Children Nursery census population distributions were statistically
the same over any seven day period. The other five patient popul-
ations did have census variations from the weekend to the weekdays.
The first four of these, Total Patients, Men Surgical, Women Surgical,
and Children Surgical populations, were found to be higher on Monday
through Friday. Conversely, Births occurred more often on the
Saturday and Sunday weekend than on the weekdays.

TABLE XII.

Total Patients

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	8376.92	1	8376.92	6.9924
Within	59899.77	50	1198.00	
Total	68276.69	51		

F RATIO STATISTIC F(1,15) F(.95) = 4.54

TABLE XIII.

Men Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	228.50	1	288.50	14.7705
Within	773.49	50	15.47	
Total	1001.99	51		

F RATIOS STATISTIC F(1,15) F(.95) = 4.54

TABLE XIV.

Men Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	102.48	1	102.48	0.6852
Within	7477.27	50	149.55	
Total	7579.75	51		

F RATIO STATISTIC F(1,15) F(.95) = 4.54

TABLE XV.

Women Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	415.56	1	415.56	9.4103
Within	2207.89	50	44.16	
Total	2623.44	51		

F RATIO STATISTIC $F(1,50)$ $F(.95) = 4.04$

TABLE XVI.

Women Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	56.08	1	56.08	0.2919
Within	9606.15	50	192.12	
Total	9662.23	51		

F RATIO STATISTIC $F(1,50)$ $F(.95) = 4.04$

TABLE XVII.

Women Obstetrical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	30.77	1	30.77	1.9111
Within	804.92	50	16.10	
Total	835.69	51		

F RATIO STATISTIC $F(1,50)$ $F(.95) = 4.04$

TABLE XVIII.

Children Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	880.71	1	880.71	57.1518
Within	770.29	50	15.41	
Total	1651.00	51		

F RATIO STATISTIC F(1,50) F(.95) = 4.04

TABLE XIX.

Children Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	8.48	1	8.48	1.1276
Within	376.19	50	7.52	
Total	384. 67	51		

F RATIO STATISTIC F(1,50) F(.95) = 4.04

TABLE XX.

Children Nursery

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	4.33	1	4.33	0.2052
Within	1055.12	50	21.10	
Total	1059.44	51		

F RATIO STATISTIC F(1,50) F(.95) = 4.04

TABLE XXI.

Births

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	37.25	1	37.25	8.3333
Within	223.68	50	4.47	
Total	260.92	51		

F RATIO STATISTIC F(1,50) F(.95) = 4.04

TABLE XXII.

Summary Table

Patient Populations	Hypothesis Accept/Reject	Interpretation of Comparison
Total Patients	Reject	Higher-Weekdays
Men Surgical	Reject	Higher-Weekdays
Men Medical	Accept	No Effect
Women Surgical	Reject	Higher-Weekdays
Women Medical	Accept	No Effect
Women Obstetrical	Accept	No Effect
Children Surgical	Reject	Higher-Weekdays
Children Medical	Accept	No Effect
Children Nursery	Accept	No Effect
Births	Reject	Higher-Weekends

Holiday Patient Census

Holiday Patient Census was the third interest area considered. The hypothesis was that the mean of the patient census during holidays equaled the mean of the patient census during the month in which the holiday occurred. The calculation results, Tables XXIII. through XXXIII., indicated that in four of the ten patient census populations this hypothesis was rejected. Total Patients, Men Surgical, Women Surgical, and Children Surgical populations did experience a census drop on holidays as compared with their census during the holiday month.

TABLE XXIII.

Total Patients

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	6075.10	1	6075.10	5.2485
Within	15047.30	13	1157.48	
Total	21122.40	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXIV.

Men Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	221.14	1	221.14	7.7159
Within	372.59	13	28.66	
Total	593.73	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXV.

Men Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	3.34	1	3.34	0.0256
Within	1689.60	13	129.97	
Total	1692.94	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXVI.

Women Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	1081.20	1	1081.20	21.3718
Within	657.73	13	50.59	
Total	1738.93	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXVII.

Women Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	100.81	1	100.81	0.5297
Within	2473.59	13	190.28	
Total	2574.40	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXVIII.

Women Obstetrical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	⁻69.14	1	69.14	3.2736
Within	274.59	13	21.12	
Total	343.73	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXIX.

Children Surgical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	378.16	1	378.16	5.8556
Within	839.59	13	64.58	
Total	1217.75	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXX.

Children Medical

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	7.62	1	7.62	1.4216
Within	69.71	13	5.36	
Total	77.33	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXXI.

Children Nursery

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	13.89	1	13.89	0.8070
Within	223.71	13	17.21	
Total	237.60	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXXII.

Births

Variance	Sum of the Squares	Degrees of Freedom	Means Square	F Ratio
Means	18.30	1	18.30	1.7562
Within	135.43	13	10.42	
Total	153.73	14		

F RATIO STATISTIC F(1,13) F(.95) = 4.67

TABLE XXXIII.

Summary Table

Patient Populations	Hypothesis Accept/Reject	Interpretation or Comparison
Total Patients	Reject	Holiday Drop
Men Surgical	Reject	Holiday Drop
Men Medical	Accept	No Effect
Women Surgical	Reject	Holiday Drop
Women Medical	Accept	No Effect
Women Obstetrical	Accept	No Effect
Children Surgical	Reject	Holiday Drop
Children Medical	Accept	No Effect
Children Nursery	Accept	No Effect
Births	Accept	No Effect

Analysis of Temperature and Precipitation Affects

The analysis of temperature and precipitation affect on the patient census populations was the fourth interest area analyzed. The hypothesis was that the patient census population was independent of the temperature. The calculations, Table XXXIV., indicated that all patient census populations, except Men Surgical and Births were

independent of the temperature variations. It appeared statistically, that the Men Surgical population and Births were dependent upon the temperature variable. Regarding the patient census populations with respect to preticipation, Table XXXV., all populations were found to be independent of the latter variable.

TABLE XXXIV.

The Analysis of Variance in Regression for Temperature

Patient Populations	N	$\overline{Y}$	S_{yx}	B_{yx}	Sx N-1	B_{yx}	$t(Byx=0)$ [28]
Total Patients	26	331.38	33.49	-0.0696	222.62	-0.941	-0.463
Men Surgical	26	44.46	5.73	-0.0720	222.62	-0.496	-2.797 [29]
Men Medical	26	56.19	12.53	+0.0086	222.62	+0.031	+0.153
Women Surgical	26	48.19	5.97	-0.0469	222.62	-0.337	-1.750
Women Medical	26	60.92	13.57	+0.0155	222.62	+0.059	+0.254
Women Obstetrical	26	41.38	4.14	+0.0170	222.62	+0.184	+0.914
Children Surgical	26	20.08	3.60	-0.0082	222.62	-0.104	-0.508
Children Medical	26	17.15	2.30	-0.0142	222.62	-0.271	-1.372
Children Nursery	26	44.23	4.05	+0.0230	222.62	+0.250	+1.263
Births	26	8.58	0.82	+0.0215	222.62	+0.118	+5.840 [30]

t STATISTIC DISTRIBUTION t(2,24) t(.95) = $\pm$ 2.06

TABLE XXXV.

The Analysis of Variance in Regression for Precipitation

Patient Populations	N	$\overline{Y}$	S_{yx}	B_{yx}	Sx N-1	B_{yx}	$t(Byx=0)$
Total Patients	26	331.38	33.29	+7.4754	3.1923	+0.145	+0.717
Men Surgical	26	44.46	6.56	-1.1368	3.1923	-0.113	-0.553
Men Medical	26	56.19	12.48	+1.8367	3.1923	+0.095	+0.470
Women Surgical	26	48.19	5.18	+1.7753	3.1923	+0.577	+1.095
Women Medical	26	60.92	13.42	+3.2702	3.1923	+0.157	+0.778
Women Obstetrical	26	41.38	4.21	-0.3453	3.1923	-0.053	-0.262
Children Surgical	26	20.08	3.61	-0.1454	3.1923	-0.026	-0.128
Children Medical	26	17.15	2.35	+0.7130	3.1923	+0.194	+0.970
Children Nursery	26	44.23	4.17	-0.5367	3.1923	-0.084	-0.411
Births	26	8.58	0.82	+0.0773	3.1923	+0.061	+0.300

t STATISTIC DISTRIBUTION t(2,24) t(.95) = $\pm$

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[28] $t_{(n-2)} = \dfrac{B_{yx}}{S_{yx}} (\sum x^2 - \overline{x} \sum x)^{\frac{1}{2}}$

[29] Y = 42.255 + (-.0720) X   This is the relationship of the temperature effect.

[30] Y = 8.9374 + (.0215) X   This is the relationship of the temperature effect.

VII. DISCUSSION

The primary purpose for undertaking an analysis of the In-school versus Out-school Patient Census comparison was to ascertain the effect of the school calendar on the Children admissions, although the effect upon the other patient populations was also of importance. Table II indicates that the Men Surgical patient population does vary with the school calendar. It is curious to note that the Men Surgical Census rises when school is in session. This is a fact of importance in this study. The majority of surgical admissions are elective, that is to say, the patient and his doctor arbitrarily set a time for admission with the hospital when the operation can be scheduled. Having this in mind a possible reason why Men Surgical patients more often choose the school-in-session time of the year for operations might be so that they are not incapacitated during their children's school vacation time when most families schedule their trips and visits.

Even though calculations did not reveal any effect of the school calendar upon Children admissions, there is, nevertheless, a definite impression of this correlation upon the minds and working arrangements of many hospital employees. It is worth while to review the data used for this statistical analysis. The Sparrow Hospital Official Census data utilized in this interest area segregates Children admissions into three classifications: Children Surgical, Children Medical, and Children Nursery. These classifications range in ages from the nursery patient, i.e., the newborn, to the pediatric

patient up to the age of 12. The official census data does not distinguish the Children patients by age groupings.

In the results of this study it was the author's opinion that the effect of the school calendar upon the admission of school-age children was being disguised by the admissions of children below school age. It can only be suggested that there is an "informal practice" on the part of the parents and doctors to "reserve" the vacation periods for school-children admissions and the school-in-session periods for the younger children. The effect of this "informal practice" was to approximately balance out the admissions over a year's time.

The Weekend versus Weekday Patient Census comparison revealed that there was no particular patient census fluctuation over a seven day period for non-elective admissions: Men Medical. Women Medical, Women Obstetrical, Children Medical, and Children Nursery. There was a difference, however, in census on weekends for the Total Patients, Men Surgical, Women Surgical, in particular the Children Surgical classification, and in the number of Births. In the Review of the Literature, several articles[31] [32] [33] pointed out that sociological customs and psychological attitudes of our population gear our living to a Monday through Friday routine, and so when arranging for the

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[31]London and Sigmond, Op. Cit.

[32]Simpson, Op. Cit.

[33]Berke, Op. Cit.

surgical admission there seems to be a tendency to approach this as one does his occupation and wish to allocate only weekday time for the surgery. Women Obstetrical is the non-elective patient classification that statistically does not fluctuate over a seven day period. In other words, the number of obstetrical admissions on Tuesday or Wednesday are statistically equal to those on Saturday or Sunday. In comparison with the Women Obstetrics results, Births were more frequent on weekends than on weekdays, even though the "expecting female" was equally likely to be admitted to the Maternity Department any day of the week. One possible explanation might be that the Thursday and Friday Obstetrical admissions were spending more time in the Labor Rooms and that parturition doesn't occur until Saturday or Sunday. Another possibility might be, as one author suggested,[34] that there are more cases of induced labor and delivery over the weekend.

The Holiday patient census comparison revealed that there was a Total Patient census holiday drop. Accounting for this, there was a holiday census drop in the Men Surgical, a significant one in Women Surgical, and in Children Surgical. Once again, the patient and his doctor schedule the elective admission so as to not interfere with the patient's and doctors holiday. In particular, the Women Surgical census dropped, possibly because the female in the home takes on additional culinary responsibilities for the festive holiday occasions, e.g., the Christmas dinner, and the July 4th picnic.

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[34]Blumberg, Op. Cit.

The fourth interest area, the effect of temperature variations, indicated that statistically only the Men Surgical census and Births are dependent upon the divergence of temperature from normal. It might be suggested that the unseasonableness of weather was an important factor in the male's decision-making process. Maybe the male in our civilization is "out-door oriented" and therefore if the weather is unusually hot or cold this brings about his decision to be or not to be admitted for his elective surgery. That Births are effected by abnormal variations in the weather may not be news to the "spinners" of old wives' tales, but there doesn't seem to be any obvious explanation for the situation. When considering the analysis of precipitation effect there wasn't any indication that precipitation or the variance in barometric pressure had any effect upon service demand in spite of the extreme amount of attention placed on, for example, the number of hear attacks brought on by over-exertion when shoveling snow.

VIII. APPLICATION

Based upon the findings of this study regarding the effect of
the school calendar, the hospital may wish to designate additional
beds on a nursing station for men surgical cases during the school
year. Also the Surgery Department may have to make allotments for
that portion of the schedule for male-type opeations during this
period of time.

The weekend versus weekday analysis points out the variance
in service demand created by elective surgery. Having this infor-
mation certain personnel staffing patterns could be created whereby,
the Admitting Office, Department of Surgery, Recovery Room, Central
Supply, the Special Diet Kitchen, and of course the nursing stations
would be able to reduce their staff on weekends. It might be to the
hospital's advantage to implement the distinctive patient facility
plan whereby part or all of a male or female surgical nursing station
could be closed down over the weekend or a skelton crew be utilized
on specific shifts. It might be possible to designate specific bed
complements or nursing stations for surgical operations where the
total length of hospital stay was known, (e.g., a surgical operation
with a 5-day stay, 4-day stay, 3-day stay, etc.) and thereby selec-
tively program elective surgical admissions based upon length of
hospitalization. This might enable specific stations to operate at a
high per cent of occupancy during the weekdays and enable the staff
to have weekends off. Of course this would result in a savings by
the hospital on payroll expense, which amounts to approximately 70
per cent of the cost of operation. On the other hand, knowledge of

these census fluctuations by administration could result in implementation of selective patient assignments: the available beds on the weekends could be marketed, as was suggested by the hospital having a "Weekend 'Resort' Special", and the Hospital would not only avoid a loss, but more actively fulfill one of the purposes of a hospital's existence--that of being a place for the promotion of good health and the prevention of disease, in this example by the creation of a practice of preventive medicine. It was noted that more Births occur on weekends. This should dictate the staffing pattern of the Labor and Delivery Rooms and possibly the Premature and Term Nurseries, i.e., have additional nursing personnel on Saturday and Sunday.

The holiday census drop in the elective admission classifications again would indicate that personnel staffing patterns and the organization of nursing stations should be flexible to these census changes.

It is obvious that census drops on weekends and holidays have a direct and most noticeble affect on the demands on nursing personnel and the utilization of beds, but also there are extensions of this "vacancy" into the functions of the Laboratory, Dietary, Radiology, Central Supply, and Pharmacy departments. Depending upon the seriousness of the medical patients and those surgical cases remaining hospitalized over the weekend and holiday, there can be a reduction in the number of Laboratory and Radiological procedures that must be done, the number of dietitians and dietary personnel to plan and produce the special surgical diets, and in the number of special solutions and equipment packs to be cleaned, made up, sterilized and

distributed by Central Supply. Likewise, the unseasonableness of the temperature and its affect on Men Surgical admissions and Births also calls for direct planning on the part of administration to make the necessary staffing and equipment arrangements for these situations.

The importance of being aware of the patient service demand and understanding the variations or fluctuations that occur extend into almost every aspect of the hospital operation. That the patient is admitted and occupies a hospital bed or the reverse that the patient admission does not occur, has far reaching consequences, for a hospital bed is not "just a bed". It is also the myrid of ancillary and paramedical services supporting the patient while he is receiving nursing care in his hospital bed.

IX. CONCLUSION

The patient service demand at Edward W. Sparrow Hospital,
Lansing, Michigan, was studied for the following patient classific-
ations:

(1.) Total Patients
(2.) Men Surgical
(3.) Men Medical
(4.) Women Surgical
(5.) Women Medical
(6.) Women Obstetrical
(7.) Children Surgical
(8.) Children Medical
(9.) Children Nursery
(10.) Births

The census information for each separate interest area was obtained
from the Edward W. Sparrow Hospital Official Census Book.

The effect of the school calendar, weekends, and holidays
on the census in each of the above patient classifications was
determined using an analysis of variance statistical procedure.
(1.) Men Surgical Patient census was found to be higher during
periods when school is in session. The other patient census clas-
sifications are not effected by the school calendar. (2.) Total
Patients, Men Surgicals, Women Surgicals, and Children Surgicals
are higher on weekdays than weekends. There are more Births on week-
days than weekends. There are more Births on Saturday and Sunday
than on weekdays. The other patient census classifications showed no
change over the seven day period. (3.) A census drop on holidays was
found in the Total Patients, Men Surgical, Women Surgical, and Child-
ren Surgical classifications. The other patient census classific-
ations showed no change over holidays.

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A linear regression statistical procedure was utilized in determining the effect of temperature and precipitation on the census. (4.) None of the patient census classifications exhibited any effect by the amount of precipitation.

The effects of the above mentioned factors on the various patient classifications are summarized on Table XXXVI, Summary of Analyses.

TABLE XXXVI

Summary of Analyses

Factors Analysed

Patient Classifications	In-School--Out-School	Week-End--Week-Day	Holiday	Temperature	Precipitation
Total Patients	No Effect	Effect	Effect	No Effect	No Effect
Men Surgical	Effect	No Effect	Effect	Effect	No Effect
Men Medical	No Effect	No Effect	No Effect	No Effect	No Effect
Women Surgical	No Effect	Effect	Effect	No Effect	No Effect
Women Medical	No Effect	No Effect	No Effect	No Effect	No Effect
Women Obstetrical	No Effect	No Effect	No Effect	No Effect	No Effect
Children Surgical	No Effect	Effect	Effect	No Effect	No Effect
Children Medical	No Effect	No Effect	No Effect	No Effect	No Effect
Children Nursery	No Effect	No Effect	No Effect	No Effect	No Effect
Births	No Effect	Effect	No Effect	Effect	No Effect

APPENDIX A

LETTERS FROM HOSPITAL PERSONNEL

REGARDING IN-SCHOOL--OUT-SCHOOL

EFFECTS ON THE PATIENT CENSUS

November 29, 1963

Dear Mr. Plasman:

On your recent question concerning the relationship of school vacations to the work load in the Laboratory, I have found that they are directly related. Especially during the Easter or Spring vacation and Christmas holidays, our total work load in the Hematology and Urinalysis sections are increased, as all admitted patients receive a routine CBC and urinalysis. This increase is primarily due to an increase in short-term surgery patients during school vacations. Also, other laboratory areas have increased procedure totals, such as, histology, as they process all tissues removed in surgery.

So from my experience in the Laboratory, dating back to 1954, I have observed that school vacations increases the total work of the Laboratory.

Yours sincerely,

Ann Spencer, M.T., (A.S.C.P.)
Hematology Section Chief
Edward W. Sparrow Hospital

DIETARY DEPARTMENT

A sharp increase in the children's trays for the T. & A. ward is definite and very marked at the beginning of all school vacations and continues in this manner throughout the vacation period. A normal number of trays ordered for this area is again resumed at the end of a vacation period.

All trays going to this area are designated by age so an appropriate tray can be sent to the child followed by the post-operative tonsil regime after T. & A. surgery.

Preparation is always made in advance of the immediate start of a vacation period to accomodate this increased load on the Dietary Department.

Doris Cox

Doris Cox, A.D.A.

Executive Dietitian

EDWARD W. SPARROW HOSPITAL

INTER-DEPARTMENTAL CORRESPONDENCE

TO: Mr. Plasman

FROM: Elisabeth Munter, R.N.

SUBJECT: Operating Room Schedule During School Vacation

DATE: November 29, 1963

The increase of number of children in the hospital during winter and
spring school vacation is evident on the Operating Room schedule.
This is a convenient time to have elective surgery done without having
the children miss classes. The greatest increase is in ear, nose, and
throat surgery. Ordinarily we have only one ENT Operating Room which
accomodates eight to ten tonsillectomies per day on an average day.
Far in advance of the winter and spring school vacations we receive
requests from the ENT staff of surgeons to have a second operating
room for tonsillectomies during the vacation period. With adjustments
in operating room schedules and staff in operating room, recovery room
and on the nursing units, we are able to provide this service.

Elisabeth Munter, R.N.

EM:ac

December 17, 1963

Dear Mr. Plasman:

In the last few years we know that the census in the E.E.N.T. Department is much larger during vacation time; that is, Christmas and Spring Vacation especially. This is especially so with the pediatric age group.

A second operating room is in operation during the periods to accommodate the increase.

Many adults are scheduled at this time also to avoid having to take sick leave from work. Teachers and students often elect this time to have surgery done.

We plan a full staff to be available at these periods to handle the situation.

Sincerely,

Eleanor Purdy, R.N.

Eleanor Purdy, R.N.
Head Nurse, 1-Main

July 15, 1963

F. B. Plasman,
Administration.

Dear Mr. Plasman:

The Admitting Office at Sparrow Hospital has been a very interesting position for me during the last fourteen and one-half years.
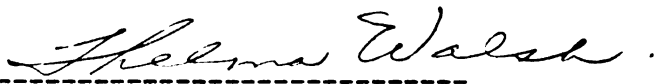
The hospital has it's busy seasons the same as any other business. At Christmas, Easter and summer vacation time, we are set up to open two operating rooms plus the necessary bed section, so that children may have throat, eye or other elective surgery.

Approximately twenty to twenty-five children per day are admitted through this period. It is very gratifying to know that the hospital has these facilities available so that children need not miss school classes during the year.

This hospital averages eight to ten children per day as emergencies with either medical or surgical diagnosis on a year round basis.

The accommodations are improving each year to help patients have elective surgery when it is convenient for them.

Very truly yours,

Helma Walsh.

Admitting Supervisor

APPENDIX B

LETTERS FROM PHYSICIANS REGARDING

TEMPERATURE VARIATIONS ON PATIENT

CENSUS

ROBERT M. STOW, M.D.

2909 EAST GRAND RIVER

LANSING 12, MICHIGAN

—

PHONE IV 9—6596

INTERNAL MEDICINE   JANUARY 20, 1964

MR. F. B. PLASMAN
EDWARD W. SPARROW HOSPITAL
1215 EAST MICHIGAN AVENUE
LANSING, MICHIGAN

DEAR MR. PLASMAN:

THIS IS THE LONG OVERDUE LETTER I PROMISED TO WRITE YOU REGARDING SUDDEN CHANGES IN WEATHER AFFECTING HOSPITAL ADMISSIONS.

OF COURSE, CERTAIN TEMPERATURE CHANGES GREATLY EFFECT THE TRAUMA ADMISSION DEPENDING ON WALKING AND DRIVING CONDITIONS PLUS EXPOSURE TO VARIOUS SPORTS SUCH AS: SKIING, SWIMMING, SKATING ETECTERA. THESE ACTIVITIES CHANGE THE TYPE OF INJURIES APPRECIABLY. THESE I BELIEVE ARE SELF EVIDENT.

IN ADDITION TO THE ABOVE THERE ARE THOSE CHANGES IN TEMPERATURE, SUCH AS A DROP, AS A CAUSE OF INCREASED ANGINA PECTORIS AND EVEN FRANK MYOCARDIAL INFARCTIONS. WHEREAS, A PATIENT MAY BE ABLE TO EXERT IN WARM TEMPERATURES WITHOUT PAIN; THE SAME EXERTION IN COLD WEATHER IS LIKELY TO PRECIPITATE ANGINA OR A CORONARY THROMBOSIS DUE TO SPASM OF THE VESSELS SECONDARY TO THE COLD AIR IN THE BRONCHI. ANOTHER DIFFICULTY IS THE PRECIPITATION OF CONGESTIVE HEART FAILURE DURING HOT WEATHER BECAUSE OF PATIENTS' INCREASED INTAKE OF SODIUM CHLORIDE IN THE FORM OF SALT TABLETS AROUND VARIOUS PLANT DRINKING FOUNTAINS OR INCREASED SOFT DRINK CONSUMPTION. FREQUENTLY THESE WILL PRECIPITATE THE FIRST EPISODE OF ACUTE PULMONARY EDEMA.

I HOPE THIS IS THE INFORMATION YOU NEEDED AND IF FURTHER EXAMPLES ARE NEEDED PLEASE DON'T HESITATE TO REQUEST IT.

SINCERELY YOURS,

ROBERT M. STOW, M.D.

RMS/WA

54

EDWARD W. SPARROW HOSPITAL

DEPARTMENT OF PATHOLOGY

February 24, 1964

Mr. F. B. Plasman
Edward W. Sparrow Hospital
1215 E. Michigan Avenue
Lansing Michigan

Dear Mr. Plasman:

The issue of effective changes of temperature or of temperature
per se on patient admission is a moot one. Temperature changes
appear to be not only inductive or condusive to the develop-
ment of acute infectious diseases, such as, the common cold,
bronchitis etcetera. But the temperature change is also a
significant factor in myocardial infarction or angina pectoris
by inducing broncho-spasm due to the cold air of winter.
Again, over exertion in winter time by certain patients appears
to be a significant percipitating factor in the development
of infectious diseases, respiratory difficulties, such as,
bronchitis or asthma, but the cold air in combination with
exertion are involved in the development of myocardial
infarction.

Obviously seasons and temperatures control or significantly
influence a variety of activities, such as, the winter sports
of skiing, ice skating, versus boating, swimming, golf, base-
ball, etcetera. Each of these sports or activities may have
"epidemic" of injuries. Frequently these are relatively spec-
ific for the sports.

Numerous other examples could be developed. I should be happy
to go into these additional details with you at any time you
wish.

Sincerely yours,

John F. Dunkel, M.D.   FCAP, FASCP
Pathologist

APPENDIX C

MONTHLY MASTER FORMS

JANUARY, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
TOTAL PATIENTS [1]	339	344	334	367	377	385	377	379	349	337	376	381	382	372	375	376	377	392	402	390	360	352	344	336	368	394	386	394	372	368	356	11,442
MEN TOTAL	108	111	109	118	121	126	132	128	125	127	130	132	127	121	125	119	120	125	124	117	116	110	116	110	114	121	111	119	110	112	109	3,715
SURGICAL	42	40	35	45	42	49	50	46	45	43	48	49	46	42	42	42	39	48	51	51	49	47	44	46	47	51	41	50	44	45	42	1,396
MEDICAL	66	71	74	73	79	77	82	82	80	84	82	84	83	81	79	83	80	77	73	73	68	69	72	64	67	70	70	69	66	67	67	2,319
WOMEN TOTAL	151	151	153	167	168	170	162	167	155	149	161	162	168	171	176	173	179	186	185	181	171	168	165	158	170	180	180	182	180	181	170	5,240
SURGICAL	26	37	38	41	43	50	57	50	33	31	35	57	58	61	66	61	56	60	53	36	40	54	55	44	46	48	47	52	38	40	42	1,450
MEDICAL	79	64	74	81	81	70	58	73	84	86	87	67	76	77	73	76	76	77	81	91	87	74	79	81	81	83	87	82	99	98	90	2,477
OBSTETRICAL	46	45	41	45	44	50	47	44	38	32	39	38	34	33	37	36	47	49	51	54	44	40	36	33	43	49	46	48	43	43	38	1,313
CHILDREN TOTAL	80	82	72	82	88	89	83	84	69	61	85	87	82	74	78	78	79	87	92	85	72	68	63	68	84	93	95	93	82	75	77	2,487
SURGICAL	24	20	10	16	17	20	21	22	17	13	23	28	24	19	21	16	12	19	22	15	15	15	11	11	18	22	22	20	14	9	8	544
MEDICAL	15	21	20	24	27	22	17	17	14	17	21	20	21	21	21	23	21	18	16	15	15	17	19	23	22	25	25	22	20	20	24	623
NURSERY	41	41	42	42	44	47	45	45	38	31	41	39	37	34	36	39	46	50	55	55	42	36	33	34	44	46	48	51	48	46	45	1,320
BIRTHS	5	9	11	6	10	10	8	8	5	8	13	5	7	4	7	14	11	10	8	10	1	4	10	11	13	10	10	8	6	6	10	258
TEMPERATURE [2]	-4	+8	+4	-6	-10	-6	+7	-0	+2	+8	+1	+6	+12	+9	+3	+1	-1	+4	+3	-2	-5	-1	-1	-5	-1	+6	+9	+9	+9	+9	+9	0
PRECIPITATION [3]	0	.04	.05	.01	.01	T	T	T	T	T	0	.25	T	.43	T	T	T	.05	.01	.03	T	.02	.01	.03	.07	.15	0	.01	0			
HOLIDAYS	xx																															
WEEKENDS		xx	xx						xx	xx						xx	xx						xx	xx						xx	xx	
SCHOOL IN [4]				xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			
OUT	xx	xx	xx																													

[1] ALL CENSUS DATA OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

FEBRUARY, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	Total
Total Patients [1]	381	382	386	388	380	386	388	393	383	373	384	371	349	366	380	391	385	386	377	363	351	367	369	353	358	361	347	338	359	10,794
Men Total	119	125	127	129	125	127	134	136	126	122	121	123	117	118	121	119	115	112	110	104	105	111	119	116	115	109	106	99	102	3,412
Surgical	44	45	47	47	42	47	49	57	55	61	59	58	53	52	50	54	50	54	59	53	48	51	53	55	53	55	45	45	41	1,482
Medical	75	80	80	82	83	80	85	79	71	61	62	65	64	66	71	65	65	58	51	51	57	60	60	61	62	54	61	54	61	1,930
Women Total	172	169	170	171	180	185	178	181	172	175	183	172	160	169	175	182	182	189	183	183	172	178	172	163	170	170	164	171	176	5,067
Surgical	40	55	56	53	55	55	54	55	58	54	50	62	54	58	63	61	57	59	46	44	42	44	51	50	48	59	48	47	56	1,534
Medical	84	74	73	74	82	84	80	82	74	86	91	76	74	66	70	76	81	82	95	97	93	91	84	83	83	72	77	80	75	2,344
Obstetrical	43	40	41	44	43	46	44	44	40	35	42	34	32	45	42	45	44	48	42	42	37	43	37	30	39	39	39	44	45	1,189
Children Total	90	88	89	88	75	74	76	76	85	75	80	76	72	79	84	90	88	85	84	76	74	78	78	74	73	82	77	68	81	2,315
Surgical	18	24	28	24	14	10	7	16	24	20	21	23	15	13	22	24	22	15	17	14	14	16	20	18	15	17	10	5	16	502
Medical	26	22	17	19	14	16	19	16	17	15	17	18	22	24	19	22	22	24	22	21	21	21	22	25	20	24	23	18	18	584
Nursery	46	42	44	45	47	48	50	44	44	40	42	35	35	42	43	44	44	46	45	41	39	41	36	31	38	41	44	45	47	229
Births	8	8	6	7	10	9	10	7	9	5	8	7	7	13	8	5	8	7	11	9	7	8	8	4	7	10	10	7	10	263
Temperature [2]	-1	-7	-4	-3	+3	+8	+4	+7	+7	+5	-0	-7	-10	-7	-2	+0	+7	-1	-4	-1	-0	-6	-8	-10	-10	-0	-4	-5	-10	
Precipitation [3]	0	.01	0	05	.45	.32	T	T	.11	.72	.05	.02	T	T	T	T	.07	T	T	T	.22	.07	T	0	.44	.09	T	T	.03	
Holidays																														
Weekends						XX	XX						XX	XX						XX	XX						XX	XX		
School In	XX	XX	XX	XX	XX			XX	XX	XX	XX	XX			XX	XX	XX	XX	XX			XX	XX	XX	XX	XX			XX	
Out																														

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[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

MARCH, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Total Patients[1]	375	376	376	366	345	336	343	344	358	382	375	367	361	360	366	365	359	368	335	337	363	370	383	377	375	366	374	380	397	390	396	11,365
Men Total	107	106	105	106	98	99	108	110	111	120	122	121	121	122	120	112	111	113	110	109	124	128	130	131	132	130	127	126	133	136	158	3,686
Surgical	40	40	42	44	37	36	36	38	38	45	46	46	43	47	52	54	59	54	45	44	50	52	55	54	57	52	50	48	57	57	73	1,491
Medical	67	66	63	62	61	63	72	72	73	75	76	75	78	75	68	58	52	59	65	65	74	76	75	77	75	78	77	78	76	79	85	2,195
Women Total	181	184	191	185	175	165	158	158	166	160	167	167	165	165	166	170	178	174	151	154	172	156	160	158	162	156	164	167	171	164	142	5,150
Surgical	58	41	46	59	54	51	58	57	56	65	51	44	41	51	67	64	70	74	57	46	64	51	35	47	50	48	57	58	61	57	41	1,679
Medical	77	100	101	85	80	80	69	62	68	60	75	79	83	78	64	66	58	59	53	59	63	58	74	62	65	60	62	57	60	65	57	2,153
Obstetrical	46	43	44	41	41	34	31	39	42	43	41	44	41	36	35	40	40	41	41	45	45	47	51	49	47	45	45	50	50	42	42	1,318
Children Total	87	86	80	75	72	72	77	76	81	94	86	79	75	73	80	83	80	81	74	74	67	86	93	88	81	80	83	87	93	90	96	2,529
Surgical	20	22	18	15	12	17	23	19	19	28	27	14	11	17	23	25	21	18	17	16	9	19	22	24	17	12	12	17	18	22	29	583
Medical	22	20	21	21	21	19	18	16	14	19	19	21	20	20	19	16	17	23	19	14	14	18	18	14	18	17	19	16	17	21	20	576
Nursery	45	44	41	39	39	36	36	41	48	47	40	44	44	46	48	42	42	40	38	39	44	49	53	50	46	51	52	54	58	47	47	1,370
Births	7	8	8	10	6	6	9	12	12	6	4	11	10	3	7	11	6	9	3	12	12	10	11	6	8	19	10	8	11	9	7	271
Temperature[2]	−13	−14	−12	−15	−14	−16	−15	−16	−17	−17	−22	−18	−17	−11	−14	−9	−9	−4	−4	−9	−12	−17	−14	−18	−25	−11	−2	+2	+14	+14	−2	
Precipitation[3]	0	T	.16	.01	.01	T	.05	0	0	0	0	0	T	T	0	.13	.09	.01	T	T	.05	.06	T	.11	.01	T	T	0	.02	.20	.01	
Holidays																																
Weekends					xx	xx						xx	xx						xx	xx						xx	xx					
School In	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx									
School Out																								xx	xx			xx	xx	xx	xx	

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[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

APRIL, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
Total Patients[1]	390	355	335	362	374	366	382	371	350	341	369	369	374	381	379	360	340	360	377	366	365	361	337	327	342	363	353	346	323	310	10,728
Men Total	125	114	95	114	123	122	124	122	122	123	120	118	116	117	103	103	100	102	105	102	95	89	90	88	87	94	101	97	97		3,221
Surgical	57	53	48	49	57	56	57	55	49	48	49	43	42	46	34	33	37	39	43	38	38	38	34	38	39	36	41	41	35		1,318
Medical	68	61	47	65	66	66	67	67	73	74	74	77	76	74	71	70	69	63	62	64	57	51	55	52	49	51	53	60	56	52	1,903
Women Total	169	156	157	156	158	167	156	154	149	157	159	160	161	164	169	169	158	176	171	173	172	167	166	172	183	171	161	147	152		4,892
Surgical	61	47	46	52	52	54	56	58	49	49	58	55	53	55	52	46	48	60	56	59	59	56	55	55	59	63	55	52	53		1,621
Medical	67	72	77	65	65	68	69	60	65	55	55	57	56	52	59	68	62	63	69	74	71	71	69	71	73	75	72	62	67		1,994
Obstetrical	41	37	37	40	39	36	42	38	40	44	44	47	51	54	53	55	48	53	51	40	42	42	40	37	42	47	41	38	33	32	1,277
Children Total	96	85	80	91	95	86	91	93	74	69	89	90	96	104	98	88	84	99	90	94	81	81	88	76	82	93	88	84	79	71	2,615
Surgical	26	23	16	26	34	25	24	31	21	18	27	28	30	30	24	12	13	24	25	26	28	19	18	24	25	29	26	29	27	18	706
Medical	22	22	23	24	20	22	25	21	13	14	18	16	17	19	19	18	18	21	22	23	20	18	18	19	17	22	18	15	17	20	581
Nursery	48	41	41	41	41	39	42	41	40	37	44	46	49	55	55	58	53	54	43	41	46	44	44	39	40	47	44	40	35	33	1,328
Births	9	6	7	10	8	9	7	7	3	11	15	10	8	15	10	12	7	6	11	9	8	8	11	7	5	11	5	6	7	4	250
Temperature[2]	-0	+1	-6	-1	-3	-1	-7	-1	-0	-1	+0	+8	+8	+5	+2	+6	+2	-8	-4	+1	+0	+7	+5	+3	+8	-0	-2	-3	+2	-1	
Precipitation[3]	T	T	0	T	T	.05	.01	.02	T	T	.13	0	T	.30	.67	T	.36	T	0	0	.03	0	0	.02	.80	.07	0	0	T	.34	
Holidays																															
Weekends		xx	xx						xx	xx						xx	xx						xx	xx						xx	
School In[4]	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			xx	xx	xx	xx	xx		
Out																										xx					

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[3] PRECIPITATION OF ALL KINDS. MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

MAY, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
TOTAL PATIENTS [1]	329	353	360	338	340	337	312	310	331	338	346	346	360	331	342	360	369	362	369	365	338	324	361	381	391	388	391	351	313	317	329	10,782
MEN TOTAL	90	96	94	97	103	99	96	84	94	99	100	106	104	98	117	113	115	118	115	107	95		112	116	113	109	108	96	90	89	87	3,159
SURGICAL	37	35	39	41	47	44	44	33	50	51	55	59	46	42	47	45	43	52	49	43	42		45	52	49	43	49	40	35	32	33	1,361
MEDICAL	53	61	55	56	56	55	52	51	44	48	45	47	58	56	70	68	72	66	66	64	53		67	64	64	66	59	56	55	57	54	1,798
WOMEN TOTAL	159	163	172	162	159	166	152	161	154	156	162	164	172	157	162	157	165	162	171	167	155		150	163	171	171	174	158	139	143	152	4,990
SURGICAL	50	52	54	50	56	55	49	53	49	46	42	40	51	36	37	43	46	53	57	61	51		51	50	54	55	59	53	40	45	52	1,550
MEDICAL	73	81	84	82	76	81	72	78	71	75	85	77	77	77	83	74	79	77	77	65	64		67	67	64	56	53	47	53	55	63	2,198
OBSTETRICAL	36	30	34	30	27	30	31	30	34	35	42	44	44	42	40	40	32	37	41	41	39		46	50	52	56	61	58	46	43	37	1,242
CHILDREN TOTAL	80	94	94	79	78	72	64	65	83	83	84	76	84	76	63	90	89	82	83	91	88		86	94	107	108	109	97	84	85	90	2,633
SURGICAL	22	35	40	26	23	23	16	15	34	25	25	18	17	10	14	26	21	23	28	19	19		11	23	33	31	25	17	11	20	32	689
MEDICAL	21	24	17	15	22	19	17	21	18	22	22	18	21	19	6	20	26	23	22	28	23		27	19	18	17	16	13	16	14	12	598
NURSERY	37	35	37	35	33	30	31	29	31	36	40	46	46	47	43	44	42	36	41	41	44		48	52	56	56	60	67	57	51	46	1,346
BIRTHS	12	5	7	3	5	7	10	5	7	8	8	9	14	11	5	9	5	6	11	9	11	9	13	13	12	14	13	13	6	4	7	267
TEMPERATURE [2]	−7	+3	+10	+12	+16	+13	−6	−14	−13	−12	−14	−12	−10	−1	+5	+3	+1	+2	+7	+12	+4	−1	−3	−7	−2	+2	+5	+4	−0	+2	+1	
PRECIPITATION [3]	T	.04	0	0	T	.57	.07	0	.40	.10	.05	.06	.01	0	0	.05	.37	0	.34	.12	.16	.09	T	0	0	T	.60	T	0	.02	0	
HOLIDAYS																														XX		
WEEKENDS	XX						XX	XX						XX	XX						XX	XX						XX	XX			
SCHOOL IN [4]	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX		XX	
OUT																														XX		

[1] ALL CENSUS DATA OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

61

JUNE, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
Total Patients [1]	322	313	313	289	269	312	338	342	330	331	322	343	380	386	394	386	358	326	303	322	313	318	322	345	321	294	329	326	310	324	9,881
Men Total	94	100	103	103	99	109	114	113	111	112	106	103	108	110	111	115	108	106	105	110	98	94	90	88	87	86	87	91	92	89	3,042
Surgical	38	43	42	43	36	44	49	47	50	51	49	46	54	55	58	58	56	49	46	50	45	47	46	45	48	49	47	58	56	42	1,447
Medical	56	57	61	60	63	65	65	66	61	61	57	57	54	55	53	57	52	57	59	60	53	47	44	43	39	37	40	37	36	47	1,595
Women Total	145	135	127	117	112	126	140	137	139	137	136	150	172	172	175	173	159	140	135	141	134	144	152	163	149	142	145	154	141	154	4,346
Surgical	51	50	49	39	43	44	51	50	57	51	43	50	57	56	54	58	63	50	45	53	44	54	56	61	55	59	63	68	63	50	1,587
Medical	58	53	50	54	46	55	56	54	47	55	56	61	71	70	69	68	56	53	60	61	63	59	66	62	56	52	48	52	44	59	1,711
Obstetrical	36	32	28	24	23	27	33	33	35	31	37	39	44	46	52	47	40	37	33	27	27	31	30	40	38	31	34	34	34	45	1,048
Children Total	83	78	83	69	58	77	84	92	80	82	80	90	100	104	108	98	91	80	63	71	81	80	94	94	85	66	97	81	77	81	2,493
Surgical	20	14	25	16	15	27	21	25	26	23	21	25	26	31	36	33	28	21	9	24	38	31	27	27	30	17	43	30	23	22	758
Medical	16	22	17	15	10	12	23	26	17	23	19	20	27	22	20	18	19	20	13	13	14	14	14	25	15	15	14	15	14	14	524
Nursery	47	42	38	38	33	38	40	41	37	36	40	45	47	51	52	47	44	34	34	34	34	36	35	42	40	34	40	36	40	45	1,211
Births	6	6	7	5	5	9	9	6	3	10	11	7	8	9	10	9	4	5	8	4	6	7	5	11	4	11	11	5	9	10	214
Temperature [2]	−0	+2	+1	+4	−1	−0	−6	−0	−8	−5	+5	−4	−1	−0	−3	+2	+2	−4	−3	−0	−3	+2	+1	−8	−8	−7	−0	+3	+3	−0	
Precipitation [3]	T	.29	0	.06	0	0	0	0	0	0	T	.07	.60	.07	.12	.35	.01	0	0	.0	0	.08	.08	T	0	0	.06	.06	0	0	
Holidays																															
Weekends				xx	xx						xx	xx						xx	xx						xx	xx					
School in [4]	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx														
out																				xx	xx	xx	xx	xx			xx	xx	xx	xx	

[1] ALL CENSUS DATE OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Total Patients [1]	305	257	231	249	264	285	285	316	285	282	307	307	298	296	278	253	257	274	292	303	282	292	271	286	316	313	318	326	292	282	288	8,890
Men Total	70	63	58	62	80	74	70	82	78	82	85	90	88	79	70	61	65	70	75	83	69	62	58	60	70	68	73	81	75	75	73	2,249
Surgical	38	37	30	27	42	37	35	51	41	48	44	35	43	47	38	30	29	33	37	37	37	33	31	31	32	35	40	42	40	40	37	1,157
Medical	32	26	28	35	38	37	35	31	37	34	41	55	45	32	32	31	36	37	38	46	32	29	27	29	38	33	33	39	35	35	46	1,092
Women Total	134	123	91	97	119	126	128	132	126	138	133	128	130	135	130	129	126	129	133	131	137	144	138	142	147	143	148	154	142	132	135	4,080
Surgical	57	59	34	28	50	47	46	48	50	56	46	47	49	55	54	48	47	50	52	51	57	57	45	46	49	48	47	54	51	46	44	1,518
Medical	34	31	28	38	39	42	50	41	40	45	46	40	44	40	40	38	37	36	40	38	44	42	48	45	41	44	47	45	41	36	42	1,262
Obstetrical	43	33	29	31	30	37	32	43	36	37	41	43	37	40	36	43	42	41	41	42	36	45	45	51	57	51	54	55	50	50	49	1,300
Children Total	101	71	82	90	65	85	87	102	81	62	89	89	80	82	78	63	66	75	84	89	76	86	75	84	99	102	97	91	75	75	80	2,561
Surgical	40	19	27	40	14	33	37	29	27	12	28	25	21	27	28	8	12	22	25	19	19	21	12	15	18	31	28	20	9	7	14	683
Medical	16	14	19	16	16	12	13	26	11	10	21	21	20	14	15	12	10	17	17	17	16	16	18	24	15	15	14	14	14	14	13	488
Nursery	45	38	36	34	35	40	37	47	43	40	43	43	39	41	38	43	44	45	47	40	49	44	51	57	56	54	57	52	54	53	53	1,390
Births	10	4	7	5	11	7	6	16	5	4	6	9	11	4	7	13	11	8	10	12	4	14	12	13	10	6	12	10	15	16	6	284
Temperature [2]	-5	-4	-8	-2	-9	-9	-6	-3	-1	-1	-2	-2	-9	-2	-0	-6	-5	-2	-2	-1	-1	-6	-1	-2	-0	-0	-1	-0	-3	-4	-9	
Precipitation [3]	.05	.35	.04	0	.05	0	0	0	0	0	0	0	.25	T	0	0	.62	.03	0	0	T	.10	0	0	0	.76	0	0	0	0	0	
Holidays				xx																												
Weekends		xx	xx						xx	xx						xx	xx						xx	xx						xx	xx	
School in [4]																																
School out	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	

[1] ALL CENSUS DATA OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

AUGUST, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Total Patients [1]	313	316	316	306	277	250	242	259	273	264	262	247	239	240	258	275	286	295	267	256	263	287	279	283	296	290	264	269	300	293	287	8,552
Men Total	78	85	86	81	70	65	73	81	85	76	69	64	60	64	63	71	75	70	60	61	65	72	75	81	92	92	80	81	83	80	75	2,313
Surgical	38	45	40	35	30	25	29	35	35	35	38	30	26	29	27	34	37	34	32	23	25	25	30	30	41	42	33	35	33	30	28	1,009
Medical	40	40	46	46	40	40	44	46	50	41	31	34	34	35	36	37	38	36	28	38	40	47	45	51	51	50	47	46	50	50	47	1,304
Women Total	148	148	144	133	120	113	115	116	114	120	114	100	101	131	127	120	131	141	118	131	120	123	119	124	126	137	124	123	134	130	127	3,806
Surgical	56	49	55	52	42	41	39	38	37	45	45	34	31	31	40	42	43	44	46	41	36	44	41	41	44	49	37	40	45	42	42	1,331
Medical	38	48	42	37	35	36	40	45	44	41	36	32	37	42	42	46	52	43	43	46	43	38	40	45	46	50	49	52	53	54	51	1,354
Obstetrical	54	51	47	44	43	36	36	33	33	34	33	34	33	36	39	39	42	45	42	43	39	41	38	38	36	38	38	31	36	34	34	1,201
Children Total	87	83	86	74	65	56	56	63	72	74	73	69	79	75	77	77	80	84	76	75	77	92	85	78	78	61	60	65	83	83	85	2,353
Surgical	18	16	20	16	12	9	14	14	12	25	20	17	21	20	25	18	21	18	17	14	14	25	22	14	19	9	11	16	31	33	30	575
Medical	14	16	16	14	11	10	10	11	19	15	16	15	19	17	11	14	13	15	16	21	20	21	20	23	19	12	11	13	14	18	16	481
Nursery	55	51	50	44	42	37	37	39	41	34	37	37	39	38	41	45	46	51	43	40	43	46	43	41	40	40	38	36	38	32	39	1,297
Births	8	7	11	11	4	7	5	9	10	4	8	4	8	7	11	11	8	11	6	7	11	9	7	9	9	6	8	5	3	8	13	245
Temperature [2]	−3	+4	−1	−4	−3	−2	+2	+1	−5	−8	−7	−3	−1	−6	−7	−6	−0	+3	+6	+4	+2	+5	+1	−4	−0	+7	+2	+10	+6	+5	+7	
Precipitation [3]	0	T	128	.02	0	0	.04	0	.51	T	0	0	.37	.02	0	0	0	0	.65	.06	T	0	0	0	T	0	.03	0	0	0	0	
Holidays																																
Weekends						xx	xx						xx	xx						xx	xx						xx	xx				
School in [4]																																
Out	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	

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[1] ALL CENSUS DATA OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM

SEPTEMBER, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total
Total Patients [1]	285	274	260	243	269	290	300	301	305	281	304	311	308	311	303	299	313	310	337	345	345	352	326	299	308	332	342	333	328	327	9,241
Men Total	72	68	70	69	83	84	87	83	77	77	89	96	99	98	92	101	99	93	91	91	92	91	89	80	83	90	103	89	88	85	2,609
Surgical	25	26	26	27	33	35	45	42	40	40	41	46	45	47	47	49	50	50	42	41	49	45	40	37	40	50	54	45	43	50	1,246
Medical	47	42	44	42	50	49	42	41	37	37	48	50	54	51	45	52	49	43	49	50	43	46	49	43	43	40	49	44	45	35	1,363
Women Total	129	126	107	112	127	130	138	147	133	137	145	136	136	141	133	144	137	154	159	159	164	160	157	141	142	154	157	158	158	157	4,235
Surgical	43	36	26	19	22	29	33	42	40	38	46	25	40	43	43	43	45	38	51	45	50	65	57	45	44	47	50	48	52	54	1,258
Medical	46	47	46	50	52	58	60	58	56	57	58	72	58	58	58	54	53	55	53	61	59	46	57	50	48	55	59	59	64	56	1,661
Obstetrical	40	43	38	38	40	40	37	47	37	42	41	39	38	38	40	36	46	44	50	53	50	53	46	46	50	52	48	47	42	47	1,316
Children Total	84	80	72	67	74	79	83	80	81	71	78	70	73	77	70	65	70	80	92	94	97	77	78	78	83	88	82	90	82	85	2,397
Surgical	28	14	12	4	8	14	18	11	16	16	17	9	11	19	15	16	7	7	24	25	23	15	11	14	16	16	22	21	18	19	475
Medical	15	21	14	21	21	19	22	23	18	12	12	13	17	15	13	12	16	25	17	14	16	18	17	16	17	15	6	18	19	20	502
Nursery	41	45	46	42	45	46	43	46	42	43	49	48	45	43	42	37	47	48	51	56	55	54	45	51	52	57	54	51	45	46	1,420
Births	7	8	9	9	9	10	7	5	10	12	11	4	8	9	8	4	14	12	9	7	9	6	6	18	7	12	8	10	5	10	269
Temperature [2]	+12	+4	+3	+10	+4	+7	+14	+15	+1	-6	-4	-5	-11	-8	-1	-4	+9	-0	+1	-0	+8	+2	+2	+12	+4	+2	+3	-3	+2	-11	
Precipitation [3]	T	0	T	T	0	0	0	0	0	0	0	.15	.03	0	0	0	T	T	0	.15	T	0	T	T	0	T	0	0	0	.06	T
Holidays					XX																										
Weekends			XX	XX						XX	XX						XX	XX						XX	XX						
School in [4]												XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	
out	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX																				

[1] ALL CENSUS DATA OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

OCTOBER, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Total Patients [1]	304	292	312	314	310	308	317	304	297	310	311	324	319	307	280	268	290	292	302	296	305	301	300	337	329	337	347	352	313	306	336	9,620
Men Total	87	86	89	90	92	88	93	81	87	91	95	99	102	97	93	94	101	103	105	98	96	93	100	114	101	108	111	114	102	105	104	3,019
Surgical	41	38	42	45	40	43	41	28	33	40	35	36	39	41	40	34	38	40	41	44	51	57	42	57	53	57	60	62	57	54	58	1,317
Medical	46	48	47	45	52	45	52	53	54	51	60	63	63	56	53	60	63	65	57	57	42	58	57	48	51	51	52	45	51	58	46	1,649
Women Total	142	133	147	147	144	136	138	140	135	124	139	140	137	134	120	111	128	133	138	135	142	141	134	153	148	147	151	157	140	136	149	4,299
Surgical	43	38	45	49	42	33	35	29	31	26	38	34	33	34	24	43	26	35	39	40	46	49	49	61	58	62	64	66	51	43	50	1,314
Medical	59	59	68	66	65	59	51	58	59	57	39	63	60	53	57	36	65	67	64	59	54	54	47	47	47	42	42	42	45	55	58	1,707
Obstetrical	40	36	34	34	37	44	52	53	45	41	62	43	44	47	39	32	37	31	35	31	38	38	38	45	43	43	45	49	44	38	41	1,278
Children Total	75	73	77	77	74	84	86	83	75	95	77	80	80	76	67	63	67	56	59	63	67	67	66	70	80	82	85	81	71	65	83	2,302
Surgical	13	17	22	24	18	18	16	11	13	33	22	26	23	17	15	14	10	11	16	12	12	7	10	8	21	18	17	13	12	13	24	508
Medical	17	16	19	17	18	18	17	14	12	17	14	13	12	12	10	12	13	13	12	12	13	13	11	11	13	20	22	19	11	11	13	448
Nursery	45	40	36	38	38	48	53	58	50	45	41	44	44	47	42	37	35	33	35	35	47	47	45	51	46	44	46	49	48	41	46	1,346
Births	9	3	5	8	10	14	8	13	3	5	8	11	9	9	7	7	2	7	10	13	11	11	5	11	7	9	14	10	7	5	13	260
Temperature [2]	-13	-2	-6	-6	+4	-1	-4	-2	-0	+5	+9	+2	+15	+15	+4	+5	+4	-5	-8	-13	-8	-2	-4	-13	-12	+1	+5	+1	+3	+5	+6	
Precipitation [3]	.15	.08	0	0	T	0	0	0	0	0	0	0	0	T	.41	0	0	.08	T	T	.02	T	T	T	T	.34	0	T	0	0	.33	
Holidays																																
Weekends	xx	xx						xx	xx						xx	xx						xx	xx						xx	xx		
School in [4]			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	
out							xx																									

[1] ALL CENSUS DATA OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM

NOVEMBER, 1960

Date	Total	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Total Patients [1]	10,060	349	330	334	342	307	309	325	324	334	342	353	335	346	351	335	348	348	352	321	324	352	345	321	299	327	324	327	349	350	357
Men Total	3,053	110	99	104	101	87	89	92	94	98	98	99	93	96	106	104	105	107	108	101	104	118	113	95	96	88	100	106	115	117	110
Surgical	1,414	56	46	51	55	40	45	47	45	49	52	45	39	39	49	47	60	53	53	47	44	55	49	44	39	40	37	37	49	51	51
Medical	1,639	54	53	53	46	47	44	45	49	49	46	54	54	57	57	60	54	54	55	54	60	63	64	51	57	48	63	69	66	66	59
Women Total	4,545	150	151	154	157	147	146	147	145	148	157	165	155	160	161	155	163	161	164	147	148	159	139	151	132	137	137	139	153	153	164
Surgical	1,519	58	62	64	62	56	49	47	45	40	46	48	45	44	49	53	62	70	58	51	54	54	30	47	35	39	44	42	57	50	54
Medical	1,755	53	52	54	54	56	63	62	65	68	62	66	60	67	64	60	63	49	64	56	52	64	72	60	62	55	44	52	47	51	58
Obstetrical	1,271	39	37	36	41	35	34	38	35	40	49	51	50	49	48	42	38	38	42	40	42	41	37	44	35	43	49	45	49	52	52
Children Total	2,462	89	80	76	84	73	74	86	85	88	87	89	87	90	84	76	80	80	80	73	72	75	93	75	71	102	87	82	81	80	83
Surgical	592	31	24	21	21	17	17	23	26	25	21	18	15	18	20	22	26	25	15	11	13	14	36	14	16	28	18	13	14	15	16
Medical	439	15	14	18	16	18	17	18	19	18	12	14	14	14	13	9	10	9	16	15	12	16	14	12	12	25	13	17	16	13	14
Nursery	1,431	43	42	45	40	40	40	45	40	45	54	57	58	58	51	45	44	46	49	47	47	46	43	49	43	49	56	52	51	52	53
Births	267	6	4	7	9	6	7	9	6	10	14	11	10	8	6	10	9	12	11	6	9	7	5	12	10	12	15	7	8	7	14
Temperature [2]		-2	-2	+1	+2	-4	-8	-11	-5	-4	-9	-7	-0	+9	+9	+23	+9	+4	+1	+5	+5	+9	+3	-0	+6	+8	+47	+46	+48	-3	-6
Precipitation [3]		.05	.02	.01	.01	.05	.05	0	0.16	.25	T	0	0	T	.38	.03	0	.11	0	0	0	.06	0	0	0	0	T	.29	.09	T	
Holidays																									xx						
Weekends						xx	xx						xx	xx							xx	xx						xx	xx			
School in [4]		xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx						xx	xx	xx
out						xx	xx						xx	xx						xx	xx			xx	xx	xx	xx	xx			

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[1] ALL CENSUS DATA OBTAINED FROM EDWARD W. SPARROW HOSPITAL OFFICIAL CENSUS BOOK

[2] TEMPERATURE EXPRESSED AS DEVIATION FROM THE EXPECTED MEAN TEMPERATURE ESTABLISHED FOR THAT PARTICULAR DATE IN LANSING, AS DETERMINED BY THE U.S. WEATHER BUREAU

[3] PRECIPITATION OF ALL KINDS, MEASURED IN INCHES OF WATER

[4] SCHOOL SCHEDULE FROM THE CALENDAR OF THE LANSING PUBLIC SCHOOL SYSTEM.

DECEMBER, 1960

Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
Total Patients [1]	343	360	328	309	319	347	368	385	367	347	334	363	365	366	361	358	329	334	342	333	338	322	301	241	236	267	297	312	325	317	289	10,203
Men Total	109	105	104	104	107	113	112	112	83	96	103	108	118	120	121	102	117	123	126	126	123	111	95	76	79	91	95	100	97	90	82	3,249
Surgical	50	58	57	52	58	60	56	54	38	39	40	41	43	48	51	51	56	57	60	59	65	58	52	38	38	37	36	46	40	39	32	1,509
Medical	59	48	47	52	49	53	56	58	45	57	63	67	75	72	70	51	61	66	67	58	58	53	43	38	41	54	59	54	57	51	50	1,740
Women Total	159	159	140	129	128	143	151	165	182	157	153	157	149	153	149	161	135	125	143	126	129	126	121	98	93	104	119	127	138	134	127	4,268
Surgical	51	45	40	38	36	45	41	42	59	40	39	40	39	45	50	64	45	40	45	45	42	37	30	24	18	35	28	42	39	38	33	1,255
Medical	56	60	53	49	50	54	61	62	66	62	66	66	67	64	58	56	46	51	56	53	48	43	45	36	43	38	27	53	60	55	51	1,685
Obstetrical	49	54	57	42	42	44	49	61	57	35	48	51	43	44	41	41	44	34	33	46	39	46	46	38	32	31	34	32	39	41	43	1,328
Children Total	78	95	84	76	84	91	105	108	102	94	78	98	98	93	91	95	77	86	82	81	86	85	85	67	64	72	83	85	90	93	80	2,686
Surgical	17	22	16	20	23	28	29	32	33	14	14	23	30	30	30	32	22	27	32	29	25	17	17	5	6	15	27	30	33	27	9	704
Medical	11	14	16	8	16	19	19	11	20	20	13	15	14	14	15	15	18	20	15	16	17	17	14	13	14	17	16	16	15	18	22	487
Nursery	50	59	52	48	45	44	57	59	60	51	54	49	46	49	46	48	57	39	35	45	51	54	49	44	40	41	39	42	48	49	—	1,495
Births	8	15	5	8	5	9	20	14	9	8	4	16	7	7	6	12	4	6	5	14	11	12	10	6	5	8	8	7	14	9	—	278
Temperature [2]	-5	-3	+6	+7	+9	-0	-1	-2	-0	-8	-3	-8	-7	-0	+4	-5	-5	+1	-7	-5	-5	-20	-25	-6	+3	-2	-9	-8	+1	+6	+6	
Precipitation [3]	0	0	0	.01	.01	.01	T	T	.01	.01	T	T	T	T	.08	.02	.02	T	T	.11	.01	.06	T	T	T	.01	T	T	.03	T	T	
Holidays																								xx								
Weekends			xx	xx						xx	xx						xx	xx						xx	xx						xx	
School In [4]	xx	xx	xx	xx	xx	xx	xx	xx			xx	xx	xx	xx	xx			xx	xx	xx	xx											
Out									xx	xx						xx	xx					xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	

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BIBLIOGRAPHY

A. BOOKS

Dixon, Wilfrid J. and Massey, Frank J. Jr., _Introduction to Statistical Analysis_, 2ed edition, New York: McGraw-Hill Book Company. 1957

Freund, John E. and Williams, Frank J., _Modern Business Statistics_. Englewood Cliffs: Prentice-Hall, 1958

MacEachern, Malcolm T., _Hospital Organization and Management_. Chicago: Physicians' Record Company, 1957

Somers, Herman M. and Somers, Anne R., _Doctors, Patients and Health Insurance_. Menasha Wisconsin: The George Banta Company, 1961

B. PERIODICALS

Agnew, Harvey, "Changing Emphasis in the Functional Role of the Hospital," _Canadian Hospital_, Vol. 33 (March, 1956) 33-34

Amberg, Ray. "Your President Reports," _Hospitals_ Vol. 33 (July 1, 1959) 63

Bailey, Norman T. J., "Statistics in Hospital Planning and Design," of _Applied Statistics_, ed Donald G. Beech and Leonard, H. C. Tippett. (10 vols.; London: Oliver and Boyd Ltd, 1956) Vol. 5, 146-157

Burke, Mark, "Weekend 'Resort' Special," _Hospitals_, Vol. 28 (September, 1954) 75

Block, Lewis, "Occupancy and Staffing Relationships in General Hospital," _Hospital Progress_ Vol. 35 (March 1954) 52-53

_____"Average Daily Census," _Hospital Topics_, (August, 1956) 32-34

_____"Admissions 1934-1953," _Hospital Topics_, (September 1956) 47-48

_____"Bed Occupancy," _Hospital Topics_, (October 1956) 40-43

_____"Average Length of Stay," _Hospital Topics_, (June 1963) 41-42

Blumberg, Mark S., "D.P.F. Concept' Helps Predict Bed Needs," _Modern Hospital_ Vol. 97 (December, 1961), 75-81.

Brown, Ray E., "The Nature of Hospital Costs," _Hospitals_ Vol. 30 (April 1, 1956) 36-39

Brown, Ray E., "Forces Affecting the Community's Hospital Bill -
Part I," Hospitals Vol. 32 (September 16, 1958) 28

_____"Forces Affecting the Community's Hospital Bill - Part II,"
Hospitals Vol. 32 (October 1, 1958) 52-54

_____"Let the Public Control Thru Planning," Hospitals Vol. 33
(December 1, 1959) 35-39

Clark, D. A., "How Changing Patterns of Payment Affect Hospital
Planning," Hospitals Vol. 35 (February 16, 1961) 60

Gorby, John H., "Effect of Unemployment on the Hospital's Daily
Census," Hospital Management, (January, 1960) 100-116

"Hospitals Do Little To Level Occupancy Rates," Modern Hospital,
Vol. 97 No. 1. (July 1961) 86-87

Klumpp, Theodore H., "Hoapitals In The Changing Climate of Medical
Care," Trustee Vol. 9 (October, 1956) 1-4

Lentz, Edith M., "The Impact of Social Change," Hospital Progress,
Vol. 40 (February, 1959) 46

Letourneau, C. U. and Ulveling, M., "Vacant Hospital Beds - A Study
of Occupancy," Hospital Management, Vol. 88 (October, 1959)
48-50

London, Morris and Sigmond, Robert M., "Are We Building Too Many
Hospital Beds?" Modern Hospital Vol. 96. (January, 1961)
59-63

_____"Small Specialized Bed Units Lower Occupancy," Modern Hospital
Vol. 96 (May, 1961) 95-100

_____"How Week Ends and Holidays Affect Occupancy," Modern Hospital
Vol. 97 (August 1961) 79-83

Martin, T. Leroy, "Budget Is A Plan For The Future Based On The
Experience Of The Past," Modern Hospital Vol. 78 (June, 1952)
82-83

McNerry, Walter J., "Hospital and Medical Economies in the Med Century,"
Hospitals Vol. 35 (December 1, 1961) 38-39

Meyers, G. W., "Hospitalization Among Residents of Urban and Rural
Communities," Canadian Journal of Public Health, Vol. 44
(February, 1958) 43-50

Peters, Joseph P., "Facts At Your Fingertips - Part II; Some Uses of
Time Series Statistics in Hospital Administration," Modern
Hospital Vol. 80 (February, 1953) 73-76

Ponton, Thomas R., "Factors To Be Considered in Survey of Community
        Hospital Needs," Hospital Management Vol. 62 (September 1946)
        40-41.

Powers, L. E. and Bennett, B. M., "Estimating Future Acute Bed Needs,"
        Hospital Management Vol. 77 (March, 1954) 98.

Roemer, Milton I., "The Influence of Prepaid Physician's Service on
        Hospital Utilization," Hospitals Vol. 32 (October 16, 1958)
        48-50
Roswell, Charles G., "Cost of Unoccupied Beds," Hospitals Vol. 27
        (June 1953), 56-57.

_____"Hospitals Costs...Yesterday, Today and Tomorrow," Hospitals
        Vol. 35 (June 16, 1961) 44.

Rourke, Anthony J. J., "Determining the Need for Health Care Facilities,"
        Hospitals Vol. 36 (October 16, 1962) 48-51.

Shanas, Ethel, "Reported Illness and the Utilization of Medical Care,"
        Public Welfare, Vol. 18 (April 1960) 103-5

Simpson, M. A., "Monday-to-Friday Wards," Lancet 1 (April 30, 1960) 977.

Stewart, C. B., "The Estimation of Hospital Bed Requirments," Canadian
        Journal of Public Health, Vol. 42 (July, 1951) 282-294

Stone, J. E., "Ratio of Personnel to Patients," Hospital and Health
        Management Vol. 13 (September, 1950) 367-369

Thompson, John B., Avant, Oscar Wade, and Spiker, Ellawyne D., "How
        Queuing Theory Works For The Hospital," Modern Hospital Vol. 94
        (March, 1960) 75-78.

Thrasher, Jewell M. et al, "Small Hospital Questions," Modern Hospital
        Vol. 87, No. 6. (December 1956) 47.

Williams, Lloyd, "Repeaters As Causes of High Hospital Utilization,"
        Hospital Management, Vol. 84, (October 1957) 36-39

"Winter Admissions to Hospitals," Lancet, Vol 2 (November 7, 1953)
        975-976.

C. REPORTS

Commission on Hospital Care, Hospital Care in the United States, New
        York: The Commonwealth Fund, 1947.

Ginzberg, Eli, A Pattern For Hospital Care: Final Report of the New
    York State Hospital Study. New York: Columbia University
    Press, 1949

Hospital Resources and Needs Commission on Hospital Care: Report of
    the Michigan Hospital Survey, Battle Creek: W. K. Kellogg
    Foundation, 1946

McNerney, W. J. (Study Director), Study of Hospital and Medical
    Economics, Ann Arbor: The University of Michigan, 1961

Michigan Department of Health, Michigan State Plan for Hospital and
    Medical Facilities Construction 1961-1962, Lansing, Michigan
    Department of Health, 1961.

United States, Local Climatological Data, Lansing, Michigan, January
    1960 - December 1960. United States Department of Commerce,
    Weather Bureau.

D. UNPUBLISHED MATERIAL

Edward W. Sparrow Hospital Official Census Book