

Newfoundland Panel on Health and Medical Care

Medical Care Utilization 1992-9

Final Report



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Health and Medical Care Research Group

Newfoundland Panel on Health and Medical Care

Medical Care Utilization 1992-9

Final Report

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NF**

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Chapter 1 – General Overview

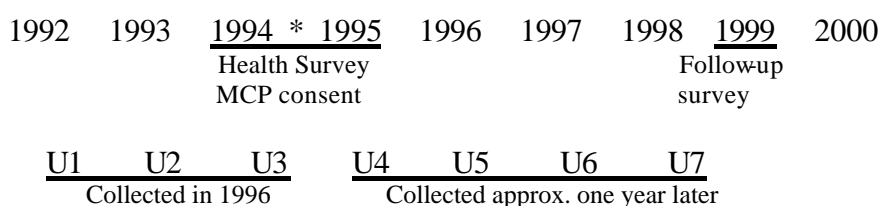
Introduction

This report presents data on volume of medical care utilization -- hospitalizations and ambulatory consultations by fee-for-service physicians -- for seven fiscal years, 1992-93 to 1998-99. The utilization data was collected as a component of a study entitled The Newfoundland Panel on Health and Medical Care. This is a population-based study, which uses a longitudinal panel design to examine medical care utilization. The main purpose of this project is to study the factors influencing the volume and patterns of medical care utilization. The design and sampling are aimed at understanding the influence of socio-economic status, together with structural and perceived access to medical care resources, on the utilization of hospitals and physicians -- utilization being measured both by volume and patterns of care.

Design

The design of the project includes a cross-sectional health survey, on a single-stage cluster random sample of households, and a seven-year longitudinal panel to study medical care utilization. A population-based design allows us to make estimations for the whole study population – adults, 20 years and older, residing in the island portion of the province of Newfoundland and Labrador. Figure 1 shows a diagram of the study.

Figure 1: Diagram of the Design of the Newfoundland Panel on Health and Medical Care



Utilization Data -- Hospital separations, physicians' claims; years counted from mid-point of survey (* April 1, 1995)

Methods

Data collection began with a cross-sectional survey that collected data on demographic, socio-economic, health status and practices, and perceived access to medical care. The survey protocol also included a component to obtain the MCP number and written consent for access to medical care databases, following a protocol approved by the Human Investigation Committee – Faculty of Medicine. For subjects providing such written consent, the MCP number (health insurance number) is used to link the survey with the medical care utilization databases -- hospital separations and physicians' claims. Therefore, data collection is carried out both by a survey and data linkage.

The MCP number was used to obtain medical care utilization data from the databases. Hospital separations were obtained from a PC supported database (Quest) maintained by the Division of Health Research and Statistics, Department of Health. Physicians' claims were obtained from computer tapes maintained by X-Wave Solutions Ltd. Data from both the hospital separation reports and from physicians' claims were entered into SPSS analysis files, with the family and subject codes from the survey (which precludes identification of the subjects) as identifier. Identification data (name, address, etc.) were removed from the analysis files. Detailed information about design and methodology may be obtained from a paper¹ and two reports^{2,3}; the latter are available from a web site⁴.

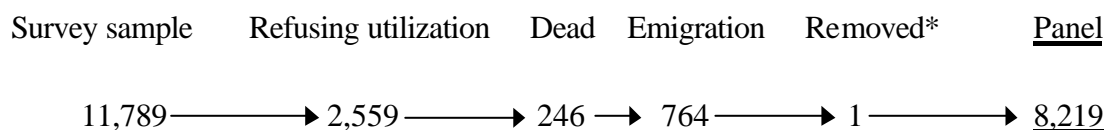
Evolution of the panel

The survey had an 84.8 per cent response rate, for a total of 11,789 subjects; 9,230 of these (78.3 per cent) gave signed consent for use of their medical care information; this constitutes the 'utilization sub-sample'. Loss of subjects at this stage did not introduce bias with respect to either sex or age distribution, or for any of four other variables selected for bias checking³. Of the 9,230 individuals, who permitted access to their utilization data, 8,219 were alive and resident in the province for all seven years; this group constitutes the 'continuous sub-sample' and we have all seven years of utilization for this group. A follow-up survey was carried out in 1999. All households in the utilization sub-sample were telephoned to verify their address and to ask about changes in the household; over 99 per cent of the individuals were either contacted in person or information as to their whereabouts was obtained from a contact. During

the seven years of the panel, a number of subjects were lost either by emigration or death, in addition to the ones refusing to participate in the utilization study. A total of 246 deaths were recorded in our sample during the years following the survey. Figure 2 shows all the losses diagrammatically, and Table 1 shows the distribution for the various groups in the survey sample by age and sex. It can be seen that mainly younger persons emigrated from the province, while the age of those dying was, as expected, mostly in the older age ranges. These losses introduced a small bias in the age distribution, as shown in Table 2. Therefore, the utilization panel of 8,219 has an age distribution that includes a higher proportion of subjects in the middle age group (40-59) in comparison with the original sample. Sex distribution is similar for both groups. It should be noted that subjects dying are not, strictly speaking, losses to the analysis, as they provide valuable information on the utilization of medical care before death.

Table 3 shows the numbers of the utilization sub sample who were resident in the province for any, or all, of the years 1992 to 1999. The number of subjects dying in any of those years is also shown in this table. It should be noted that movement of subjects either into or out of the province in any single year varied, so the numbers for individual years in Table 3 does not necessarily represent the same individuals. An individual was counted in the sample for utilization for a year if he/she was resident in the province for at least nine months of that year. Irrespective of when an individual died during the year he/she is counted in the sample for utilization for that year.

Figure 2: Diagram of the loss of subjects



*: requested removal

Table 1: Distribution (%) of various groups in sample by age and sex

| | Survey sample | Refused utilization | Deaths | Left province | All losses | Continuous sub-sample |
|--------|--------------------|---------------------|--------|---------------|-------------------|-----------------------|
| 20-29 | 21.6 | 23.7 | 1.2 | 54.2 | 28.6 | 18.5 |
| 30-39 | 23.6 | 24.7 | 2.8 | 24.0 | 23.0 | 23.8 |
| 40-49 | 23.7 | 21.3 | 7.3 | 14.1 | 18.8 | 25.8 |
| 50-59 | 13.1 | 12.0 | 6.1 | 5.5 | 10.2 | 14.4 |
| 60-69 | 9.4 | 9.6 | 27.2 | 0.9 | 8.9 | 9.7 |
| 70+ | 8.6 | 8.8 | 55.3 | 1.3 | 10.4 | 7.8 |
| Male | 46.5 | 45.2 | 56.5 | 50.4 | 47.1 | 46.2 |
| Female | 53.5 | 54.8 | 43.5 | 49.6 | 52.9 | 53.8 |
| N | 11789 ¹ | 2559 ¹ | 246 | 764 | 3570 ¹ | 8219 |

¹ age was refused by two individuals

Table 2: Sex and age distributions for the survey sample and for all losses, number and (%) for age groups and [%] for sex distribution.

| Age (grouped) | Survey sample | | | All subjects lost | | |
|---------------|----------------|-----------------------------|-----------------------------|-------------------|-----------------------------|----------------------------|
| | Male | Female | Total | Male | Female | Total |
| 20-39 | 2470 (45.0) | 2847 (45.2) | 5317 (45.1) | 888 (52.8) | 955 (50.6) | 1843 (51.7) |
| 40-59 | 2066 (37.7) | 2276 (36.1) | 4342 (36.8) | 484 (28.8) | 551 (29.2) | 1035 (29.0) |
| 60+ | 947 (17.3) | 1181 (18.7) | 2128 (18.1) | 310 (18.4) | 380 (20.1) | 690 (19.3) |
| Total | 5483 [46.5] | 6306 ¹ [53.5] | 11789 ¹ (100) | 1682 [47.1] | 1888 ¹ [52.9] | 3570 ¹ (100) |

¹ age was refused by two individuals

Table 3: Number in utilization sub-sample for individual years

| | Number alive all year | Number of deaths in year |
|----------------------------|-----------------------|--------------------------|
| 1992-3 | 9075 | - |
| 1993-4 | 9116 | - |
| 1994-5 | 9168 | - |
| 1995-6 | 9056 | 45 |
| 1996-7 | 8812 | 58 |
| 1997-8 | 8555 | 75 |
| 1998-9 | 8349 | 68 |
| 1992-9 (alive all 7 years) | 8219 | |

General Information about Data

Limitations

Telephone coverage on the island was approximately 98 per cent at the time of the survey. Individuals without telephone service are not included in the sampling base. The individuals most likely excluded are the transient population, those without a permanent residence.

The adoption of a population-based design permits us to obtain estimates for the whole population under study, namely, adults 20 years and older residing in the island portion of the province of Newfoundland and Labrador. It was possible to use a relatively simple sample design, taking advantage of the random digit dialing method. The large sample size yields results with a relatively small sampling error. For example, and for the whole continuous utilization sub-sample (8,219 individuals), any percentage, for example, 50 per cent, is accurate within ± 1.13 per cent, that is, the true result is between 48.87 and 51.13 per cent (50 per cent is the percentage with the largest standard error, for other percentages, i.e., 20 per cent, 30 per cent, the range is smaller). For females (4,418), the standard error will be ± 1.53 per cent, and for males (3,801), ± 1.67 . See Appendix 3 in the Adult Health Survey Report² for further details on the standard error calculations.

Utilization data is subjected to the limitations of the databases; the Department of Health reports that the Quest database includes practically all hospital separations, by using several sources. The completeness of the physician's claims database is not known. However, since the information is collected as an integral part of claims for payment it is generally considered that they are complete. It should be noted that salaried physicians do not submit claims to the database. Therefore in regions where there is a preponderance of salaried physicians our numbers are an underestimation.

Changes in place of residence within the province during the study period have not been taken into account in this report, a person's location is taken as that at the time of the survey.

Data presentation

The data is presented for the whole sampling area (island of Newfoundland) and also for an aggregation by degree of urbanization, which also corresponds fairly closely with the number and complexity of medical care resources (structural access⁵), as follows: Area 1: metropolitan St. John's: urbanized, tertiary care institutions, most of the specialists, GPs under fee-for-service; Area 2: Urban Corridor: smaller cities and towns (urban for provincial standards) regional hospitals, fewer specialists, most GPs on fee-for-service; Area 3: Remote/Rural comprising small, isolated communities, small rural hospitals or clinics, no specialists, a large proportion of GPs on salary (see Figure A 1). A map showing the seven Institutional Boards, using information about their boundaries provided by the Department of Health and Community Services is included in the Appendix (Figure A 2). The proportion of the sample by the three areas for the seven institutional boards on the island is shown in Table A 1. Table A 2 in the Appendix shows the age and sex distributions for the continuous sub-sample for the areas as shown in Figure A 1.

The information in this report is based on the various sub-populations of the panel. For many of the early tables, in either the hospitalization or physician sections, the number included in each table are the maximum number of individuals that we collected information on. These sections will be titled 'all available data' and will result in a different 'N' for different years. Subsequent tables will only include the 8,219 individuals, and this section will be titled 'continuous sub-sample'. The section titled 'deaths' includes the 246 individuals who died in the years 1995 to 1999.

Chapter 2 – Hospitalizations

Highlights

- A little more than one in 10 Newfoundlanders had at least one hospitalization in any given year (Table 4)
- For each of the seven fiscal years studied, individuals resident in the province for all years and who were admitted to hospital stayed for an average of eight to 11 days, and had, on average, a little over one episode of hospitalization each (Table 6)
- Overall, for the seven fiscal years combined, individuals who were admitted to hospital did so, on the average, for 15 days, and had 2.2 hospitalizations (Table 8)
- The range over the seven-year period, for those hospitalized, was one to 2,012 hospital days, and one to 45 hospitalizations (Table 8)
- Almost one quarter of all hospitalizations for females are pregnancy related (Table 8)
- A little over one third of all respondents had at least one hospitalization in the seven-year period (Table 9)
- Males spend more days in hospital per 100 persons than females do for all age ranges except 40-59 where the number is slightly higher for females (excluding pregnancy related hospitalizations) (Figure 5 and Table 11)
- Age-standardized values for the three urban areas show that residents in the Urban Corridor made the most visits to the hospital and that males in the Remote/Rural and females in the Urban Corridor had the highest mean length of stay (Table 12)

- Nearly five per cent of the subjects (the 'very high' level of users) account for over 40 per cent of all hospitalizations and over 60 per cent of all hospital days (Table 13)
- The top three diagnoses for females are pregnancy, digestive and genitourinary, accounting for 49 per cent of all hospitalizations (Table 18)
- Circulatory, digestive and respiratory are the top three diagnoses for males accounting for 47 per cent of all hospitalizations (Table 18)
- Hospitalizations for circulatory conditions are the top consumer of hospital days (Table 18)
- Hospitalizations for mental conditions have the highest value of mean length of stay per hospitalization for either sex (Table 18)

Methods

For each separation, the following variables were obtained from the hospital databases: sex, date of birth, hospital chart number, date of admission, date of discharge, length of stay (LOS), facility code, residence code, entry code (direct, emergency, newborn, stillborn), exit code (died, signed out, discharged), most responsible diagnosis, up to 15 other diagnoses with code for diagnosis type (pre-admit condition, post-admit condition, most responsible condition, E-code), principal procedure, up to two other procedures, and, episode type code (acute, same day surgery, emergency/outpatient, chronic, medical day care). The files for 1992/3 and 1993/4 contain only three diagnoses and do not contain the episode type code. All variables are present in the 1994/5 to 1998/9 files. For this report only the acute episode type and direct or emergency entry code separations were retained for analysis. Diagnoses codes were grouped into 18 diagnostic groups according to ICD.9.CM (supplementary diagnoses being the 18th group). Pregnancy diagnoses contained in the supplementary diagnoses category (V220-V249 and V270-V279) have been included in with other pregnancy diagnoses for our analysis.

Demographic variables used in the analyses (age, sex, residence, etc.) were taken from the health survey rather than the hospital data. Residence in the province for at least nine months of the fiscal year was used as the criterion for inclusion of that subject in the data for that fiscal year.

The data for hospitalizations is presented in tables and figures in this chapter. We use two types of indicators: the first type includes length of stay (the sum of the number of days in hospital per episode) and hospitalizations (the number of times a subject was hospitalized, which is obtained from the number of separations in the database). Since a relatively small proportion of the population is hospitalized in any year, these indicators are presented for hospitalized subjects only. The second type of indicator is population based to permit population comparisons -- separations per 100 persons and hospital days per 100 persons.

Using Table 4 as an example, indicators are presented for each of the fiscal years. For total length of stay and for hospitalizations we use the same measures of central tendency and dispersion -- the mean (average), and the median (the value at the 50th percentile of the distribution). The range shows the minimum and maximum, and the sum is self-explanatory.

It is easier to analyze results first by single years, and then for the whole period. However, it is important to note that some indicators for the whole seven-year period cannot be derived from the indicators for the single years; i.e., mean length of stay for seven-year period cannot be computed from the seven single year means. This is explained in part by the fact that the longer the period under study, the better the chance of capturing subjects with higher utilization and with multiple hospitalizations over several years; therefore, for some subjects, utilization over the seven-year period is more than the simple combination of utilization over single years.

Hospitalizations will be analyzed firstly for all available data, followed by the continuous sub-sample, those dying, emigrants, and finally by diagnosis.

Results

All available data

For individual years 1992-3 to 1998-9, and including all available data (including hospitalizations in the year of death) the mean length of stay ranges from 8.8 to 12.2 days in a year (Table 4). When hospitalizations in the year of death are excluded (Table 5) the mean ranges from 8.8 to 10.9 days in a single year. A slight trend upwards in the mean number of days can be seen in Table 5 as the panel gets older. The mean number of hospitalizations, in either table, is around 1.4 in a single year. When this rate is extrapolated to the total panel sample in any year, this number of hospitalizations ranges (in Table 5) ranges from 11 to 13 per 100 persons (0.11 to 0.13 per person), and the number of hospital days ranges from 77 to 96 per 100 persons.

Table 4: Selected hospital indicators by year, including hospitalizations in year of death

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| Total lengthof stay (days) | | | | | | | |
| Mean | 8.89 | 9.56 | 8.77 | 11.61 | 11.05 | 12.17 | 12.05 |
| Median | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| SD | 14.53 | 16.51 | 14.44 | 25.09 | 16.61 | 27.24 | 22.89 |
| Range | 1-231 | 1-234 | 1-181 | 1-485 | 1-162 | 1-525 | 1-375 |
| Sum | 7007 | 7219 | 7501 | 9414 | 8910 | 9934 | 9511 |
| Number of hospitalizations | | | | | | | |
| Mean | 1.36 | 1.35 | 1.36 | 1.45 | 1.46 | 1.43 | 1.48 |
| Median | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| SD | 0.88 | 0.83 | 0.85 | 0.91 | 0.95 | 1.01 | 1.01 |
| Range | 1-10 | 1-8 | 1-9 | 1-8 | 1-9 | 1-10 | 1-10 |
| Sum | 1069 | 1018 | 1163 | 1173 | 1174 | 1169 | 1164 |
| Subjects hospitalized | | | | | | | |
| N | 788 | 755 | 855 | 811 | 806 | 816 | 789 |
| % | 8.68 | 8.28 | 9.33 | 8.91 | 9.07 | 9.46 | 9.37 |
| Separations per 100 persons | 11.78 | 11.17 | 12.69 | 12.89 | 13.24 | 13.55 | 13.83 |
| Hosp days per 100 persons | 77.21 | 79.19 | 81.82 | 103.44 | 100.45 | 115.11 | 113.00 |
| Total number of subjects | 9075 | 9116 | 9168 | 9101 | 8870 | 8630 | 8417 |

Table 5: Selected hospital indicators by year, excluding hospitalizations in year of death

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| Total length of stay (days) | | | | | | | |
| Mean | 8.89 | 9.56 | 8.77 | 10.30 | 9.79 | 10.35 | 10.85 |
| Median | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| SD | 14.53 | 16.51 | 14.44 | 21.96 | 14.08 | 23.48 | 21.88 |
| Range | 1-231 | 1-234 | 1-181 | 1-485 | 1-162 | 1-525 | 1-375 |
| Sum | 7007 | 7219 | 7501 | 7980 | 7490 | 7843 | 7998 |
| Number of hospitalizations | | | | | | | |
| Mean | 1.36 | 1.35 | 1.36 | 1.41 | 1.41 | 1.40 | 1.44 |
| Median | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| SD | 0.88 | 0.83 | 0.85 | 0.86 | 0.90 | 0.99 | 0.97 |
| Range | 1-10 | 1-8 | 1-9 | 1-8 | 1-9 | 1.10 | 1-10 |
| Sum | 1069 | 1018 | 1163 | 1093 | 1080 | 1059 | 1061 |
| Subjects hospitalized | | | | | | | |
| N | 788 | 755 | 855 | 775 | 765 | 758 | 737 |
| % | 8.68 | 8.28 | 9.33 | 8.56 | 8.68 | 8.86 | 8.83 |
| Separations per 100 persons | 11.78 | 11.17 | 12.69 | 12.07 | 12.26 | 12.38 | 12.71 |
| Hosp days per 100 persons | 77.21 | 79.19 | 81.82 | 88.12 | 85.00 | 91.68 | 95.80 |
| Total number of subjects | 9075 | 9116 | 9168 | 9056 | 8812 | 8555 | 8349 |

Continuous sub-sample

The “base population” for tables in the previous section and this section are different. Table 4 includes all subjects for each year, including those dying. In Table 5, we have excluded, in the corresponding year, the subjects dying, and the number of hospital days in the year of death. In this section we include only those subjects alive and residing in the province for the whole seven-year period (continuous sub-sample). It is obvious that the indicators differ from table to table. The difference between Tables 4 and 5 corresponds to the total number of hospital days in the year of death; the gradual increase in the number of hospital days in Table 5 is now not so marked as seen in Table 4. For Table 4, the increase in the mean number of hospital days from 92-93 (8.89) to 98-99 (12.05) is 36 per cent; in Table 5 it is 22 per cent. When comparing Table 4 and Table 6, and again using hospital days as the example, we can quantify the loss of hospital days when analyzing different sub-samples; comparing Tables 4 and 6, and summing the yearly sum of LOS, it is 15,165 hospital days, or a reduction of 26 per cent. It is important to ascertain the source of this substantial loss. Using figures from Figure 6 (see later) for the number of hospital days attributable to subjects dying, we note that it is 13,634 hospital days. A simple computation using the total hospital days from Table 4, minus the days related to death,

and the total of Table 6, demonstrates the loss related to the elimination of subjects emigrating at any point during the study is only 1,531 hospital days. Therefore, and as we are studying and reporting the utilization for subjects dying separately, the real loss to the analysis related to the decision to use indicators from the continuous utilization sub-sample, is relatively small (three per cent). Consequently, comparisons between years from Table 6 are as accurate as possible with this methodology. All indicators – mean number of hospital days and of number of hospitalizations, percentage of subjects hospitalized, and separations and hospital days per 100 persons, show an increase from year to year (with a few exceptions).

The mean and the median are good indicators of the number of contacts per individual; the mean is influenced more by the shape of the distribution – skewed to the right, with a long tail of a few subjects who have a very high number of contacts. The median is useful, as it shows the number of contacts for the lower 50 per cent of the subjects. The standard deviation and the maximum number of contacts also help to illustrate the shape of the distribution. Data for hospitals is presented (Table 7 and Table 8) including and excluding pregnancy related visits to show the contribution of pregnancies to utilization; for total hospital days, it shows that pregnancy used 3,622 days, or eight per cent of the total.

Table 9 shows the distribution for number of hospitalizations. It is clear that most of the sample had none or very few hospitalizations. Figure 3 shows the distribution for those subjects hospitalized from one to 50 days; the continuation of the graph for those hospitalized 50 or more days has not been included as it forces the lower end of the scale to be compressed into less space. It shows the mean and median and helps to understand the interpretation of these measures. Most respondents were hospitalized in only one of the seven years, with only seven respondents hospitalized in each of the seven years. This is shown in Table 10 and the pie chart in Figure 4. Of the 2,993 individuals hospitalized, 1,565 (52.3 per cent) were single hospitalizations (and consequently, within one year), and 1,428 were of subjects with two or more hospitalizations. Of these, 1,143 (80 per cent of 1,428) occurred in multiple years.

Figure 5 shows the number of hospital days for 100 persons per year for the seven-year period. Similar information can be seen in Table A 3, but this time divided by the area of

residence. It can be seen that, when pregnancy related visits are excluded, females have considerably less days in hospital than males for the older age groups (60+).

Table 11 shows means for number of hospitalizations and total hospital days, classified by sex, age (three groups) and area of residence. For females, the numbers in parenthesis show values excluding pregnancy, where different from when pregnancy is included. This table allows us to make comparisons between variables of interest, while having some control over the influence of the other variables. For example, with respect to number of hospitalizations (and number of hospital days), there is a trend toward higher values in the Urban Corridor and Remote/Rural areas; this difference holds when making these comparisons by sex and age groups. In males, there is a large difference in the number of hospitalizations when considering age (7.4 to 4.3 times more likely to be hospitalized for the 60+ over the 20-39). For females, this difference is very small (1.6 to 1.3) for all hospitalizations, and moderate (3.3 to 2.5 times) when excluding pregnancy. The difference holds across areas, although with different values. This table also shows that the influence of age is larger than the influence of sex.

Table 12 shows means for number of hospitalizations and of hospital days, by the three areas, age standardized (reference population: age distribution for the province, 1996 Census). It confirms the results from Table 11, in a fashion which is easy to read, and demonstrates, once again, that subjects have more hospitalizations and more hospital days in the Urban Corridor and the Remote/Rural areas. These figures were also calculated for subjects who resided in the same area for all seven years, but small differences were noted. For the mean number of hospitalizations, there is an increase of 43 per cent for males and females in the Urban Corridor compared to St. John's; the difference between St. John's and the Remote/Rural area is smaller. For the mean total number of hospital days, and for males, there are 58 per cent more days in Remote/Rural compared to St. John's, and for females, the increase is 41 per cent between St. John's and Urban Corridor.

The maximum values seen in Table 7 and Table 8 demonstrate that some individuals had a very large number of contacts. One of the many possible ways to investigate this is to divide the distribution into percentiles. We used 75th and 95th percentiles. Up to the 75th percentile is

considered to be a relatively “normal” utilization (this is somehow arbitrary). The subjects between the 75th and 95th percentiles are considered to be high users, while the subjects above the 95th percentile are very high users. The next table (Table 13) shows the relative contribution of these groups to the total utilization. The contribution of high and very high users is especially notable for hospitalizations; 17.4 per cent of subjects had 76.2 per cent of all hospitalizations, and 22.8 per cent of all subjects had 93.7 per cent of all hospital days.

Table 14 analyzes the area of residence of subjects hospitalized, and the location of the hospital in which they were hospitalized. For subjects residing in St. John's, 97 per cent are hospitalized in St. John's. For subjects from the Urban Corridor, 73 per cent are hospitalized there, and 26 per cent referred to St. John's. In contrast, only 21 per cent of subjects living in the Remote/Rural area are hospitalized there, while 52 per cent are referred to hospitals in the Urban Corridor, and 27 per cent to hospitals in St. John's. This corresponds well with the level of complexity – availability of specialities and diagnostic/therapeutic services - of the hospitals in these three areas.

Table 6: Selected hospital indicators by year, resident and alive for all 7 years

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| Total length of stay (days) | | | | | | | |
| Mean | 8.07 | 8.46 | 7.82 | 9.62 | 9.15 | 9.94 | 10.86 |
| Median | 5.0 | 5.0 | 4.0 | 5.0 | 5.0 | 5.0 | 5.0 |
| SD | 13.36 | 15.52 | 11.13 | 22.89 | 12.91 | 23.72 | 21.96 |
| Range | 1-231 | 1-234 | 1-148 | 1-485 | 1-162 | 1-525 | 1-375 |
| Sum | 5616 | 5518 | 5645 | 6291 | 6323 | 7008 | 7930 |
| Number of hospitalizations | | | | | | | |
| Mean | 1.31 | 1.31 | 1.32 | 1.36 | 1.38 | 1.38 | 1.44 |
| Median | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| SD | 0.80 | 0.79 | 0.78 | 0.77 | 0.80 | 0.98 | 0.97 |
| Range | 1-10 | 1-8 | 1-8 | 1-5 | 1-9 | 1-10 | 1-10 |
| Sum | 914 | 853 | 956 | 888 | 952 | 972 | 1048 |
| Subjects hospitalized | | | | | | | |
| N | 696 | 652 | 722 | 654 | 691 | 705 | 730 |
| % | 8.47 | 7.93 | 8.78 | 7.96 | 8.41 | 8.58 | 8.88 |
| Separations per 100 persons | 11.12 | 10.38 | 11.63 | 10.80 | 11.58 | 11.83 | 12.75 |
| Hosp days per 100 persons | 68.33 | 67.14 | 68.68 | 76.54 | 76.93 | 85.27 | 96.48 |
| Total number of subjects | 8219 | 8219 | 8219 | 8219 | 8219 | 8219 | 8219 |

Table 7: Selected indicators for hospitalizations, continuous sub-sample, 7-year period

| Indicator | Number of hospitalizations incl pregnancy | Number of hospitalizations No pregnancy | Total hospital days, with pregnancy | Total hospital days, no pregnancy |
|-------------------|---|---|-------------------------------------|-----------------------------------|
| Mean | 0.8 | 0.7 | 5.4 | 5.0 |
| Median | 0 | 0 | 0 | 0 |
| S.D. | 1.8 | 1.7 | 27.6 | 27.5 |
| Maximum | 45 | 45 | 2012 | 2012 |
| Sum for 7 years | 6583 | 5652 | 44331 | 40709 |
| Sum per year | 940 | 807 | 6333 | 5816 |
| Mean per year | 0.11 | 0.10 | 0.77 | 0.71 |
| % with no contact | 63.6 | 68.9 | 63.6 | 68.9 |

Table 8: Selected hospital indicators for continuous sub-sample, 7-year period

| | Males | Females | | All |
|---|--------|----------------|-------------------|----------------|
| | | With pregnancy | Without pregnancy | With pregnancy |
| Number of hospitalizations (those hospitalized) | | | | |
| Mean | 2.4 | 2.1 | 2.1 | 2.2 |
| Median | 1 | 1 | 1 | 1 |
| SD | 2.9 | 2.0 | 2.1 | 2.3 |
| Range | 1-45 | 1-24 | 1-19 | 1-45 |
| Sum | 2561 | 4022 | 3091 | 6583 |
| Total length of stay (LOS) (those hospitalized) | | | | |
| Mean | 18.8 | 12.5 | 13.8 | 14.8 |
| Median | 7 | 6 | 6 | 6 |
| SD | 67.1 | 22.4 | 24.7 | 44.2 |
| Range | 1-2012 | 1-339 | 1-307 | 1-2012 |
| Sum | 20348 | 23983 | 20361 | 44331 |
| Number of hospitalizations (all) | | | | |
| Mean | 0.7 | 0.9 | 0.7 | 0.8 |
| Median | 0 | 0 | 0 | 0 |
| SD | 1.9 | 1.7 | 1.6 | 1.8 |
| Range | 0-45 | 0-24 | 0-19 | 0-45 |
| Sum | 2561 | 4022 | 3091 | 6583 |
| Total length of stay (LOS) (all) | | | | |
| Mean | 5.4 | 5.4 | 4.6 | 5.4 |
| Median | 0 | 0 | 0 | 0 |
| SD | 36.8 | 16.0 | 15.7 | 27.6 |
| Range | 0-2012 | 0-339 | 0-307 | 0-2012 |
| Sum | 20348 | 23983 | 20361 | 44331 |
| N | 3801 | 4418 | 4418 | 8219 |

Table 9: Number of hospitalizations for continuous sub-sample, 7-year period

| | Number of subjects | % |
|----------------------------------|--------------------|------|
| None | 5226 | 63.6 |
| 1 | 1565 | 19.0 |
| 2 | 685 | 8.3 |
| 3 | 307 | 3.7 |
| 4 | 173 | 2.1 |
| 5 | 97 | 1.2 |
| 6 | 49 | 0.6 |
| 7 | 33 | 0.4 |
| 8 | 14 | 0.2 |
| 9 | 15 | 0.2 |
| 10 | 11 | 0.1 |
| 11 | 11 | 0.1 |
| 12 | 8 | 0.1 |
| 13 | 9 | 0.1 |
| 14 | 1 | <0.1 |
| 15 | 4 | <0.1 |
| 16 | 2 | <0.1 |
| 17 | 1 | <0.1 |
| 18 | 1 | <0.1 |
| 19 | 1 | <0.1 |
| 23 | 1 | <0.1 |
| 24 | 2 | <0.1 |
| 25 | 1 | <0.1 |
| 33 | 1 | <0.1 |
| 45 | 1 | <0.1 |
| Total number of hospitalizations | 6583 | 100 |

Figure 3: Distribution of those hospitalized between 1 and 50 days, continuous sub-sample, 7-year period

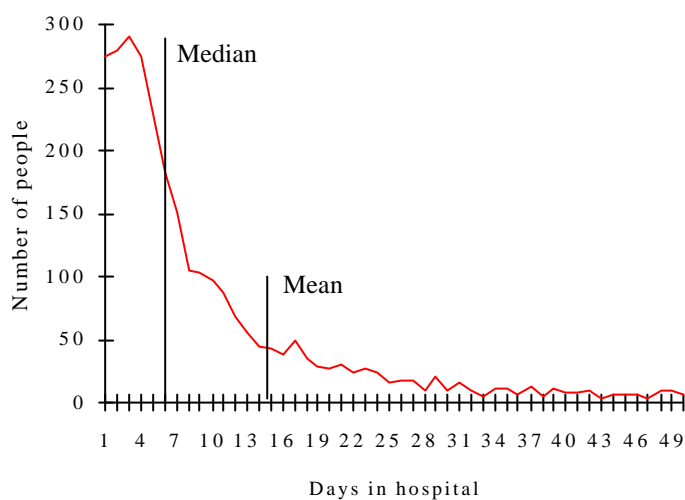


Table 10: Number of subjects by number of hospitalizations and the number of years they occur in, continuous sub-sample, 7-year period

| Number of hospitalizations | Number of years hospitalizations occur in | | | | | | | Total |
|----------------------------|---|------------|------------|------------|-----------|-----------|----------|-------------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 1 | 1565 | - | - | - | - | - | - | 1565 |
| 2 | 221 | 464 | - | - | - | - | - | 685 |
| 3 | 49 | 161 | 97 | - | - | - | - | 307 |
| 4 | 9 | 61 | 71 | 32 | - | - | - | 173 |
| 5 | 4 | 26 | 27 | 35 | 5 | - | - | 97 |
| 6 | - | 6 | 18 | 20 | 3 | 2 | - | 49 |
| 7 | - | - | 12 | 9 | 12 | - | - | 33 |
| 8-9 | 1 | 4 | 5 | 8 | 6 | 5 | - | 29 |
| 10-11 | 1 | 1 | 2 | 7 | 8 | 3 | - | 22 |
| 12-15 | - | - | 3 | 2 | 4 | 9 | 4 | 22 |
| 16-45 | - | - | - | 1 | 2 | 5 | 3 | 11 |
| Total | 1850 | 723 | 235 | 114 | 40 | 24 | 7 | 2993 |

Figure 4: Percentage of subjects hospitalized in single or multiple years, continuous sub-sample, 7-year period

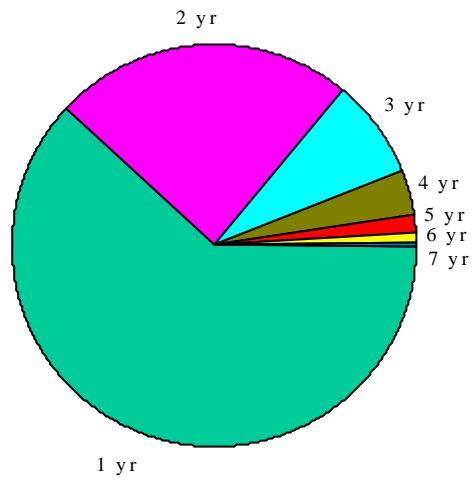


Figure 5: Hospital days per 100 persons per year, continuous sub-sample, 7-year period

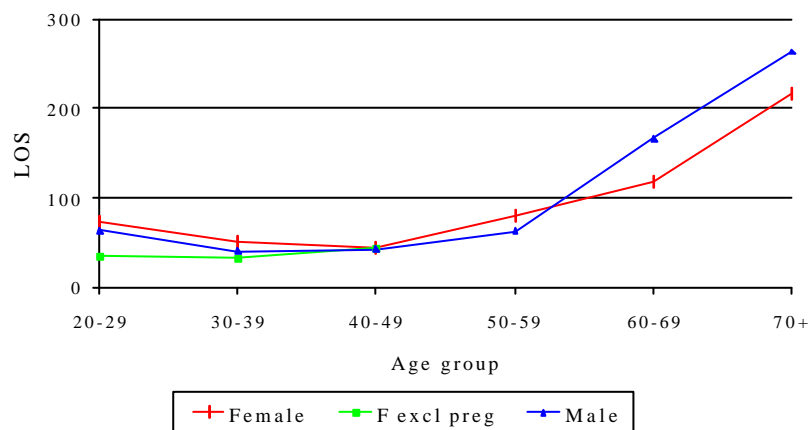


Table 11: Mean number of hospitalizations and mean length of stay by degree of urbanization, sex and age, continuous sub-sample, 7-year period

| | | St. John's | | Urban corridor | | Remote/rural | | Total | | |
|----------------------------|-------|------------|-------------------------|----------------|------------|--------------|------------|-------|------------|------------|
| | | Male | Female | Male | Female | Male | Female | Male | Female | Total |
| Number of hospitalizations | 20-39 | 0.21 | 0.75(0.32) ¹ | 0.44 | 1.11(0.57) | 0.38 | 0.97(0.48) | 0.34 | 0.93(0.45) | 0.66(0.40) |
| | 40-59 | 0.41 | 0.58(0.56) | 0.67 | 0.73(0.72) | 0.54 | 0.72(0.71) | 0.54 | 0.68(0.67) | 0.61(0.60) |
| | 60+ | 1.55 | 0.98 | 1.89 | 1.40 | 1.97 | 1.59 | 1.84 | 1.36 | 1.57 |
| | Total | 0.47 | 0.72(0.52) | 0.78 | 1.02(0.79) | 0.75 | 0.99(0.78) | 0.67 | 0.91(0.70) | 0.80(0.69) |
| Length of stay | 20-39 | 1.78 | 3.23(1.59) | 2.62 | 5.86(3.65) | 5.81 | 3.83(2.00) | 3.52 | 4.20(2.33) | 3.89(2.87) |
| | 40-59 | 2.50 | 3.99(3.88) | 4.54 | 3.93(3.92) | 3.46 | 3.91(3.90) | 3.49 | 3.94(3.90) | 3.73(3.71) |
| | 60+ | 13.21 | 9.04 | 14.83 | 12.98 | 15.00 | 12.17 | 14.52 | 11.53 | 12.85 |
| | Total | 3.59 | 4.47(3.68) | 5.47 | 6.47(5.56) | 6.62 | 5.42(4.64) | 5.35 | 5.43(4.61) | 5.39(4.95) |

¹ Values excluding pregnancy related visits are shown in parenthesis where different

Table 12: Age standardized means for hospitalizations, by degree of urbanization, continuous sub-sample, 7-year period

| | St. John's | | Urban Corridor | | Remote/Rural | |
|---------------------------------|------------|--------|----------------|--------|--------------|--------|
| | Male | Female | Male | Female | Male | Female |
| Mean number of hospitalizations | 0.56 | 0.75 | 0.80 | 1.07 | 0.75 | 1.04 |
| Mean sum LOS | 4.38 | 4.92 | 5.68 | 6.96 | 6.90 | 5.79 |

Table 13: Relative contribution of high and very high users to total hospitalizations, by percentiles, including and excluding pregnancy related visits, continuous sub-sample, 7-year period

| Level of utilization (percentiles) | Number of Hospitalizations ¹ | | | Total days of stay (LOS) | | |
|------------------------------------|---|----------------|----------------|--------------------------|----------------|----------------|
| | Values | % subjects | % contacts | Values | % subjects | % days |
| 0-75 [normal] | 0-1 (0-1) ² | 82.6 (85.8) | 23.8 (24.7) | 0-4 (0-2) | 77.2 (75.5) | 6.3 (2.0) |
| 75-95 [high] | 2-4 (2-3) | 14.2 (9.6) | 45.3 (32.1) | 5-25 (3-24) | 17.9 (19.6) | 35.8 (35.5) |
| 95+ [very high] | 5+ (4+) | 3.2 (4.6) | 30.9 (43.3) | 26+ (25+) | 4.8 (4.9) | 57.8 (62.5) |

¹: due to the shape of the distribution, the first group (0-75) for number of hospitalizations does not correspond to 75% of the subjects. ²: values when pregnancy is excluded

Table 14: Percentage distribution of place of residence and location of hospital, continuous sub-sample, 7-year period

| Location of hospital | Residence | | |
|----------------------|------------|----------------|--------------|
| | St. John's | Urban Corridor | Remote/Rural |
| St. John's | 97.1 | 26.3 | 26.5 |
| Urban Corridor | 1.7 | 72.6 | 51.7 |
| Rural/Remote | 0.1 | 0.4 | 21.0 |
| Labrador | 0.3 | 0.1 | <0.1 |
| Other provinces | 0.6 | 0.7 | 0.8 |
| Outside Canada | 0.2 | - | - |

Deaths

The contribution to utilization of the subjects dying during the study is of interest. Of course, since the survey took place during the third year of the period of utilization, we only registered deaths occurring from the fourth to the seventh year of the study. There are several ways to study those dying.

Table 15 and Table 16 show hospital indicators for utilization in the year of death, for subjects dying. Not all subjects who died were hospitalized in the year of death; between 70 and 80 per cent of those dying were hospitalized in the year of death, but 27 of the 246 (11 per cent) were never hospitalized in the period from 1992/3 up to their death. All indicators are substantially higher than in the general population; for hospital days, the mean is 34.5 days for those subjects dying and hospitalized in the year of death (187) and 26.3 for all subjects dying (246). Selected hospital indicators for the subjects dying in the four years are presented in Tables A 3 to A 6.

But to have the total picture of the utilization of hospitals by subjects dying we must count all the utilization, in all available years up to the year of death. Figure 6 shows this data. We have the contributions of the subjects dying in the 4th to 7th year, and for all previous years that they were alive. This shows very clearly the large number of hospital days in the year of death, and how the contribution increases across the years. It shows that, for the “capture” period, there are 13,634 hospital days for the 246 subjects. One way to interpret these figures is to calculate an “expected” number of hospital days for the subjects dying. For this we applied the mean number of hospital days in a year for subjects 60 years and older (1.6 days). For the 45 subjects dying in 1995/96, they should have 71 hospital days; it is very clear that the numbers are much higher, for both the year of death, and the previous years. The figure of 1,434 days – for 1995/6 – is 20 times higher than the expected number of days for subjects 60+ years old.

Another analysis uses person-years to account for the different number of years for each "cohort" of dying subjects, and obtains a mean of 9.8 hospital days per person-year, which is 12 times the mean number of hospital days per year in the continuous sub-sample.

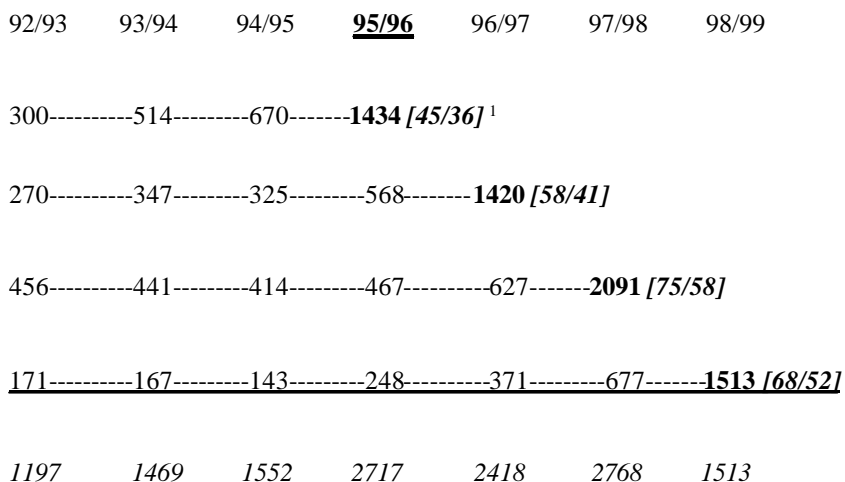
Table 15: Selected hospital indicators in year of death, those hospitalized

| | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|-------------------------------|--------|--------|--------|--------|
| Total length of stay (days) | | | | |
| Mean | 39.83 | 34.63 | 36.05 | 29.10 |
| Median | 20.50 | 26.00 | 21.00 | 19.00 |
| SD | 55.17 | 34.10 | 51.60 | 29.50 |
| Range | 1-260 | 2-127 | 1-324 | 1-118 |
| Sum | 1434 | 1420 | 2091 | 1513 |
| Number of hospitalizations | | | | |
| Mean | 2.22 | 2.29 | 1.90 | 1.98 |
| Median | 2.00 | 2.00 | 2.00 | 1.50 |
| SD | 1.44 | 1.47 | 1.10 | 1.29 |
| Range | 1-6 | 1-8 | 1-6 | 1-7 |
| Sum | 80 | 94 | 110 | 103 |
| Subjects hospitalized | | | | |
| N | 36 | 41 | 58 | 52 |
| % | 80.00 | 70.69 | 77.33 | 76.47 |
| Separations per 100 persons | 178 | 162 | 147 | 151 |
| Hospital days per 100 persons | 3187 | 2448 | 2788 | 2225 |
| Total number of subjects | 45 | 58 | 75 | 68 |

Table 16: Selected hospital indicators in year of death, all deaths

| | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|-----------------------------|--------|--------|--------|--------|
| Total length of stay (days) | | | | |
| Mean | 31.87 | 24.48 | 27.88 | 22.25 |
| Median | 8.00 | 14.50 | 12.00 | 10.50 |
| SD | 51.77 | 32.69 | 47.77 | 28.59 |
| Range | 0-260 | 0-127 | 0-324 | 0-118 |
| Sum | 1434 | 1420 | 2091 | 1513 |
| Number of hospitalizations | | | | |
| Mean | 1.78 | 1.62 | 1.47 | 1.51 |
| Median | 1.00 | 1.00 | 1.00 | 1.00 |
| SD | 1.57 | 1.62 | 1.26 | 1.41 |
| Range | 0-6 | 0-8 | 0-6 | 0-7 |
| Sum | 80 | 94 | 110 | 103 |
| Total number of subjects | 45 | 58 | 75 | 68 |

Figure 6: Number of hospital days for subjects dying



¹ First figure in bracket is the number of deaths in that year, and second figure denotes the number who were hospitalized in the year of death

Emigrants

The average number of hospitalizations and length of stay for those individuals who moved into, or out of, the province during the seven-year period is shown in Table 17. It can be seen that this group of people had less visits and shorter lengths of stay than those in the continuous sub-sample. This is most likely due to their younger age.

Table 17: Hospital utilization for emigrants compared to continuous sub-sample

| | Emigrants | | Continuous sub-sample | |
|---------------------------|-----------------------|---------|-----------------------|---------|
| | N of hospitalizations | Sum LOS | N of hospitalizations | Sum LOS |
| Mean/year/person | 0.09 | 0.42 | 0.11 | 0.77 |
| N (with utilization data) | 761 | 761 | 8219 | 8219 |
| % with no contact | 77.3 | 77.3 | 63.6 | 63.6 |

Diagnosis

Other results of interest are the coded diagnoses for hospitalizations. Table 18 shows the most important rubrics of the ICD-9-CM for hospitalizations. The table shows the diagnostic rubrics with either the most hospitalizations or total length of stay; the differences between males and females are what would be expected. We have included the rubric mental, for its contribution to total length of stay, especially in males. Table A 8 shows similar information for all individual diagnostic rubrics.

Looking at the number of hospitalizations, for males, the top three diagnoses (accounting for 47 per cent of all hospitalizations) are circulatory, digestive and respiratory, and for female the top three (accounting for 49 per cent of all hospitalizations) are pregnancy, digestive and genitourinary. Pregnancy alone accounts for almost one quarter of all hospitalizations for females. Hospitalizations for circulatory and mental conditions are more than twice as common in males than females, while respiratory and musculoskeletal conditions are diagnosed nearly twice as commonly in males than females (Table A 8). Genitourinary, as expected, is more common in females than males.

When the length of stay for males is considered, circulatory, mental and digestive are the top three conditions (accounting for 56 per cent of all days spent in hospital), whereas for females the top three conditions are circulatory, pregnancy and digestive (accounting for 44 per cent of all days in hospital). The mean number of days per hospitalization for the various diagnoses is generally higher for males than females. This is particularly noticeable for mental, neoplasm and respiratory related hospitalizations (Table A 8).

Table 18: Major diagnostic rubrics for hospitalizations by sex, number of visits, number of subjects, total LOS and mean LOS, continuous sub-sample, 7-year period

| Diagnostic rubric | Hospitalizations | Respondents | Sum LOS (days) | Mean LOS (days) |
|--------------------|------------------|-------------|----------------|-----------------|
| MALES | | | | |
| Circulatory | 591 (23.1%) | 274 | 5057 (24.9%) | 18.5 |
| Digestive | 374 (14.6%) | 265 | 2233 (11.0%) | 8.4 |
| Respiratory | 226 (8.8%) | 106 | 1368 (6.7%) | 12.9 |
| Injury & poisoning | 214 (8.4%) | 190 | 1563 (7.7%) | 8.2 |
| Mental | 152 (5.9%) | 64 | 4088 (20.1%) | 63.9 |
| Total | 2561 (100%) | - | 20348 (100%) | - |
| FEMALES | | | | |
| Pregnancy | 931 (23.1%) | 563 | 3622 (15.1%) | 6.4 |
| Digestive | 578 (14.4%) | 395 | 3181 (13.3%) | 8.1 |
| Genitourinary | 454 (11.3%) | 381 | 2092 (8.7%) | 5.5 |
| Circulatory | 427 (10.6%) | 230 | 3762 (15.7%) | 16.4 |
| Mental | 109 (2.7%) | 69 | 1862 (7.8%) | 27.0 |
| Total | 4022 (100%) | - | 23983 (100%) | - |

Chapter 3 – Physician Visits – Fee for Service only

Highlights

- For any single year, individuals went to a general practitioner four times on average, and to a specialist once (Table 19)
- For single years, the proportion of subjects in the sample visiting a general practitioner ranges from 73 to 76 per cent and a specialist from 32 to 39 per cent (Table 19)
- For the whole seven-year period, 94 per cent of the subjects went to a general practitioner at least once, while 77 per cent visited a specialist at least once (Table 22)
- The maximum number of visits to a general practitioner for any one patient is 835 over the seven-year period; for specialists it is 369 (Table 22)
- On average, females made 61 per cent and 37 per cent more visits to GPs and specialists respectively than males (Table 23)
- Residents of the St. John's metro area make about twice as many visits to specialists as residents of other areas of the island (Table 26)
- About five per cent of the subjects account for 22 per cent of visits to GPs and 31 per cent of visits to specialists (Table 27)
- For males, the diagnoses with the most visits to general practitioners are circulatory, respiratory and musculoskeletal; for females they are respiratory, circulatory and genitourinary. In both sexes, ill-defined diagnoses are the largest category (about 19 per cent) (Table 29)

Methods

The variables obtained from the claims file were: date of service, diagnosis code, speciality code, fee code, and postal code of physician. All visits recorded on the claims file for our respondents were provided to us. Included in the fee code are digits to identify where the visit occurred, the speciality of the physician and whether the physician was the attending physician, the assisting physician, or the anesthetist. Only ambulatory visits were selected for this analysis. Ambulatory visits are defined as visits to: doctor's office, patient's home, or hospital outpatient department. Emergency department visits are included in the outpatient category.

Because we are using the claims file to obtain ambulatory visits, we are not capturing visits to general practitioners who may be under salary rather than fee for service; this results in underestimating the number of visits to GPs, especially in those areas with a significant proportion of GPs under salary (i.e., southern coast, northern peninsula). There are some salaried specialists around the province but most ambulatory visits to specialists are captured so this information should be comparable across the province.

For physicians' tables, indicators are presented for the whole sample – not just those utilizing the service as done previously for hospital data -- as a major proportion of all subjects visited a doctor during the time covered. Indicators are presented separately for general practitioners and specialists.

Results

All available data

Tables 19 and 20 show indicators of utilization, per year, with and without consultations in the year of death. The differences are minimal, as the number of consultations to physicians in the year of death is not substantial. On average, individuals visit a GP four times a year, and a specialist once a year. There is a trend toward more visits in the latter years of the study, which is more pronounced for specialists. It is interesting to note the range of visits to GPs over the years; while the maximum number of visits is similar in the first three years (75-75-77 for GPs) the

maximum number of visits is much larger in the last two years; 261-304 (only five individuals account for this difference); this is not the case for specialists, with much lower differences, and the maximum occurring in the second year (77 for 1993/4).

Table 19: Selected physician visit indicators by year, including pregnancy and including consultations in year of death

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|--|--------|--------|--------|--------|--------|--------|--------|
| Number of visits to a GP | | | | | | | |
| Mean | 4.16 | 4.30 | 4.34 | 4.43 | 4.38 | 4.41 | 4.68 |
| Median | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| SD | 5.69 | 5.70 | 5.64 | 5.89 | 5.98 | 6.57 | 7.50 |
| Range | 0-75 | 0-75 | 0-77 | 0-117 | 0-154 | 0-261 | 0-304 |
| Sum | 37747 | 39212 | 39833 | 40294 | 38872 | 38033 | 39427 |
| Number of visits to a specialist | | | | | | | |
| Mean | 0.97 | 1.05 | 1.02 | 1.06 | 1.10 | 1.16 | 1.17 |
| Median | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SD | 2.56 | 2.71 | 2.43 | 2.28 | 2.43 | 2.52 | 2.51 |
| Range | 0-65 | 0-77 | 0-58 | 0-55 | 0-50 | 0-50 | 0-50 |
| Sum | 8840 | 9579 | 9377 | 9626 | 9763 | 10036 | 9874 |
| Subjects with at least 1 visit to a GP | | | | | | | |
| N | 6652 | 6787 | 6845 | 6903 | 6644 | 6489 | 6320 |
| % | 73.3 | 74.5 | 74.7 | 75.8 | 74.9 | 75.2 | 75.1 |
| Subjects with at least 1 visit to a specialist | | | | | | | |
| N | 2905 | 3086 | 3248 | 3350 | 3239 | 3287 | 3275 |
| % | 32.0 | 33.9 | 35.4 | 36.8 | 36.5 | 38.1 | 38.9 |
| Total number of subjects | 9075 | 9116 | 9168 | 9101 | 8870 | 8630 | 8417 |

Table 20: Selected physician visit indicators by year, including pregnancy but excluding consultations in year of death

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|--|--------|--------|--------|--------|--------|--------|--------|
| Number of visits to a GP | | | | | | | |
| Mean | 4.16 | 4.30 | 4.34 | 4.41 | 4.38 | 4.40 | 4.68 |
| Median | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| SD | 5.69 | 5.70 | 5.64 | 5.86 | 5.96 | 6.57 | 7.49 |
| Range | 0-75 | 0-75 | 0-77 | 0-117 | 0-154 | 0-261 | 0-304 |
| Sum | 37747 | 39212 | 39833 | 39906 | 38564 | 37623 | 39054 |
| Number of visits to a specialist | | | | | | | |
| Mean | 0.97 | 1.05 | 1.02 | 1.05 | 1.10 | 1.16 | 1.17 |
| Median | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| SD | 2.56 | 2.71 | 2.43 | 2.27 | 2.43 | 2.52 | 2.50 |
| Range | 0-65 | 0-77 | 0-58 | 0-55 | 0-50 | 0-50 | 0-50 |
| Sum | 8840 | 9579 | 9377 | 9528 | 9678 | 9924 | 9760 |
| Subjects with at least 1 visit to a GP | | | | | | | |
| N | 6652 | 6787 | 6845 | 6865 | 6604 | 6427 | 6270 |
| % | 73.3 | 74.5 | 74.7 | 75.8 | 74.9 | 75.1 | 75.1 |
| Subjects with at least 1 visit to a specialist | | | | | | | |
| N | 2905 | 3086 | 3248 | 3324 | 3212 | 3244 | 3242 |
| % | 32.0 | 33.9 | 35.4 | 36.7 | 36.5 | 37.9 | 38.8 |
| Total number of subjects | 9075 | 9116 | 9168 | 9056 | 8812 | 8555 | 8349 |

Continuous sub-sample

Table 21 shows the same indicators as in Tables 19 and 20, but for the continuous sub-sample; this eliminates all visits from subjects dying and from subjects leaving or entering the province at any point during the study. Comparing totals from Tables 19, 21 and Figure 7, we can see that the differences are not large; using GPs as example, there are 10,044 visits related to those dying (3.7 per cent of all visits), and 11,943 in subjects emigrating (4.4 per cent). There is a marked increase in the maximum number of visits to GPs in the last four years, but this is entirely attributable to only five individuals, and to the large variation in the maximum number of visits from year to year in individuals with very high number of visits. Deaths and emigrants will be analyzed later in this chapter.

Table 22 and Table 23 show a summary of indicators to visits to GPs, (by sex, and with and without pregnancy in females, in Table 23). The mean number of visits is larger in females with pregnancy related visits, the mean for females is 37.1 and for males 23.0, a difference of 14.1, or 61 per cent higher than the mean for males. For visits to specialists, the difference between means is not so high, 36.5 per cent. The average number of visits per year to GPs is 4.4, and to specialists, 1.1.

The frequency and percentage for number of visits – grouped – to GPs and specialists is shown in Table 24. The category with 'no visits' is of interest, six per cent of the respondents did not visit a GP in the seven-year period. At the other end of the scale, five per cent had more than 91 visits in the seven-year period, this equates to 13 or more in a year on average, more than one a month. 77 per cent of all subjects had at least one visit to a specialist in the seven-year period.

Tables 25 and 26 present information to help understand the influence of sex, age, and residence on the utilization of physicians. Table 25 shows that the influence of sex is very important; for GPs, females are 1.6 times more likely to visit a GP, and 1.4 times more likely to visit a specialist than males; these differences hold for the three areas. With respect to age, older males are 2.5 times more likely to visit a GP than younger males; in females, the difference by age is smaller (1.3). For specialists, the proportions are 2.9 for males, and 1.4 for females. Once again, these differences hold for the three areas. Therefore as seen in hospitalizations, age has more influence on the level of utilization than sex.

Table 26 presents age adjusted (same procedure as for hospitals, Table 12) means for visits to GPs and specialists, by areas. This emphasizes the differences by area, holding the influence of age and sex. For GPs, there is a small difference between St. John's and the Urban Corridor, and a larger difference with the Remote/Rural, due to the loss of visits to salaried physicians. With respect to specialists, there is a clear gradient, with fewer visits for the Urban Corridor, and even less for the Remote/Rural area. Subjects in the Remote/Rural area have about 70 per cent of the visits to GPs than the subjects residing in St. John's; this difference is about 45 per cent for specialists. These figures were also calculated for subjects living in the same area for

Table 22: Selected indicators for visits to general practitioners and specialists, 7-year period, continuous sub-sample

| Indicators | Visits to GPs | Visits to specialists |
|-------------------|---------------|-----------------------|
| Mean | 30.6 | 7.5 |
| Median | 22 | 3 |
| S.D. | 35.5 | 13.3 |
| Maximum | 835 | 369 |
| Sum | 251431 | 61761 |
| Average per year | 4.4 | 1.1 |
| % with no contact | 6.2 | 23.1 |

Table 23: Selected fee-for-service physician indicators for continuous sub-sample, 7-year period

| | Males | Females | | All |
|-------------------------------|-------|----------------|-------------------|----------------|
| | | With pregnancy | Without pregnancy | With pregnancy |
| Number of visits to GPs (all) | | | | |
| Mean | 23.0 | 37.1 | 35.7 | 30.6 |
| Median | 15 | 28 | 27 | 22 |
| SD | 31.9 | 37.1 | 36.8 | 35.5 |
| Range | 0-835 | 0-583 | 0-583 | 0-835 |
| Sum | 87520 | 163911 | 157876 | 251431 |
| Number of specialists (all) | | | | |
| Mean | 6.3 | 8.6 | 8.1 | 7.5 |
| Median | 2 | 5 | 4 | 3 |
| SD | 12.4 | 13.9 | 13.7 | 13.3 |
| Range | 0-272 | 0-369 | 0-369 | 0-369 |
| Sum | 23806 | 37955 | 35653 | 61761 |
| N | 3801 | 4418 | 4418 | 8219 |

Table 24: Number and percent of subjects by number of fee-per-service physician visits, continuous sub-sample, 7-year period

| Number of visits | GP visits | | Specialist visits | |
|------------------|-----------|------|-------------------|------|
| | N | % | N | % |
| 0 | 508 | 6.2 | 1899 | 23.1 |
| 1-6 | 1136 | 13.8 | 3472 | 42.2 |
| 7-13 | 1227 | 14.9 | 1488 | 18.1 |
| 14-20 | 1039 | 12.6 | 652 | 7.9 |
| 21-27 | 968 | 11.8 | 308 | 3.7 |
| 28-41 | 1334 | 16.2 | 242 | 2.9 |
| 42-62 | 1032 | 12.6 | 94 | 1.1 |
| 63-90 | 566 | 6.9 | 40 | 0.5 |
| 91+ | 409 | 5.0 | 24 | 0.3 |
| Total | 8219 | 100 | 8219 | 100 |

Table 25: Mean number of visits to fee-for-service GPs and specialists, continuous sub-sample, 7-year period

| | | St. John's | | Urban Corridor | | Remote/Rural | | Total | | |
|---------------------------------|-------|------------|--------|----------------|--------|--------------|--------|-------|--------|-------|
| | | Male | Female | Male | Female | Male | Female | Male | Female | Total |
| Number of visits to GPs | 20-39 | 18.8 | 41.2 | 17.8 | 41.0 | 12.5 | 25.7 | 16.1 | 35.2 | 26.5 |
| | 40-59 | 28.1 | 40.5 | 26.7 | 39.2 | 16.8 | 27.6 | 23.2 | 35.1 | 29.4 |
| | 60+ | 45.1 | 48.2 | 41.6 | 46.8 | 35.7 | 43.1 | 39.7 | 45.7 | 43.1 |
| | Total | 26.1 | 42.1 | 25.5 | 41.4 | 18.8 | 29.7 | 23.0 | 37.1 | 30.6 |
| Number of visits to specialists | 20-39 | 5.6 | 11.0 | 3.5 | 6.4 | 2.8 | 5.1 | 3.9 | 7.5 | 5.9 |
| | 40-59 | 9.6 | 14.5 | 6.5 | 7.2 | 4.3 | 5.7 | 6.6 | 8.9 | 7.8 |
| | 60+ | 19.7 | 14.8 | 9.0 | 9.7 | 8.1 | 8.2 | 11.2 | 10.6 | 10.8 |
| | Total | 9.1 | 13.0 | 5.7 | 7.4 | 4.5 | 5.9 | 6.3 | 8.6 | 7.5 |

Table 26: Age standardized means for visits to fee-for service GPs and specialists, by degree of urbanization, continuous sub-sample, 7-year period

| | St. John's | | Urban Corridor | | Remote/Rural | |
|--------------------------------------|------------|--------|----------------|--------|--------------|--------|
| | Male | Female | Male | Female | Male | Female |
| Mean number of visits to GPs | 27.5 | 42.8 | 25.6 | 41.9 | 18.7 | 30.3 |
| Mean number of visits to specialists | 9.9 | 13.2 | 5.7 | 7.4 | 4.4 | 6.0 |

Table 27: Relative contribution of high and very high users to total visits to General Practitioners and specialists, including pregnancy related visits, continuous sub-sample, 7-year period

| Level of utilization (percentiles) | Visits to General Practitioners | | | Visits to specialists | | |
|------------------------------------|---------------------------------|------------|------------|-----------------------|------------|------------|
| | Values | % subjects | % contacts | Values | % subjects | % contacts |
| 0-75 [normal] | 0-41 | 75.6 | 40.5 | 0-9 | 75.2 | 27.0 |
| 75-95 [high] | 42-90 | 19.4 | 37.5 | 10-27 | 19.9 | 41.8 |
| 95+ [very high] | 91+ | 5.0 | 22.0 | 28+ | 4.9 | 31.1 |

Deaths

Figure 7 includes the visits to GPs, and Figure 8 the visits to specialists, for subjects dying during the study. The number of visits to GPs is relatively high, although not as high as seen in hospital days. The number of visits tends to peak in the year before the year of death. Applying the same technique as with hospital days – the number of visits expected in subjects 60 years and older – the number of visits in the year including death varies between 0.9 and 1.4 times the expected number.

With respect to visits to specialists, the number of visits tend to peak in the year before death, but there are exceptions. The number of visits in the year including death with the largest number of visits ranges between 1.0 and 1.4 times the expected number of visits for individuals 60+.

We must remember that most subjects who died had lengthy hospitalizations, a fact which would have reduced the time in which they could make ambulatory visits.

Figure 7: Number of visits to GPs for subject dying

| 92/93 | 93/94 | 94/95 | <u>95/96</u> | 96/97 | 97/98 | 98/99 |
|------------|------------|------------|---------------------------------|------------|------------|---------------------------|
| 361 | 357 | 410 | 388 [45/38] ¹ | | | |
| 488 | 446 | 476 | 308 [58/40] | | | |
| 505 | 543 | 594 | 410 [75/62] | | | |
| <u>339</u> | <u>361</u> | <u>390</u> | <u>348</u> | <u>452</u> | <u>514</u> | <u>373 [68/50]</u> |
| 1693 | 1707 | 1870 | 1935 | 1542 | 924 | 373 |

¹ First figure in bracket is the number of deaths in that year, and second figure denotes the number who visited a GP in the year of death

Figure 8: Number of visits to specialists for subjects dying

| 92/93 | 93/94 | 94/95 | <u>95/96</u> | 96/97 | 97/98 | 98/99 |
|-----------|-----------|-----------|--------------------------------|------------|------------|---------------------------|
| 89 | 86 | 110 | 98 [45/26] ¹ | | | |
| 88 | 125 | 154 | 85 [58/27] | | | |
| 170 | 166 | 165 | 112 [75/43] | | | |
| <u>66</u> | <u>87</u> | <u>99</u> | <u>94</u> | <u>131</u> | <u>153</u> | <u>114 [68/33]</u> |
| 413 | 464 | 528 | 514 | 419 | 265 | 114 |

¹ First figure in bracket is the number of deaths in that year, and second figure denotes the number who visited a specialist in the year of death

Emigrants

In Table 28, we show utilization for subjects emigrating, in comparison with the continuous sub-sample. Once again as seen in hospitalizations, there is less utilization for emigrants, a fact that may be related to them being younger.

Table 28: GP and specialist utilization for emigrants compared to continuous sub-sample

| | Emigrants | | Continuous sub-sample | |
|---------------------------|---------------|-----------------------|-----------------------|-----------------------|
| | Visits to GPs | Visits to specialists | Visits to GPs | Visits to specialists |
| Mean/year/person | 3.4 | 0.7 | 4.4 | 1.1 |
| N (with utilization data) | 686 | 686 | 8219 | 8219 |
| % with no contact | 9.9 | 45.1 | 6.2 | 23.1 |

Diagnosis

Table 29 shows the most prevalent diagnostic rubrics for visits to a GP. In males, circulatory, respiratory, musculoskeletal, and injury/poisoning account for 50 per cent of all visits, while in females, respiratory, circulatory, genitourinary and musculoskeletal account for 46 per cent of all visits. We have included the rubric mental in males, and mental and pregnancy in females, although they are not among the first five rubrics, as they have a relatively high mean number of consultations. Table A 10 shows the data for all diagnostic groups. The rubric ill-defined represents 18 to 19 per cent of all visits. This may be related to the difficulty of arriving at a definitive diagnosis on ambulatory visits, or to problems of registration and coding.

The following table (Table 30) shows the diagnostic rubrics with more consultations to specialists. Ill-defined diagnoses are now in second (male) or third (female) place. For specialists, mental and pregnancy are included among the first six rubrics, and they also show a large mean number of visits. Table A 11 shows the data for all diagnostic groups.

Table 29: Major diagnostic rubrics for visits to fee-for-service GPs by sex, number of visits, number of subjects, and mean number of visits, continuous sub-sample, 7-year period

| Diagnostic rubric | GP visits | Respondents | Mean visits |
|----------------------|---------------|-------------|-------------|
| MALES | | | |
| Ill-defined | 16258 (18.6%) | 2713 | 6.0 |
| Circulatory | 14680 (16.8%) | 1453 | 10.1 |
| Respiratory | 13509 (15.4%) | 2456 | 5.5 |
| Musculoskeletal | 9763 (11.2%) | 2037 | 4.8 |
| Injury and poisoning | 5781 (6.6%) | 1807 | 3.2 |
| Mental | 4046 (4.6%) | 828 | 4.9 |
| Total | 87520 (100%) | - | - |
| FEMALES | | | |
| Ill-defined | 31660 (19.3%) | 3663 | 8.6 |
| Respiratory | 23576 (14.4%) | 3425 | 6.9 |
| Circulatory | 19560 (11.9%) | 1955 | 10.0 |
| Genitourinary | 19527 (11.9%) | 3302 | 5.9 |
| Musculoskeletal | 13530 (8.3%) | 2624 | 5.2 |
| Mental | 8588 (5.2%) | 1767 | 4.9 |
| Pregnancy | 6035 (3.7%) | 588 | 10.3 |
| Total | 163911 (100%) | - | - |

Table 30: Major diagnostic rubrics for visits to specialists by sex, number of visits, number of subjects, and mean number of visits, continuous sub-sample, 7-year period

| Diagnostic rubric | Specialist visits | Respondents | Mean visits |
|-------------------|-------------------|-------------|-------------|
| MALES | | | |
| Nervous | 3958 (16.6%) | 1059 | 3.7 |
| Ill-defined | 3024 (12.7%) | 1085 | 2.8 |
| Musculoskeletal | 2561 (10.8%) | 758 | 3.4 |
| Mental | 2550 (10.7%) | 204 | 12.5 |
| Genitourinary | 2212 (9.3%) | 632 | 3.5 |
| Circulatory | 2175 (9.1%) | 524 | 4.2 |
| Total | 23806 (100%) | - | - |
| FEMALES | | | |
| Genitourinary | 6753 (17.8%) | 1692 | 4.0 |
| Nervous | 5440 (14.3%) | 1438 | 3.8 |
| Ill-defined | 3594 (9.5%) | 1386 | 2.6 |
| Musculoskeletal | 3515 (9.3%) | 913 | 3.8 |
| Mental | 3322 (8.8%) | 286 | 11.6 |
| Pregnancy | 2302 (6.1%) | 378 | 6.1 |
| Total | 37955 (100%) | - | - |

Speciality of attending specialist

Another way of analyzing the utilization of specialists, also related to morbidity, is to account for the number of visits by speciality of the physician (only for specialists). This is included in Table 31, for the six specialties with more visits (64 per cent and 67 per cent, respectively, of all visits in males and females). Five specialties are included both in males and females. Once again, with respect to visits to psychiatrists, we have a very large mean number of consultations. Table A 12 includes data for all specialties.

Table 31: Visits to specialists by major specialities by sex, number of visits, number of subjects, and mean number of visits, continuous sub-sample, 7-year period

| Speciality | Specialist visits | Respondents | Mean visits |
|------------------------|-------------------|-------------|-------------|
| MALES | | | |
| Internal medicine | 2989 (12.6%) | 744 | 4.0 |
| Ophthalmology | 2649 (11.1%) | 783 | 3.4 |
| Psychiatry | 2555 (10.7%) | 179 | 14.3 |
| Orthopaedic surgery | 2461 (10.3%) | 775 | 3.2 |
| Urology | 2412 (10.1%) | 722 | 3.3 |
| General surgery | 2253 (9.5%) | 901 | 2.5 |
| FEMALES | | | |
| Obstetrics/gynaecology | 7825 (20.6%) | 1576 | 5.0 |
| General surgery | 3917 (10.3%) | 1395 | 2.8 |
| Ophthalmology | 3710 (9.8%) | 1051 | 3.5 |
| Internal medicine | 3655 (9.6%) | 955 | 3.8 |
| Psychiatry | 3328 (8.8%) | 235 | 14.2 |
| Orthopaedic surgery | 3126 (8.2%) | 916 | 3.4 |

Chapter 4 – Analytical Approach to Medical Care Utilization

Highlights

- Sex and age are included in all the models tested; in most cases, the influence of age is larger than the influence of sex, with the exception of the model for GPs in Remote/Rural areas
- Number of chronic conditions and self-assessed status are significant variable in all the models, with more influence on visits to physicians
- Socio-economic variables are included in all models; employment and education are entered in models for hospitals, and SESORE (index combining income adequacy and education) is included in the models related to visits to physicians
- Residence – used as a proxy for access to services – enters in all models, with different values; it is particularly important as a factor in explaining the number of visits to specialists

Methods

In the preceding chapters we have presented descriptive data about utilization. In many tables we have presented results by sex, and sometimes, by age. In two tables – Tables 11 and 25 – we used an elementary analytical presentation, including three variables: sex, age, and area of residence.

From the literature on medical care utilization, and from our own work, we know that medical care is influenced – or explained – by many factors, measured as variables. We also know that the relationships between these variables are complex. From the health survey we obtained many variables potentially useful to develop and test models to explain utilization. Considering that we have mostly categorical variables, and that the distributions for utilization are non-normal, we are using binary logistic regression when the response variable is dichotomous, and ordinal logistic regression when there are more than two categories in the dependent variable. These models produce results that isolate, statistically, the influence of each

significant variable. Therefore, these results allow us to quantify the influence of variables of interest, taking into account sample size and possible interactions with other variables

For this report we will test models including: sex, age (continuous), self-assessed health status (SAHS, 4 levels), SEScore (an index of socio-economic status, including education and income adequacy, 3 levels), employment (3 levels), education (5 levels), area of residence (3 levels), LSINDEX (sum of four health practices – never smoked, moderate drinker, physically active, BMI 20-26), and number of chronic conditions (4 levels). Area of residence, once socio-economic variables are controlled, becomes a proxy for the amount and complexity of medical care resources (number of hospital beds, number of physicians). For each analysis, we include all the variables, and then remove those that do not contribute to the results (non-significant), and then we show results for a model including all the significant variables. In models including hospitalization data we test excluding pregnancy visits, as we are trying to understand the factors resulting in utilization resulting from disease and injury. Pregnancy visits are included for GP and specialist models. Figure 9 shows a summary of the significant variables for the various analyses. Models are available on request from the authors.

Table 33 to Table 36 use, once again, the division in percentiles, to characterize the level of utilization (although with more groups shown here than in previous tables). The interpretation of these tables is relatively straightforward; the figures correspond to the percentage of subjects in each category. For example, in Table 33, and considering the influence of sex, it shows that 71 per cent of males had no hospital days, in contrast with 66 per cent of females. These figures represent the influence of a single variable – in this case, sex – holding all others constant. In these tables we only show the extreme values for the significant variables, (e.g. university degree and less than high school for education).

Figure 9: Significant variables for multivariate analyses. Hospitalization and physician visits, continuous sub-sample, 7-year period

| Variable | Hospital yes/no | LOS – Patterns | GP-St. John's - Urban corridor | GP Remote/Rural | Specialists |
|--------------------|--------------------|-------------------|-----------------------------------|--------------------|-------------|
| Sex | + | + | + | + | + |
| Age | + | + | + | + | + |
| SAHS | + | + | + | + | + |
| SESCORE | | | + | + | + |
| Employment | + | + | | | |
| Education | + ¹ | + ¹ | | | |
| Area | + | + | + | | + |
| LSINDEX | + | + | + | | |
| Chronic conditions | + | + | + | + | + |

¹: education is significant only if pregnancy is excluded

Probability of being hospitalized

Probability of hospitalization: as being hospitalized is a rare event, even when studying a seven-year period, it is interesting to understand the variables that are associated with hospitalizations. This model (Table 32) indicates that the variables with the strongest association with the probability of being hospitalized are age (ratio of 2.5 when excluding pregnancies) and education (ratio of 2.1). Number of chronic conditions and self-assessed health status are also determinants of hospitalization. It should be noted that the probability of hospitalization is nearly ten percent higher in both Urban Corridor and Remote/Rural than in St. John's, when controlling for the influence of all other variables in the model. Figure 10 and Figure 11 show graphically the difference in the probability of being hospitalized for two age groups and degree of urbanization respectively.

Table 32: Event probability of being hospitalized, for significant variables, with and without pregnancy visits, logistic regression, continuous sub-sample, 7-year period

| Variable | With pregnancy | No pregnancy |
|--------------------|-----------------|--------------|
| Sex | | |
| Male | 0.28 | 0.28 |
| Female | 0.43 | 0.33 |
| Age | | |
| 20-39 | 0.33 | 0.22 |
| 60+ | 0.53 | 0.54 |
| SAHS | | |
| Excellent- good | 0.33 | 0.27 |
| Fair-poor | 0.50 | 0.49 |
| Employment | | |
| Full- time | 0.30 | 0.23 |
| Not working | 0.33 | 0.28 |
| Education | | |
| University degree | NS ¹ | 0.20 |
| < High school | | 0.42 |
| Area of residence | | |
| St. John's | 0.31 | 0.25 |
| Urban corridor | 0.39 | 0.34 |
| Remote/rural | 0.38 | 0.34 |
| LSINDEX | | |
| High | 0.27 | 0.20 |
| Low | 0.56 | 0.53 |
| Chronic conditions | | |
| 0 | 0.24 | 0.17 |
| 3+ | 0.51 | 0.49 |

¹ variable is not significant in model

Figure 10: Event probability of being hospitalized – by age, continuous sub-sample, 7-year period

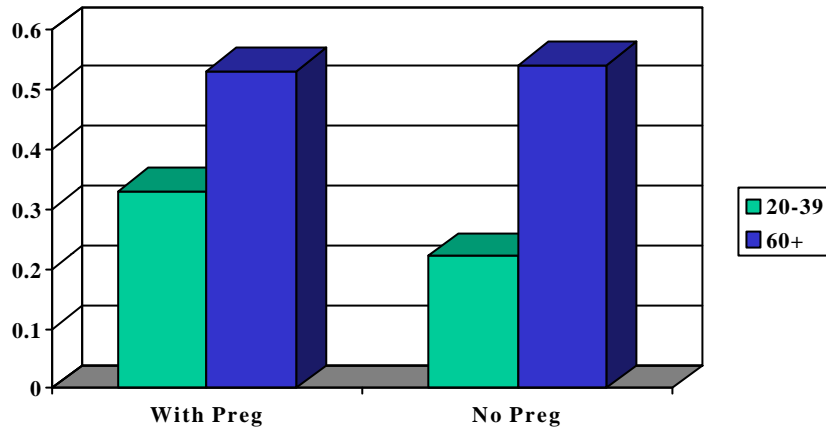
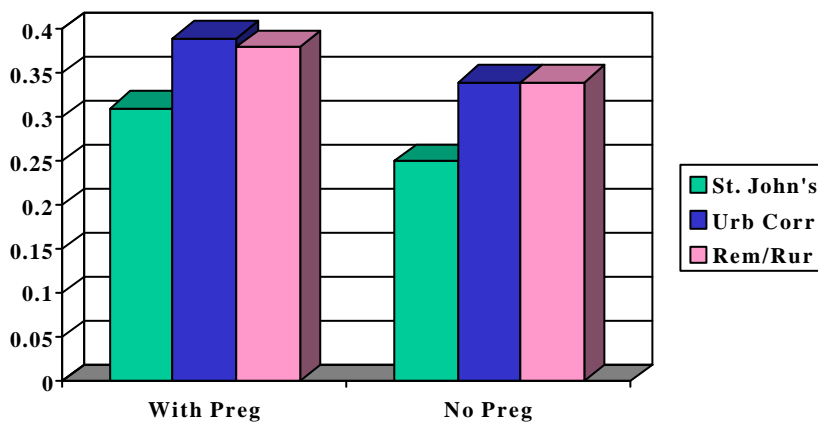


Figure 11: Event probability of being hospitalized – by area of residence, continuous sub-sample, 7-year period



Number of hospital days

Tables 33 shows that for the two middle categories – one to two, and three to 24 hospital days – there are more females than males (28 per cent against 24 per cent). Now, if we consider age, the differences for zero hospital days between young subjects (20-39) and older subjects (60+) are more accentuated, 79 per cent and 43 per cent. Inspection of the other categories show that 48 per cent of older subjects had three or more hospital days, while for younger individuals the comparative figure is 15 per cent. Figure 12 shows the probability of having various lengths of stay by the lowest and highest education level.

Figure 12: Event probability for various levels of length of stay – by education, continuous sub-sample, 7-year period

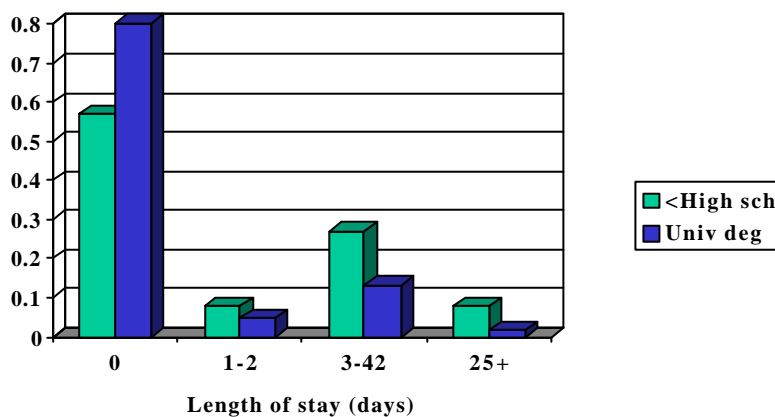


Table 33: Event probability of being at various levels of LOS, for significant variables, excluding pregnancy visits, ordinal logistic regression, continuous sub-sample, 7-year period

| Variable | Number of days | | | |
|--------------------|----------------|------|------|------|
| | 0 | 1-2 | 3-24 | 25+ |
| Sex | | | | |
| Male | 0.71 | 0.06 | 0.18 | 0.05 |
| Female | 0.66 | 0.07 | 0.21 | 0.05 |
| Age | | | | |
| 20-39 | 0.79 | 0.05 | 0.13 | 0.02 |
| 60+ | 0.43 | 0.09 | 0.36 | 0.12 |
| SAHS | | | | |
| Excellent- good | 0.73 | 0.06 | 0.17 | 0.04 |
| Fair-poor | 0.50 | 0.08 | 0.32 | 0.10 |
| Employment | | | | |
| Full-time | 0.77 | 0.06 | 0.14 | 0.03 |
| Not working | 0.72 | 0.07 | 0.18 | 0.04 |
| Education | | | | |
| University degree | 0.80 | 0.05 | 0.13 | 0.02 |
| < High school | 0.57 | 0.08 | 0.27 | 0.08 |
| Area of residence | | | | |
| St. John's | 0.74 | 0.06 | 0.16 | 0.04 |
| Urban corridor | 0.66 | 0.07 | 0.22 | 0.06 |
| Remote/rural | 0.66 | 0.07 | 0.22 | 0.05 |
| LSINDEX | | | | |
| High | 0.81 | 0.05 | 0.12 | 0.02 |
| Low | 0.45 | 0.08 | 0.34 | 0.13 |
| Chronic conditions | | | | |
| 0 | 0.83 | 0.05 | 0.10 | 0.02 |
| 3+ | 0.50 | 0.09 | 0.32 | 0.10 |

Physicians visits

Tables 34 and 35 show data for GPs separated by area since we know that in the remote/rural area we are missing a number of visits that are made to salaried physicians. Table 34 looks at visits to GPs in St. John's and Urban Corridor areas, and it shows that the influence of age is important. The pattern of utilization, for those 60 years and older, is clearly shifted when compared to the 20-39 group, with larger percentages in the higher levels of utilization (69 per cent of those 60+ have 26 or more visits, compared to 44 per cent for the 20-39 aged group). For the same table, the difference between areas, although statistically significant, has little practical value. Socio-economic status – as measured by SESCORE – has a definitive influence on the level of utilization; subjects with score one (low) report higher utilization than individuals with a score of nine (60 per cent versus 43 per cent for the category 26 or more visits).

Table 35 shows data for visits to GPs in remote and rural areas, where there are more GPs under salary who are not included in the study. As expected, for all categories the number of visits is lower than in the two other areas. The same variables enter into the model (area of residence is not a factor here). But there is an intriguing difference; the influence of socio-economic status is reversed in the model but the actual difference is minimal.

Table 36 shows the model for visits to specialists. The differences for sex, age, and SAHS are similar to those for GPs, with different magnitude. But there are interesting differences with respect to two variables. For SESCORE, subjects with the higher level report more visits to specialists (a lower percentage with 0-1 visits, 29 per cent, and a moderate concentration in the 4-9 and 10-27 categories (50 per cent). And for area of residence, as expected, the number of visits to specialists is higher for St. John's, with Urban Corridor in second place (Table 36 and Figure 15). This points to two factors: the availability of specialists, and more access to them for people with higher SES.

Table 34: Event probability of being at various levels of visiting a GP, St. John's and Urban corridor areas, for significant variables, including pregnancy visits, ordinal logistic regression, continuous sub-sample, 7-year period

| Variable | Number of visits | | | | |
|--------------------|------------------|-------|-------|-------|------|
| | 0-13 | 14-25 | 26-44 | 45-93 | 94+ |
| Sex | | | | | |
| Male | 0.40 | 0.25 | 0.20 | 0.12 | 0.03 |
| Female | 0.15 | 0.21 | 0.29 | 0.27 | 0.07 |
| Age | | | | | |
| 20-39 | 0.32 | 0.23 | 0.23 | 0.17 | 0.04 |
| 60+ | 0.13 | 0.19 | 0.29 | 0.31 | 0.09 |
| SAHS | | | | | |
| Excellent-good | 0.29 | 0.24 | 0.25 | 0.18 | 0.04 |
| Fair-poor | 0.13 | 0.17 | 0.28 | 0.32 | 0.10 |
| SESCORE | | | | | |
| Low | 0.19 | 0.20 | 0.27 | 0.26 | 0.07 |
| High | 0.33 | 0.25 | 0.24 | 0.16 | 0.03 |
| Area of residence | | | | | |
| St. John's | 0.25 | 0.23 | 0.26 | 0.21 | 0.05 |
| Urban corridor | 0.28 | 0.23 | 0.25 | 0.19 | 0.05 |
| LSINDEX | | | | | |
| High | 0.34 | 0.24 | 0.23 | 0.15 | 0.03 |
| Low | 0.12 | 0.17 | 0.28 | 0.33 | 0.10 |
| Chronic conditions | | | | | |
| 0 | 0.45 | 0.26 | 0.18 | 0.09 | 0.01 |
| 3+ | 0.09 | 0.15 | 0.29 | 0.36 | 0.11 |

Figure 13: Event probability for levels of visits to GPs – self-assessed health status, St. John's and Urban corridor, continuous sub-sample, 7-year period

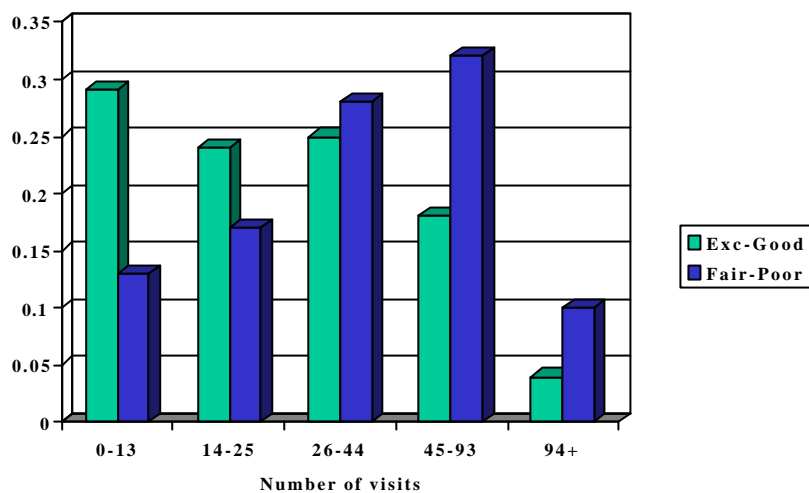


Figure 14: Event probability for levels of visits to GPs – by socio-economic status, St. John's and Urban corridor, continuous sub-sample, 7-year period

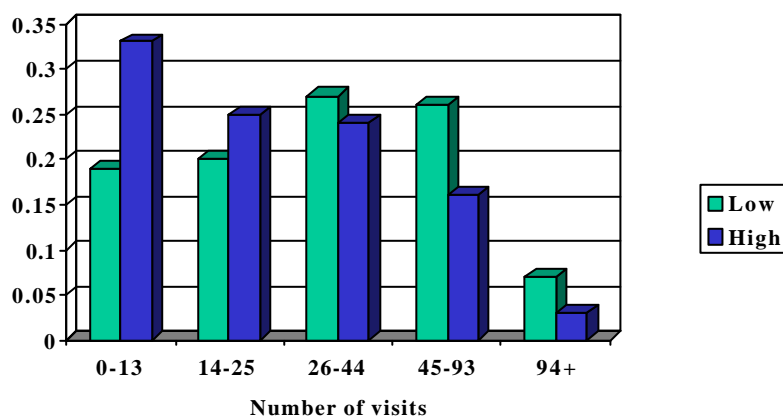


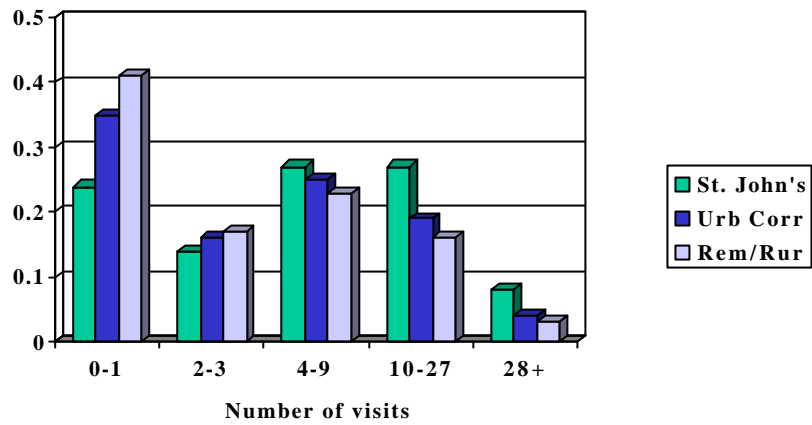
Table 35: Event probability of being at various levels of visiting a GP, Remote/rural areas, for significant variables, including pregnancy visits, ordinal logistic regression, continuous sub-sample, 7-year period

| Variable | Number of visits | | | | |
|--------------------|------------------|------|-------|-------|------|
| | 0-4 | 5-15 | 16-34 | 35-84 | 85+ |
| Sex | | | | | |
| Male | 0.35 | 0.25 | 0.22 | 0.15 | 0.03 |
| Female | 0.20 | 0.22 | 0.28 | 0.24 | 0.06 |
| Age | | | | | |
| 20-39 | 0.31 | 0.24 | 0.24 | 0.17 | 0.04 |
| 60+ | 0.14 | 0.19 | 0.28 | 0.30 | 0.09 |
| SAHS | | | | | |
| Excellent-good | 0.30 | 0.24 | 0.24 | 0.18 | 0.04 |
| Fair-poor | 0.17 | 0.20 | 0.27 | 0.27 | 0.08 |
| SESCORE | | | | | |
| Low | 0.26 | 0.23 | 0.25 | 0.21 | 0.05 |
| High | 0.26 | 0.24 | 0.26 | 0.20 | 0.05 |
| Chronic conditions | | | | | |
| 0 | 0.43 | 0.26 | 0.19 | 0.10 | 0.02 |
| 3+ | 0.13 | 0.18 | 0.29 | 0.31 | 0.09 |

Table 36: Event probability of being at various levels of visiting a specialist, for significant variables, including pregnancy visits, ordinal logistic regression, continuous sub-sample, 7-year period

| Variable | Number of visits | | | | |
|--------------------|------------------|------|------|-------|------|
| | 0-1 | 2-3 | 4-9 | 10-27 | 28+ |
| Sex | | | | | |
| Male | 0.42 | 0.16 | 0.23 | 0.16 | 0.04 |
| Female | 0.27 | 0.16 | 0.27 | 0.24 | 0.06 |
| Age | | | | | |
| 20-39 | 0.42 | 0.16 | 0.23 | 0.16 | 0.03 |
| 60+ | 0.21 | 0.14 | 0.28 | 0.29 | 0.08 |
| SAHS | | | | | |
| Excellent-good | 0.37 | 0.16 | 0.25 | 0.18 | 0.04 |
| Fair-poor | 0.23 | 0.14 | 0.28 | 0.28 | 0.08 |
| SESCORE | | | | | |
| Low | 0.35 | 0.16 | 0.25 | 0.20 | 0.05 |
| High | 0.29 | 0.15 | 0.27 | 0.23 | 0.06 |
| Area of residence | | | | | |
| St. John's | 0.24 | 0.14 | 0.27 | 0.27 | 0.08 |
| Urban corridor | 0.35 | 0.16 | 0.25 | 0.19 | 0.04 |
| Remote/rural | 0.41 | 0.17 | 0.23 | 0.16 | 0.03 |
| Chronic conditions | | | | | |
| 0 | 0.52 | 0.17 | 0.19 | 0.10 | 0.02 |
| 3+ | 0.17 | 0.13 | 0.29 | 0.32 | 0.09 |

Figure 15: Event probability for levels of visits to specialists – by area of residence, continuous sub-sample, 7-year period



Chapter 5 – Patterns of Utilization

Highlights

- Most individuals have a relatively low level of utilization; this is true when using different criteria to define low and high utilization
- Males are more likely to be low users; 23 per cent of males, and nine per cent of females had 0-9 visits to a GP, and 0-1 visits to a specialist, and no hospitalizations
- Studying only visits to physicians (GPs and specialists), 13 per cent could be classified as high or very high users for both GPs and specialists; while 17 per cent were low users for both
- Using another approach, it is possible to identify three distinct groups of high users:
 - High users of GPs: there are 242 individuals, or three per cent
 - High users of GPs and specialists: 305 individuals, or four per cent
 - Finally, high users of the three services: GPs, specialists, and hospitals; there are 587 subjects (seven per cent). These account for 20 per cent of all visits to GPs, 25 per cent of all visits to specialists, and 32 per cent of all hospitalizations, and 36 per cent of all hospital days

Methods

In this chapter, we will address the issue of the relationship between the three services studied in this project: hospitals, general practitioners, and specialists. It is clear from the previous chapters that a substantial number of subjects had contacts with the three services.

One way to look at the relationship is to compare the amount of contacts for the three services; this approach relies on frequencies and tabulations. Firstly, we will study the association between the three services, by computing a correlation matrix. Then, we will study the association between visits to GPs and specialists. And finally, we will study the associations

between all three services. We will identify groups of subjects according to their utilization, and describe them by demographic, socio-economic and health characteristics.

Results

Table 37 shows correlation coefficients for the percentile distributions for each service; it also includes age. The largest correlation coefficient is between number of hospitalizations and total hospital days, which is to be expected. The next coefficient (in absolute value) corresponds to GPs and specialists. Finally, there are moderate associations between visits to specialists and hospital utilization. The associations between visits to GPs and hospitalization variables are not so high. It should be noted that all coefficients are significant, as a consequence of the large sample size; therefore, it is necessary to make judgements based on the absolute values of the coefficients to decide which associations have some practical importance. This first analysis shows that there is a moderate association between the number of contacts for the three services. This also suggests that in many cases, there are exceptions, and that subjects with high volume in one service may be normal users in the others.

In order to simplify this analysis, the next table (Table 38) shows the association between visits to GPs and to specialists, again grouping by percentiles used before. The most important points are: 17.3 per cent of all subjects fall in the low normal category for both GPs and specialists; 36.6 per cent are in the low and middle normal categories for both. On the other hand, 12.9 per cent fall in the high and very high for both GPs and specialists, and 1.4 per cent in the very high categories for both. Another analysis (table not included) shows that 317 subjects, or 3.9 per cent, never had any visits to either a GP or a specialist.

Once we have some understanding of the combined utilization of GPs and specialists, it is appropriate to study the three services. For this, we constructed a table with the same categories by percentiles for physicians and hospital days; this was done for all subjects, and separately by sex, as there were major differences between sexes. Table 39 shows the percentages (computed for all males and for all females) for this analysis (Table A 13 shows the frequencies). In males 23.3 per cent of subjects are in the cell that corresponds to no

hospitalizations, 0-9 GP visits, and 0-1 specialists visits. For females, the same cell has only 8.6 per cent of the subjects; this is to be expected as females have higher levels of utilization.

Another way to analyze this data is to identify groups of subjects with high utilization, for visits to GPs, specialists, and hospitalizations in various combinations. Tables 40 and 41 show these groups. A first group (242 subjects, 2.9 per cent of the continuous sub-sample) has high utilization only for GPs, low utilization for specialists, and no hospitalizations. These subjects had a mean of 66 visits (9.4 per year on average), a range of 42-449 visits, and they account for 6.4 per cent of all visits to GPs. A second group has high utilization for both GPs and specialists, and no hospitalizations. For these 305 subjects (3.7 per cent), and for GPs, the mean is 72.1, range 42-260, and they account for 8.7 per cent of all visits. For specialists, the mean is 21.3 visits, the range 10-134, and they account for 10.5 per cent of all visits. Finally, a third group has high utilization in all the three services. There are 587 subjects (7.1 per cent). For hospitalizations they have a mean of 3.6 hospitalizations, 27.3 hospital days, and they account for 32.2 per cent of hospitalizations and 36.2 per cent of hospital days. With respect to visits to physicians, the mean for GPs is 87.7 (range 42-835), with 20.5 per cent of all visits; for specialists, the mean is 26.0 (range 10-272), and 24.7 per cent of all visits.

Table 41 shows the distributions for demographic, socio-economic and health variables for these three groups, together with the continuous sub-sample for comparison. These three groups are more likely to be female and older than the continuous sub-sample. With respect to socio-economic variables, the first group (high GPs) and the third (high for all services) tend to have lower income and less education. But this does not hold for the second group (high GPs and specialists); these subjects report higher income, and slightly higher education. This may be related to the fact that a higher proportion of this group resides in St. John's (53.4 per cent against 31.3 per cent in the comparison group). The other groups have distributions for residence not much different from the comparison group.

With respect to health variables, for self-assessed health status and number of chronic conditions, there is a trend toward poorer health as we move from high utilization for one service

to the three services. These figures and trends must be studied with prudence; the absolute number in these subgroups is small and, therefore, some differences are not statistically significant. Also, there are subjects in all categories of the variables under study; therefore, it is not possible to arrive at an equivocal categorization of these groups. We will discuss this further in the conclusions.

Table 37: Correlation (Spearman's rho) between grouped values of utilization variables, continuous sub sample, 7-year period

| | Age | N Hosp | Sum LOS | N GP |
|--|-------|--------|---------|-------|
| Age (grouped) | 1.0 | - | - | - |
| Number of hospitalizations (grouped) ¹ | 0.123 | 1.0 | - | - |
| Sum LOS (grouped) ² | 0.143 | 0.981 | 1.0 | - |
| Number of visits to GPs (grouped) ³ | 0.154 | 0.331 | 0.328 | 1.0 |
| Number of visits to Specialists (grouped) ⁴ | 0.196 | 0.430 | 0.432 | 0.531 |

¹: 0, 1, 2-4, 5+

²: 0, 1-4, 5-25, 26+

³: 0-9, 10-22, 23-41, 42-90, 91+

⁴: 0-1, 2-3, 4-9, 10-27, 28+

Table 38: Level of visits to GPs by visits to specialists (as a % of total subjects), continuous sub-sample, 7-year period

| Visits to GPs | Visits to specialists | | | | |
|------------------------|------------------------------|---------------------|----------------------|-----------------|--------------------|
| | 0-1 [low normal] | 2-3 [mid normal] | 4-9 [high normal] | 10-27 [high] | 28+ [very high] |
| 0-9 [low normal] | 1419 ¹ (17.3%) | 347 (4.2%) | 301 (3.7%) | 112 (1.4%) | 13 (0.2%) |
| 10-22 [mid normal] | 802 (9.8%) | 442 (5.4%) | 522 (6.4%) | 237 (2.9%) | 26 (0.3%) |
| 23-41 [high normal] | 406 (4.9%) | 321 (3.9%) | 676 (8.2%) | 503 (6.1%) | 85 (1.0%) |
| 42-90 [high] | 150 (1.8%) | 184 (2.2%) | 477 (5.8%) | 622 (7.6%) | 165 (2.0%) |
| 91+ [very high] | 26 (0.3%) | 26 (0.3%) | 83 (1.0%) | 163 (2.0%) | 111 (1.4%) |

¹: 317 of these had 0 visits to both GPs and specialists

Table 39: Percentage distribution of individuals by sex, by visits to GPs, visits to specialists and length of stay, continuous sub-sample, 7-year period

| Sex | LOS | GP visits | Visits to specialists | | | | | Total |
|-----|------|-----------|-----------------------|------|------|-------|------|-------|
| | | | 0-1 | 2-3 | 4-9 | 10-27 | 28+ | |
| M | 0 | 0-9 | 23.26 | 4.26 | 2.42 | 0.55 | 0.08 | 30.57 |
| | | 10-22 | 10.92 | 5.08 | 5.13 | 1.71 | 0.26 | 23.10 |
| | | 23-41 | 3.10 | 2.24 | 3.81 | 1.82 | 0.32 | 11.29 |
| | | 42-90 | 0.97 | 0.66 | 2.08 | 1.63 | 0.37 | 5.71 |
| | | 91+ | 0.13 | 0.16 | 0.16 | 0.32 | 0.11 | 0.87 |
| | 1-4 | 0-9 | 1.16 | 0.82 | 0.76 | 0.24 | 0.05 | 3.03 |
| | | 10-22 | 0.71 | 0.58 | 0.82 | 0.50 | 0.05 | 2.66 |
| | | 23-41 | 0.34 | 0.32 | 1.21 | 0.95 | 0.13 | 2.95 |
| | | 42-90 | 0.08 | 0.16 | 0.45 | 0.61 | 0.08 | 1.37 |
| | | 91+ | 0.05 | 0.00 | 0.03 | 0.26 | 0.08 | 0.42 |
| | 5-25 | 0-9 | 0.82 | 0.50 | 0.76 | 0.39 | 0.05 | 2.53 |
| | | 10-22 | 0.34 | 0.71 | 1.05 | 0.53 | 0.03 | 2.66 |
| | | 23-41 | 0.05 | 0.24 | 1.03 | 1.45 | 0.32 | 3.08 |
| | | 42-90 | 0.03 | 0.11 | 0.87 | 2.16 | 0.47 | 3.63 |
| | | 91+ | 0.03 | 0.03 | 0.18 | 0.37 | 0.16 | 0.76 |
| | 26+ | 0-9 | 0.13 | 0.13 | 0.26 | 0.16 | 0.05 | 0.74 |
| | | 10-22 | 0.05 | 0.05 | 0.37 | 0.21 | 0.00 | 0.68 |
| | | 23-41 | 0.08 | 0.13 | 0.16 | 0.63 | 0.26 | 1.26 |
| | | 42-90 | 0.03 | 0.00 | 0.47 | 0.92 | 0.39 | 1.82 |
| | | 91+ | 0.00 | 0.03 | 0.11 | 0.29 | 0.47 | 0.89 |
| F | 0 | 0-9 | 8.65 | 1.83 | 1.70 | 0.66 | 0.00 | 12.83 |
| | | 10-22 | 6.61 | 3.26 | 3.37 | 1.34 | 0.18 | 14.76 |
| | | 23-41 | 4.46 | 3.06 | 5.61 | 2.99 | 0.27 | 16.39 |
| | | 42-90 | 1.63 | 1.77 | 3.37 | 3.08 | 0.70 | 10.55 |
| | | 91+ | 0.25 | 0.18 | 0.75 | 0.81 | 0.23 | 2.22 |
| | 1-4 | 0-9 | 1.04 | 0.59 | 0.59 | 0.25 | 0.00 | 2.47 |
| | | 10-22 | 0.75 | 0.63 | 0.88 | 0.63 | 0.02 | 2.92 |
| | | 23-41 | 1.02 | 0.88 | 1.99 | 1.36 | 0.11 | 5.36 |
| | | 42-90 | 0.41 | 0.57 | 1.40 | 1.99 | 0.43 | 4.80 |
| | | 91+ | 0.02 | 0.09 | 0.20 | 0.29 | 0.23 | 0.84 |
| | 5-25 | 0-9 | 0.57 | 0.50 | 0.75 | 0.43 | 0.02 | 2.26 |
| | | 10-22 | 0.43 | 0.57 | 1.18 | 0.70 | 0.09 | 2.97 |
| | | 23-41 | 0.57 | 0.77 | 2.11 | 2.44 | 0.48 | 6.36 |
| | | 42-90 | 0.38 | 0.95 | 2.42 | 3.62 | 1.06 | 8.44 |
| | | 91+ | 0.09 | 0.14 | 0.34 | 1.18 | 0.72 | 2.47 |
| | 26+ | 0-9 | 0.05 | 0.02 | 0.16 | 0.05 | 0.07 | 0.34 |
| | | 10-22 | 0.02 | 0.02 | 0.05 | 0.16 | 0.00 | 0.25 |
| | | 23-41 | 0.07 | 0.05 | 0.25 | 0.43 | 0.18 | 0.97 |
| | | 42-90 | 0.02 | 0.09 | 0.27 | 0.81 | 0.41 | 1.61 |
| | | 91+ | 0.05 | 0.00 | 0.18 | 0.34 | 0.63 | 1.20 |

Table 40: Selected utilization variables for high utilization groups, continuous sub-sample, 7-year period

| | High GP ¹ | High GP, SP ² | High GP, SP, Hosp ³ | Comparison continuous sub-sample |
|----------------------------|----------------------|--------------------------|--------------------------------|----------------------------------|
| N | 242 | 305 | 587 | 8219 |
| Number of hospitalizations | | | | |
| Mean | 0 | 0 | 3.6 | 0.8 |
| Range | | | 1-24 | 0-45 |
| Sum | | | 2,120 | 6,583 |
| Length of stay | | | | |
| Mean | 0 | 0 | 27.3 | 5.4 |
| Range | | | 5-339 | 0-2012 |
| Sum | | | 16,036 | 44,331 |
| Visits to GPs | | | | |
| Mean | 66.1 | 72.1 | 87.7 | 30.6 |
| Range | 42-449 | 42-260 | 42-835 | 0-835 |
| Sum | 16,005 | 21,978 | 51,504 | 251,431 |
| Visits to specialists | | | | |
| Mean | 1.44 | 21.3 | 26.0 | 7.5 |
| Range | 0-3 | 10-134 | 10-272 | 0-369 |
| Sum | 349 | 6,507 | 15,283 | 61,761 |

¹High GP: GP 42+ visits, SP < 4 visits, Sum LOS = 0 days

²High GP, SP: GP 42+ visits, SP 10+ visits, Sum LOS = 0 days

³High GP, SP, Hosp: GP 42+ visits, SP 10+ visits, Sum LOS 5+ days

Table 41: Selected demographic and health variables for high utilization groups, continuous sub-sample, 7-year period

| | High GP ¹ | High GP, SP ² | High GP, SP, Hosp ³ | Comparison continuous sub-sample |
|-----------------------------|----------------------|--------------------------|--------------------------------|----------------------------------|
| N | 242 | 305 | 587 | 8219 |
| % female | 69.8 | 69.8 | 66.1 | 53.8 |
| Age | | | | |
| 20-34 | 20.2 | 17.7 | 22.1 | 29.9 |
| 35-49 | 38.8 | 40.7 | 22.5 | 38.2 |
| 50-64 | 19.4 | 27.2 | 24.0 | 19.7 |
| 65+ | 21.5 | 14.4 | 31.3 | 12.3 |
| Income adequacy | | | | |
| Very low | 12.1 | 3.0 | 11.9 | 6.8 |
| Low | 30.1 | 23.6 | 29.8 | 23.7 |
| Low middle | 34.7 | 29.3 | 34.5 | 35.4 |
| Upper middle | 15.1 | 25.6 | 13.1 | 19.5 |
| High | 7.9 | 18.5 | 10.7 | 14.7 |
| Education | | | | |
| < High school | 45.5 | 31.5 | 48.7 | 35.6 |
| High school | 24.2 | 18.0 | 19.6 | 19.3 |
| Trades/diploma | 20.7 | 29.8 | 20.1 | 25.1 |
| University, no degree | 4.1 | 11.1 | 5.6 | 9.9 |
| University, with degree | 5.4 | 9.5 | 6.0 | 10.1 |
| Residence | | | | |
| St. John's | 31.4 | 53.4 | 36.8 | 31.3 |
| Urban corridor | 29.3 | 25.2 | 31.9 | 29.5 |
| Rural/remote | 39.3 | 21.3 | 31.3 | 39.2 |
| Self assessed health status | | | | |
| Excellent/good | 75.2 | 70.2 | 59.5 | 80.2 |
| Fair/poor | 24.8 | 29.8 | 40.5 | 19.8 |
| Chronic conditions | | | | |
| 0 | 14.9 | 10.5 | 6.0 | 26.6 |
| 1 | 23.6 | 14.8 | 14.8 | 26.6 |
| 2 | 21.8 | 17.7 | 15.7 | 18.9 |
| 3+ | 39.7 | 57.0 | 63.5 | 27.9 |
| LSIndex | | | | |
| Low | 4.6 | 2.6 | 5.3 | 2.5 |
| 2 | 20.7 | 16.2 | 25.3 | 15.3 |
| 3 | 38.6 | 31.7 | 37.2 | 34.3 |
| 4 | 25.3 | 39.3 | 23.4 | 35.5 |
| High | 10.8 | 10.2 | 8.9 | 12.5 |

¹High GP: GP 42+ visits, SP < 4 visits, Sum LOS = 0 days

²High GP, SP: GP 42+ visits, SP 10+ visits, Sum LOS = 0 days

³High GP, SP, Hosp: GP 42+ visits, SP 10+ visits, Sum LOS 5+ days

Utilization before and after regionalization

After this study was developed and submitted for funding, we discovered that the health survey was planned for the year in which regionalization was to be implemented (1994-95). Therefore, the first three years and the last four years were, approximately, before and after regionalization. We assumed that it would be interesting to learn if there were differences between these two periods, which would indicate some influence of this very significant change in the management of the health care system.

Table 42 shows yearly means for number of hospitalizations, length of stay (number of hospital days), visits to GPs, and visits to specialists, for the three areas, and the percent change between these two periods. There are substantial differences between areas. For St. John's, the differences are relatively small: there is a small reduction in the number of hospitalizations, but a nine per cent increase in the number of hospital days. Changes in the mean number of visits for GPs and specialists are very small. In contrast, there differences in the other two areas are more considerable. This is especially true for the difference in the number of hospital days, 25 per cent and 31 per cent for Urban Corridor and for Remote/Rural respectively. There is an increase in the average number of visits to specialists in the Urban Corridor, and to GPs and specialists in Remote/Rural.

Of course, attempts to discern a straightforward cause-effect would be difficult. There were organizational changes, and probably changes in the number of physicians, as well as possible changes in referral patterns. One area, St. John's, is now under a single institutional board, the others include mixes of several institutional and community boards; to try to isolate the effects of these would be complex, even with a large sample size. There were also changes in demographic and social factors. The period under study, seven years, is relatively short to study social and organizational change; there are many factors that may respond to longer "secular drift" effects. The fact that one region had little change, while the others had larger differences, may point to differences in the results of regionalization; but more services do not, necessarily, mean better health care.

Table 42: Amount of utilization per year for the years before and after regionalization, continuous sub-sample, 7-year period

| | 1992-5 | 1995-9 | % change |
|--|--------|--------|----------|
| St. John's | | | |
| Number of hospitalizations (per year) | 0.090 | 0.085 | -5.6 |
| Length of stay (per year) | 0.553 | 0.603 | 9.0 |
| Number of visits to GPs (per year) | 4.933 | 5.013 | 1.6 |
| Number of visits to specialists (per year) | 1.603 | 1.605 | 0.1 |
| Urban Corridor | | | |
| Number of hospitalizations (per year) | 0.120 | 0.135 | 12.5 |
| Length of stay (per year) | 0.753 | 0.938 | 25.1 |
| Number of visits to GPs (per year) | 4.840 | 4.885 | 0.9 |
| Number of visits to specialists (per year) | 0.847 | 1.013 | 19.6 |
| Remote/Rural | | | |
| Number of hospitalizations (per year) | 0.120 | 0.130 | 8.3 |
| Length of stay (per year) | 0.727 | 0.953 | 31.1 |
| Number of visits to GPs (per year) | 3.237 | 3.720 | 14.9 |
| Number of visits to specialists (per year) | 0.667 | 0.810 | 21.4 |

Chapter 6 – Conclusions

The study was done, and its design adopted, to respond to the need to do a population-based study of utilization, without the advantage of a complete and accurate registry of insured individuals. A population-based design permits one to obtain estimates for the whole population under study, namely, adults 20 years and older residing in the island portion of the province of Newfoundland and Labrador.

Hospitalizations are relatively rare events; only a little more than 30 per cent of the subjects had at least one hospitalization in the seven-year period. But subjects hospitalized tend to have more than one episode; of the 2,993 subjects hospitalized, almost half (1,428, or 48 per cent), had two or more hospitalizations. Multiple hospitalizations tend to occur over several years.

Another fact to notice is that there are more hospitalizations and hospital days outside St. John's, when analyzing the data by sex and adjusting for age. This difference is substantial. The hospitalization of subjects dying during the study shows that these subjects had a much larger utilization of hospitalizations, even many years before they died.

The most prevalent diagnoses for hospitalizations are not surprising, corresponding to what we know about morbidity in the province. The role of pregnancy-related hospitalizations is of interest, not only for their volume, almost 25 per cent of all hospitalizations in females, but for the problem they represent to the study of factors associated with utilization. Pregnancy is not a disease, although it may cause pathology in some cases. From the point of view of managers, it demands resources as does any other condition, and therefore, it must be counted equally. From the point of view of explaining utilization, it responds to different underlying causes than illness; therefore, we have excluded pregnancy-related hospitalizations in our multivariate analysis.

The analysis of the place of residence of subjects, and the location of the hospital in which they are hospitalized demonstrates that there is a very clear relationship between the level

of care – availability of specialities, and of diagnostic and therapeutic facilities – and the place to which subjects are referred for hospitalization.

In contrast with hospitalizations, most subjects had a consultation with a physician over the seven-year period. There are differences between GPs and specialists. It is important to underline the differences between areas in terms of the number of visits. For GPs, the major difference is, as expected, in the Remote/Rural area; this is attributable to underreporting as we are missing visits to GPs under salary. It is worth noticing that individuals in the Remote/Rural area have about 70 per cent of the visits seen in the other two areas; this could point to an utilization of salaried physicians of about 30 per cent, but this would appear to be low, as much as 50 per cent of physicians in this area are under salary. Therefore, actual utilization of GPs in this area could be higher than in other areas. In contrast, for specialists, there is a clear gradient in the mean number of visits as we go from St. John's (highest), to the Urban Corridor, and finally, to the Remote/Rural area (lowest). This could be attributed to the availability of specialists.

One factor that calls for attention is the very large number of consultations to physicians in some individuals. The issue of high utilization is one that stimulates great interest in policy makers and managers, considering the large volume of resources used by relatively few individuals. Analysis of demographic, socio-economic and health variables show some trends, but they are not substantial. It is necessary to be careful about reaching conclusions, and labeling these individuals. It is also important to remember that not all utilization is initiated by patients; this is especially true in the case of specialists and even more so for hospitalizations. We have not yet considered variables related to providers.

If an individual requires medical attention several times a month, it cannot be doubted that something is wrong and that this requires some attention, and probably a different kind of services or even a specific program. From the point of view of resources, this needs monitoring, and actions related to a careful consideration of all possible aspects related to patients and providers.

The analysis of the factors associated with the volume of utilization resulted in results that confirm findings from other studies, in the province and in Canada. These results confirm the importance of demographic, socio-economic and health variables, and are good indication of the magnitude of their influence. Some results are intriguing; for example, for hospitalizations, both the number and for length of stay, the socio-economic variables included in the models are employment and education. The influence of education is higher, while employment has a modest effect. But for visits to physicians, the significant variable is SESCORE, an additive score including income and education. But for GPs, lower levels have more visits, while for specialists, the reverse occurs.

All tables presenting data for each of the seven years of the study show a trend toward higher utilization. A preliminary analysis of the contribution to each year of three groups, normal users (up to 75 percentile), high users, and subjects dying (not shown) demonstrates this is related, in part, to the better representation of higher users, and to the inclusion of subjects dying during the study. Another factor maybe the aging of the sample, and the loss of younger subjects due to emigration.

Finally, it is of interest to ascertain how our figures compare with Canada and other countries. Table 43 shows that our data is similar to the other countries for visits to physicians but lower for mean number of hospital days. This is most likely explained by the fact that our data is for adults only, and we did not include institutionalized persons in our study.

Table 43: Mean number of visits to physicians and mean hospital days for selected countries¹ and the NF survey

| Country | Mean number of visits to physicians | Mean number of hospital days |
|----------------|-------------------------------------|------------------------------|
| Canada | 6.6 | 1.9 |
| France | 6.5 | 2.6 |
| United Kingdom | 5.1 | 1.7 |
| USA | 6.0 | 1.1 |
| NPHMC | 5.6 | 0.8 |

¹: OECD Health Data, 1999, Vol. 10/11/99; CREDES, Paris (CD Version)

The longitudinal design for the utilization panel has both advantages and disadvantages. The main advantage is a more valid capture of utilization events, as the period, seven years, reduces the possibility of “truncating” the data, as can happen with shorter capture periods. It is possible to obtain more information on frequent users, as these subjects have many events over several years; this is especially true for hospitalizations, which are relatively rare events. It was also possible to obtain data on utilization before death in those subjects dying after the survey. Therefore, the design allows for a more valid representation of the utilization experience of the sample, which is closer to the real experience of the population than in most studies using shorter periods, usually one year. The main disadvantage is the unavoidable loss of subjects over the length of the study. In one case, death, this becomes an added benefit, as it is possible to gain some understanding of their utilization experience. For subjects lost due to emigration or other causes, we know with certainty that these losses were due to emigration in most cases, and we have some data about their utilization. The follow-up survey was able to contact, or find information on, over 99 per cent of the individuals either directly or from their contacts.

Another confounder is related to subjects moving within the province during the study. We know how many subjects moved, and their new address. There were 7,891 individuals who did not move residence. We have computed age-adjusted means by area and by sex for number of hospitalizations, length of stay, and visits to GPs and specialists (not shown), for this group as well as for the 8,219 in the continuous sub-sample. The differences are minimal. This shows that movement within the province does not affect the overall utilization picture.

There are not many longitudinal studies of medical care utilization. Therefore, there are few precedents about the interpretation and presentation of utilization over a number of years. We are presenting the data in several formats, trying to convey a picture about utilization over the duration of the panel, but also presenting year averages, to facilitate comparisons with other studies. The seven-period for this research was decided on practical grounds: the length of the study, and cost.

Recommendations

As always happens with research, we have answered some questions, but raised many new ones.

The study was done, and its design adopted, to respond to the need to do a population-based study of utilization, without the advantage of a complete and accurate registry of insured individuals. But once the provincial registry is updated – a task in progress – it would be possible to develop a permanent monitoring system of utilization. This could include comparisons of the utilization experience of longitudinal panels of different duration, for example, five and ten years, to arrive at standards for the collection, analysis and presentation of longitudinal data. Another issue to solve is how to present the data. Most of the data available for international comparisons use means (as the OECD data presented). But although the mean is easy to obtain and interpret, it is not the best summary measure, as the distributions are not normal. We think that it would not be difficult to adopt a more comprehensive presentation, by simply computing the mean and quartiles, which would give a better representation of the shape of the distribution, and allow for more precise comparisons.

It is obvious that socio-economic factors play an important role in explaining medical care utilization. Future studies should include more comprehensive socio-economic variables, such as income changes over time, the effects of employment and underemployment, and demographic changes.

The initial design of this study included abstracting records from salary GPs, for a one-year period, to gain some insights into their level of utilization. Changes related to regionalization, and the constant rotation of salaried physicians made this approach difficult to implement, and it had to be abandoned. To obtain a complete picture of the utilization of GPs, procedures such as “shadow” billing for salaried physicians should be instituted. Until then, the total utilization of GPs in areas with a significant proportion of them under salary will remain a conjecture, although this information would be important for policy purposes.

Appendix

Supplementary Tables

Table A 1: Number and percentage of individuals in areas by urbanization by Institutional Boards

| Institutional Boards | Degree of urbanization | | | |
|----------------------|------------------------|----------------|---------------|---------------|
| | St. John's | Urban Corridor | Remote/Rural | Total |
| St. John's | 3947 86.4% | 308 6.7% | 313 6.9% | 4568 100% |
| Avalon | - | 532 45.5% | 638 54.5% | 1170 100% |
| Peninsulas | - | 621 46.3% | 721 53.7% | 1342 100% |
| Central East | - | 160 15.2% | 892 84.8% | 1052 100% |
| Central West | - | 655 49.6% | 665 50.4% | 1320 100% |
| Western | - | 1089 51.6% | 1022 48.4% | 2111 100% |
| Grenfell | - | - | 226 100% | 226 100% |
| Total | 3947 33.5% | 3365 28.5% | 4477 38.0% | 11789 100% |

Table A 2: Age and sex distribution for the three areas of the province, continuous sub-sample

| | St. John's | Urban Corridor | Remote/Rural |
|---------------|------------|----------------|--------------|
| Male | | | |
| 20-29 | 20.5 | 18.4 | 17.0 |
| 30-39 | 25.3 | 22.6 | 21.9 |
| 40-49 | 25.7 | 26.4 | 26.9 |
| 50-59 | 15.3 | 15.8 | 14.7 |
| 60-69 | 8.3 | 9.3 | 11.1 |
| 70+ | 4.9 | 7.5 | 8.4 |
| Female | | | |
| 20-29 | 21.9 | 16.7 | 17.0 |
| 30-39 | 23.3 | 24.3 | 25.3 |
| 40-49 | 24.5 | 27.0 | 24.6 |
| 50-59 | 14.0 | 12.7 | 14.3 |
| 60-69 | 8.7 | 10.6 | 9.6 |
| 70+ | 7.5 | 8.8 | 9.1 |

Table A 3: Number of hospitalizations and mean length of stay per 100 persons per year, continuous sub-sample, 7-year period

| | Number of hospitalizations | | | Length of stay | | |
|----------------------------|----------------------------|----------------|--------------|----------------|----------------|--------------------|
| | St. John's | Urban Corridor | Remote/Rural | St. John's | Urban Corridor | Remote/Rural |
| Females | | | | | | |
| 20-29 | 11.2 | 21.8 | 18.6 | 44.4 | 117.8 | 67.7 |
| 30-39 | 10.1 | 11.9 | 10.6 | 47.8 | 60.3 | 46.1 |
| 40-49 | 7.1 | 9.7 | 8.2 | 40.5 | 48.7 | 42.1 |
| 50-59 | 10.4 | 11.7 | 13.8 | 85.6 | 72.0 | 79.5 |
| 60-69 | 9.3 | 16.7 | 19.3 | 68.5 | 152.6 | 126.2 |
| 70+ | 19.5 | 24.1 | 26.3 | 199.5 | 225.2 | 223.8 |
| Females (excl preg) | | | | | | |
| 20-29 | 4.3 | 9.7 | 6.3 | 21.0 | 69.7 | 24.0 |
| 30-39 | 4.9 | 7.1 | 7.1 | 24.3 | 40.1 | 31.6 |
| 40-49 | 6.6 | 9.6 | 8.1 | 38.1 | 48.5 | 41.9 |
| 50-59 | 10.4 | 11.7 | 13.8 | 85.6 | 72.0 | 79.5 |
| 60-69 | 9.3 | 16.7 | 19.3 | 68.5 | 152.6 | 126.2 |
| 70+ | 19.5 | 24.1 | 26.3 | 199.5 | 225.2 | 223.8 |
| Males | | | | | | |
| 20-29 | 2.3 | 5.9 | 4.9 | 10.4 | 37.1 | 132.9 ¹ |
| 30-39 | 3.6 | 6.5 | 5.8 | 37.6 | 37.6 | 44.0 |
| 40-49 | 4.3 | 8.6 | 5.5 | 24.6 | 60.8 | 41.8 |
| 50-59 | 8.3 | 11.1 | 11.5 | 54.3 | 71.8 | 63.1 |
| 60-69 | 18.0 | 22.8 | 24.0 | 140.9 | 183.5 | 170.5 |
| 70+ | 29.3 | 32.3 | 33.5 | 267.0 | 246.9 | 272.2 |

¹ one extreme case increases the value for length of stay

Table A 4: Selected hospital indicators by year, those dying in 1995/6

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 |
|------------------------------------|--------|--------|--------|--------|
| Total length of stay (days) | | | | |
| Mean | 6.67 | 11.42 | 14.89 | 31.87 |
| Median | 0 | 0 | 0 | 8 |
| SD | 18.70 | 24.48 | 32.81 | 51.77 |
| Range | 0-104 | 0-92 | 0-169 | 0-260 |
| Sum | 300 | 514 | 670 | 1434 |
| Number of hospitalizations | | | | |
| Mean | 0.60 | 0.67 | 1.00 | 1.78 |
| Median | 0 | 0 | 0 | 1 |
| SD | 1.36 | 1.33 | 1.68 | 1.57 |
| Range | 0-7 | 0-6 | 0-9 | 0-6 |
| Sum | 27 | 30 | 45 | 80 |
| Number of subjects | 45 | 45 | 45 | 45 |

Table A 5: Selected hospital indicators by year, those dying in 1996/7

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 |
|-----------------------------|--------|--------|--------|--------|--------|
| Total length of stay (days) | | | | | |
| Mean | 4.66 | 5.98 | 5.60 | 9.79 | 24.48 |
| Median | 0 | 0 | 0 | 0 | 14.50 |
| SD | 12.38 | 13.98 | 11.78 | 18.13 | 32.69 |
| Range | 0-69 | 0-72 | 0-66 | 0-80 | 0-127 |
| Sum | 270 | 347 | 325 | 568 | 1420 |
| Number of hospitalizations | | | | | |
| Mean | 0.38 | 0.45 | 0.69 | 1.03 | 1.62 |
| Median | 0 | 0 | 0 | 0 | 1 |
| SD | 0.85 | 0.84 | 1.13 | 1.78 | 1.62 |
| Range | 0-4 | 0-3 | 0-5 | 0-8 | 0-8 |
| Sum | 22 | 26 | 40 | 60 | 94 |
| Number of subjects | 58 | 58 | 58 | 58 | 58 |

Table A 6: Selected hospital indicators by year, those dying in 1997/8

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 | 1997-8 |
|-----------------------------|--------|--------|--------|--------|--------|--------|
| Total length of stay (days) | | | | | | |
| Mean | 6.08 | 5.88 | 5.52 | 6.23 | 8.36 | 27.88 |
| Median | 0 | 0 | 0 | 0 | 0 | 12 |
| SD | 16.51 | 14.26 | 21.64 | 10.95 | 18.43 | 47.77 |
| Range | 0-98 | 0-86 | 0-181 | 0-49 | 0-102 | 0-324 |
| Sum | 456 | 441 | 414 | 467 | 627 | 2091 |
| Number of hospitalizations | | | | | | |
| Mean | 0.49 | 0.47 | 0.44 | 0.60 | 0.76 | 1.47 |
| Median | 0 | 0 | 0 | 0 | 0 | 1 |
| SD | 1.02 | 0.91 | 0.79 | 0.84 | 1.50 | 1.26 |
| Range | 0-4 | 0-5 | 0-4 | 0-3 | 0-9 | 0-6 |
| Sum | 37 | 35 | 33 | 45 | 57 | 110 |
| Number of subjects | 75 | 75 | 75 | 75 | 75 | 75 |

Table A 7: Selected hospital indicators by year, those dying in 1998/9

| | 1992-3 | 1993-4 | 1994-5 | 1995-6 | 1996-7 | 1997-8 | 1998-9 |
|-----------------------------|--------|--------|--------|--------|--------|--------|--------|
| Total length of stay (days) | | | | | | | |
| Mean | 2.51 | 2.46 | 2.10 | 3.65 | 5.46 | 9.96 | 22.25 |
| Median | 0 | 0 | 0 | 0 | 0 | 0 | 10.50 |
| SD | 6.47 | 8.14 | 5.52 | 7.10 | 15.07 | 18.78 | 28.59 |
| Range | 0-28 | 0-49 | 0-37 | 0-29 | 0-95 | 0-93 | 0-118 |
| Sum | 171 | 167 | 143 | 248 | 371 | 677 | 1513 |
| Number of hospitalizations | | | | | | | |
| Mean | 0.32 | 0.24 | 0.38 | 0.46 | 0.56 | 0.88 | 1.51 |
| Median | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| SD | 0.72 | 0.58 | 0.86 | 0.92 | 1.04 | 1.26 | 1.41 |
| Range | 0-3 | 0-3 | 0-5 | 0-4 | 0-5 | 0-5 | 0-7 |
| Sum | 22 | 16 | 26 | 31 | 38 | 60 | 103 |
| Number of subjects | 68 | 68 | 68 | 68 | 68 | 68 | 68 |

Table A 8: Number of hospitalizations, sum of length of stay and mean days per hospitalization for principal diagnosis by sex, continuous sub-sample, 7-year period

| | Males | | | | | | Females | | | | | |
|-----------------|------------------|------|----------------|------|-----|------|------------------|------|----------------|------|-----|------|
| | Hospitalizations | | Length of stay | | | | Hospitalizations | | Length of stay | | | |
| | Visits | % | Sum LOS | % | N | Mean | Visits | % | Sum LOS | % | N | Mean |
| Diagnosis | | | | | | | | | | | | |
| Infectious | 17 | 0.7 | 122 | 0.6 | 17 | 7.2 | 13 | 0.3 | 96 | 0.4 | 13 | 7.4 |
| Neoplasm | 113 | 4.4 | 1145 | 5.6 | 87 | 13.2 | 233 | 5.8 | 1653 | 6.9 | 193 | 8.6 |
| Endocrine | 57 | 2.2 | 590 | 2.9 | 41 | 14.4 | 75 | 1.9 | 735 | 3.1 | 60 | 12.3 |
| Blood | 15 | 0.6 | 150 | 0.7 | 12 | 12.5 | 11 | 0.3 | 75 | 0.3 | 8 | 9.4 |
| Mental | 152 | 5.9 | 4088 | 20.1 | 64 | 63.9 | 109 | 2.7 | 1862 | 7.8 | 69 | 27.0 |
| Nervous | 72 | 2.8 | 401 | 2.0 | 54 | 7.4 | 117 | 2.9 | 583 | 2.4 | 77 | 7.6 |
| Circulatory | 591 | 23.1 | 5057 | 24.9 | 274 | 18.5 | 427 | 10.6 | 3762 | 15.7 | 230 | 16.4 |
| Respiratory | 226 | 8.8 | 1368 | 6.7 | 106 | 12.9 | 207 | 5.1 | 1073 | 4.5 | 146 | 7.3 |
| Digestive | 374 | 14.6 | 2233 | 11.0 | 265 | 8.4 | 578 | 14.4 | 3181 | 13.3 | 395 | 8.1 |
| Genitourinary | 196 | 7.7 | 861 | 4.2 | 144 | 6.0 | 454 | 11.3 | 2092 | 8.7 | 381 | 5.5 |
| Pregnancy | - | - | - | - | - | - | 931 | 23.1 | 3622 | 15.1 | 563 | 6.4 |
| Skin | 47 | 1.8 | 334 | 1.6 | 40 | 8.4 | 47 | 1.2 | 290 | 1.2 | 42 | 6.9 |
| Musculoskeletal | 191 | 7.5 | 1269 | 6.2 | 142 | 8.9 | 181 | 4.5 | 1468 | 6.1 | 131 | 11.2 |
| Congenital | 5 | 0.2 | 19 | 0.1 | 3 | 6.3 | 3 | 0.1 | 54 | 0.2 | 3 | 18.0 |
| Ill-defined | 214 | 8.4 | 734 | 3.6 | 168 | 4.4 | 267 | 6.6 | 1166 | 4.9 | 195 | 6.0 |
| Injury | 214 | 8.4 | 1563 | 7.7 | 190 | 8.2 | 215 | 5.3 | 1649 | 6.9 | 174 | 9.5 |
| Supplementary | 77 | 3.0 | 414 | 2.0 | 68 | 6.1 | 154 | 3.8 | 622 | 2.6 | 135 | 4.6 |
| Total | 2561 | 100 | 20348 | 100 | - | - | 4022 | 100 | 23983 | 100 | - | - |

Table A 9: Number of visits to GPs and specialists per 100 persons per year, continuous sub-sample, 7-year period

| | Number of GP visits | | | Number of specialist visits | | |
|----------------|---------------------|----------------|--------------|-----------------------------|----------------|--------------|
| | St. John's | Urban Corridor | Remote/Rural | St. John's | Urban Corridor | Remote/Rural |
| Females | | | | | | |
| 20-29 | 598 | 633 | 392 | 137 | 104 | 70 |
| 30-39 | 581 | 554 | 350 | 176 | 83 | 75 |
| 40-49 | 527 | 559 | 376 | 172 | 97 | 75 |
| 50-59 | 668 | 563 | 426 | 270 | 114 | 93 |
| 60-69 | 590 | 632 | 551 | 174 | 143 | 126 |
| 70+ | 802 | 712 | 684 | 257 | 132 | 108 |
| Males | | | | | | |
| 20-29 | 229 | 237 | 157 | 59 | 47 | 32 |
| 30-39 | 300 | 268 | 194 | 97 | 53 | 46 |
| 40-49 | 359 | 375 | 220 | 107 | 94 | 53 |
| 50-59 | 474 | 391 | 279 | 190 | 92 | 79 |
| 60-69 | 578 | 541 | 398 | 251 | 127 | 103 |
| 70+ | 758 | 659 | 658 | 332 | 132 | 133 |

Table A 10: Number of visits to GPs and mean number per person, by diagnosis and sex, continuous sub-sample, 7-year period

| | Males | | | | Females | | | |
|----------------------|--------|------|-------------|------|---------|------|-------------|------|
| | Visits | % | N with diag | Mean | Visits | % | N with diag | Mean |
| Diagnosis | | | | | | | | |
| Infectious | 1738 | 2.0 | 898 | 1.9 | 3219 | 2.0 | 1458 | 2.2 |
| Neoplasm | 305 | 0.3 | 153 | 2.0 | 430 | 0.3 | 225 | 1.9 |
| Endocrine | 4635 | 5.3 | 972 | 4.8 | 8795 | 5.4 | 1387 | 6.3 |
| Blood | 1136 | 1.3 | 231 | 4.9 | 2720 | 1.7 | 628 | 4.3 |
| Mental | 4046 | 4.6 | 828 | 4.9 | 8588 | 5.2 | 1767 | 4.9 |
| Nervous | 4893 | 5.6 | 1674 | 2.9 | 8532 | 5.2 | 2382 | 3.6 |
| Circulatory | 14680 | 16.8 | 1453 | 10.1 | 19560 | 11.9 | 1955 | 10.0 |
| Respiratory | 13509 | 15.4 | 2456 | 5.5 | 23576 | 14.4 | 3425 | 6.9 |
| Digestive | 3409 | 3.9 | 1196 | 2.9 | 5331 | 3.3 | 1666 | 3.2 |
| Genitourinary | 2698 | 3.1 | 947 | 2.8 | 19527 | 11.9 | 3302 | 5.9 |
| Pregnancy | - | - | - | - | 6035 | 3.7 | 588 | 10.3 |
| Skin | 4570 | 5.2 | 1543 | 3.0 | 6557 | 4.0 | 2190 | 3.0 |
| Musculoskeletal | 9763 | 11.2 | 2037 | 4.8 | 13530 | 8.3 | 2624 | 5.2 |
| Congenital | 99 | 0.1 | 47 | 2.1 | 98 | 0.1 | 75 | 1.3 |
| Perinatal | - | - | - | - | - | - | - | - |
| Ill-defined | 16258 | 18.6 | 2713 | 6.0 | 31660 | 19.3 | 3663 | 8.6 |
| Injury and poisoning | 5781 | 6.6 | 1807 | 3.2 | 5753 | 3.5 | 2044 | 2.8 |
| Total | 87520 | 100 | - | - | 163911 | 100 | - | - |

Table A 11: Number of visits to specialists and mean number per person, by diagnosis and sex, continuous sub-sample, 7-year period

| | Males | | | | Females | | | |
|----------------------|--------|------|-------------|------|---------|------|-------------|------|
| | Visits | % | N with diag | Mean | Visits | % | N with diag | Mean |
| Diagnosis | | | | | | | | |
| Infectious | 307 | 1.3 | 132 | 2.3 | 555 | 1.5 | 264 | 2.1 |
| Neoplasm | 1104 | 4.6 | 314 | 3.5 | 1849 | 4.9 | 666 | 2.8 |
| Endocrine | 734 | 3.1 | 185 | 4.0 | 1570 | 4.1 | 364 | 4.3 |
| Blood | 125 | 0.5 | 48 | 2.6 | 160 | 0.4 | 71 | 2.3 |
| Mental | 2550 | 10.7 | 204 | 12.5 | 3322 | 8.8 | 286 | 11.6 |
| Nervous | 3958 | 16.6 | 1059 | 3.7 | 5440 | 14.3 | 1438 | 3.8 |
| Circulatory | 2175 | 9.1 | 524 | 4.2 | 1648 | 4.3 | 535 | 3.1 |
| Respiratory | 1201 | 5.0 | 459 | 2.6 | 2067 | 5.4 | 727 | 2.8 |
| Digestive | 1272 | 5.3 | 513 | 2.5 | 1808 | 4.8 | 708 | 2.6 |
| Genitourinary | 2212 | 9.3 | 632 | 3.5 | 6753 | 17.8 | 1692 | 4.0 |
| Pregnancy | - | - | - | - | 2302 | 6.1 | 378 | 6.1 |
| Skin | 1568 | 6.6 | 521 | 3.0 | 2255 | 5.9 | 800 | 2.8 |
| Musculoskeletal | 2561 | 10.8 | 758 | 3.4 | 3515 | 9.3 | 913 | 3.8 |
| Congenital | 52 | 0.2 | 17 | 3.1 | 48 | 0.1 | 27 | 1.8 |
| Perinatal | - | - | - | - | - | - | - | - |
| Ill-defined | 3024 | 12.7 | 1085 | 2.8 | 3594 | 9.5 | 1386 | 2.6 |
| Injury and poisoning | 963 | 4.0 | 351 | 2.7 | 1069 | 2.8 | 380 | 2.8 |
| Total | 23806 | 100 | - | - | 37955 | 100 | - | - |

Table A 12: Specialist visits by speciality of doctor by sex, continuous sub-sample, 7-year period

| Speciality | Male | | | | Female | | | |
|--------------------------|--------|------|-----|------|--------|------|------|------|
| | Visits | % | N | Mean | Visits | % | N | Mean |
| Anaesthesia | 77 | 0.3 | 60 | 1.3 | 107 | 0.3 | 88 | 1.2 |
| Emergency med | 27 | 0.1 | 27 | 1.0 | 34 | 0.1 | 34 | 1.0 |
| Dermatology | 1175 | 4.9 | 292 | 4.0 | 1814 | 4.8 | 532 | 3.4 |
| General surgery | 2253 | 9.5 | 901 | 2.5 | 3917 | 10.3 | 1395 | 2.8 |
| Cardiac surgery | 30 | 0.1 | 24 | 1.3 | 15 | <0.1 | 8 | 1.9 |
| Vascular surgery | 204 | 0.9 | 74 | 2.8 | 336 | 0.9 | 109 | 3.1 |
| Thoracic surgery | 108 | 0.5 | 39 | 2.8 | 126 | 0.3 | 54 | 2.3 |
| Internal medicine | 2989 | 12.6 | 744 | 4.0 | 3655 | 9.6 | 955 | 3.8 |
| Cardiology | 1247 | 5.2 | 378 | 3.3 | 775 | 2.0 | 313 | 2.5 |
| Endocrinology | 98 | 0.4 | 22 | 4.4 | 342 | 0.9 | 92 | 3.7 |
| Respirology | 356 | 1.5 | 107 | 3.3 | 464 | 1.2 | 119 | 3.9 |
| Rheumatology | 362 | 1.5 | 61 | 5.9 | 457 | 1.2 | 156 | 2.9 |
| Gastroenterology | 882 | 3.7 | 287 | 3.1 | 1357 | 3.6 | 456 | 3.0 |
| Medical Oncology | 1 | <0.1 | 1 | 1.0 | - | - | - | - |
| Nephrology | 234 | 1.0 | 31 | 7.5 | 149 | 0.4 | 41 | 3.6 |
| Haematology | 292 | 1.2 | 41 | 7.1 | 295 | 0.8 | 73 | 4.0 |
| Neurology | 545 | 2.3 | 253 | 2.1 | 724 | 1.9 | 393 | 1.8 |
| Neurosurgery | 343 | 1.4 | 135 | 2.5 | 309 | 0.8 | 133 | 2.3 |
| Obs/gynaecology | 48 | 0.2 | 19 | 2.5 | 7825 | 20.6 | 1576 | 5.0 |
| Gyne oncology | - | - | - | - | 250 | 0.7 | 59 | 4.2 |
| Ophthalmology | 2649 | 11.1 | 783 | 3.4 | 3710 | 9.8 | 1051 | 3.5 |
| Orthopaedic surgery | 2461 | 10.3 | 775 | 3.2 | 3126 | 8.2 | 916 | 3.4 |
| Otolaryngology | 2076 | 8.7 | 679 | 3.1 | 3027 | 8.0 | 976 | 3.1 |
| Paediatrics | 111 | 0.5 | 89 | 1.2 | 316 | 0.8 | 244 | 1.3 |
| Pediatric cardiology | - | - | - | - | 2 | <0.1 | 1 | 2.0 |
| Pediatric endocrinology | - | - | - | - | 2 | <0.1 | 1 | 2.0 |
| Pediatric immunology | 24 | 0.1 | 18 | 1.3 | 55 | 0.1 | 44 | 1.3 |
| Physical Medicine | 7 | <0.1 | 6 | 1.2 | 51 | 0.1 | 20 | 2.6 |
| Plastic surgery | 240 | 1.0 | 96 | 2.5 | 336 | 0.9 | 161 | 2.1 |
| Psychiatry | 2555 | 10.7 | 179 | 14.3 | 3328 | 8.8 | 235 | 14.2 |
| Urology | 2412 | 10.1 | 722 | 3.3 | 1039 | 2.7 | 370 | 2.8 |
| Developmental pediatrics | - | - | - | - | 12 | <0.1 | 4 | 3.0 |
| Total | 23806 | 100 | - | - | 37955 | 100 | - | - |

Table A 13: Count of individuals by sex, visits to GPs, visits to specialists, and length of stay, continuous sub-sample, 7-year period

| Sex | LOS | GP visits | Visits to specialists | | | | | Total |
|-----|------|-----------|-----------------------|-----|-----|-------|-----|-------|
| | | | 0-1 | 2-3 | 4-9 | 10-27 | 28+ | |
| M | 0 | 0-9 | 884 | 162 | 92 | 21 | 3 | 1162 |
| | | 10-22 | 415 | 193 | 195 | 65 | 10 | 878 |
| | | 23-41 | 118 | 85 | 145 | 69 | 12 | 429 |
| | | 42-90 | 37 | 25 | 79 | 62 | 14 | 217 |
| | | 91+ | 5 | 6 | 6 | 12 | 4 | 33 |
| | 1-4 | 0-9 | 44 | 31 | 29 | 9 | 2 | 115 |
| | | 10-22 | 27 | 22 | 31 | 19 | 2 | 101 |
| | | 23-41 | 13 | 12 | 46 | 36 | 5 | 112 |
| | | 42-90 | 3 | 6 | 17 | 23 | 3 | 52 |
| | | 91+ | 2 | - | 1 | 10 | 3 | 16 |
| | 5-25 | 0-9 | 31 | 19 | 29 | 15 | 2 | 96 |
| | | 10-22 | 13 | 27 | 40 | 20 | 1 | 101 |
| | | 23-41 | 2 | 9 | 39 | 55 | 12 | 117 |
| | | 42-90 | 1 | 4 | 33 | 82 | 18 | 138 |
| | | 91+ | 1 | 1 | 7 | 14 | 6 | 29 |
| | 26+ | 0-9 | 5 | 5 | 10 | 6 | 2 | 28 |
| | | 10-22 | 2 | 2 | 14 | 8 | - | 26 |
| | | 23-41 | 3 | 5 | 6 | 24 | 10 | 48 |
| | | 42-90 | 1 | - | 18 | 35 | 15 | 69 |
| | | 91+ | - | 1 | 4 | 11 | 18 | 34 |
| F | 0 | 0-9 | 382 | 81 | 75 | 29 | - | 567 |
| | | 10-22 | 292 | 144 | 149 | 59 | 8 | 652 |
| | | 23-41 | 197 | 135 | 248 | 132 | 12 | 724 |
| | | 42-90 | 72 | 78 | 149 | 136 | 31 | 466 |
| | | 91+ | 11 | 8 | 33 | 36 | 10 | 98 |
| | 1-4 | 0-9 | 46 | 26 | 26 | 11 | - | 109 |
| | | 10-22 | 33 | 28 | 39 | 28 | 1 | 129 |
| | | 23-41 | 45 | 39 | 88 | 60 | 5 | 237 |
| | | 42-90 | 18 | 25 | 62 | 88 | 19 | 212 |
| | | 91+ | 1 | 4 | 9 | 13 | 10 | 37 |
| | 5-25 | 0-9 | 25 | 22 | 33 | 19 | 1 | 100 |
| | | 10-22 | 19 | 25 | 52 | 31 | 4 | 131 |
| | | 23-41 | 25 | 34 | 93 | 108 | 21 | 281 |
| | | 42-90 | 17 | 42 | 107 | 160 | 47 | 373 |
| | | 91+ | 4 | 6 | 15 | 52 | 32 | 109 |
| | 26+ | 0-9 | 2 | 1 | 7 | 2 | 3 | 15 |
| | | 10-22 | 1 | 1 | 2 | 7 | - | 11 |
| | | 23-41 | 3 | 2 | 11 | 19 | 8 | 43 |
| | | 42-90 | 1 | 4 | 12 | 36 | 18 | 71 |
| | | 91+ | 2 | - | 8 | 15 | 28 | 53 |

Supplementary Figures

Figure A 1: Areas by degree of urbanization and medical care resources, Newfoundland

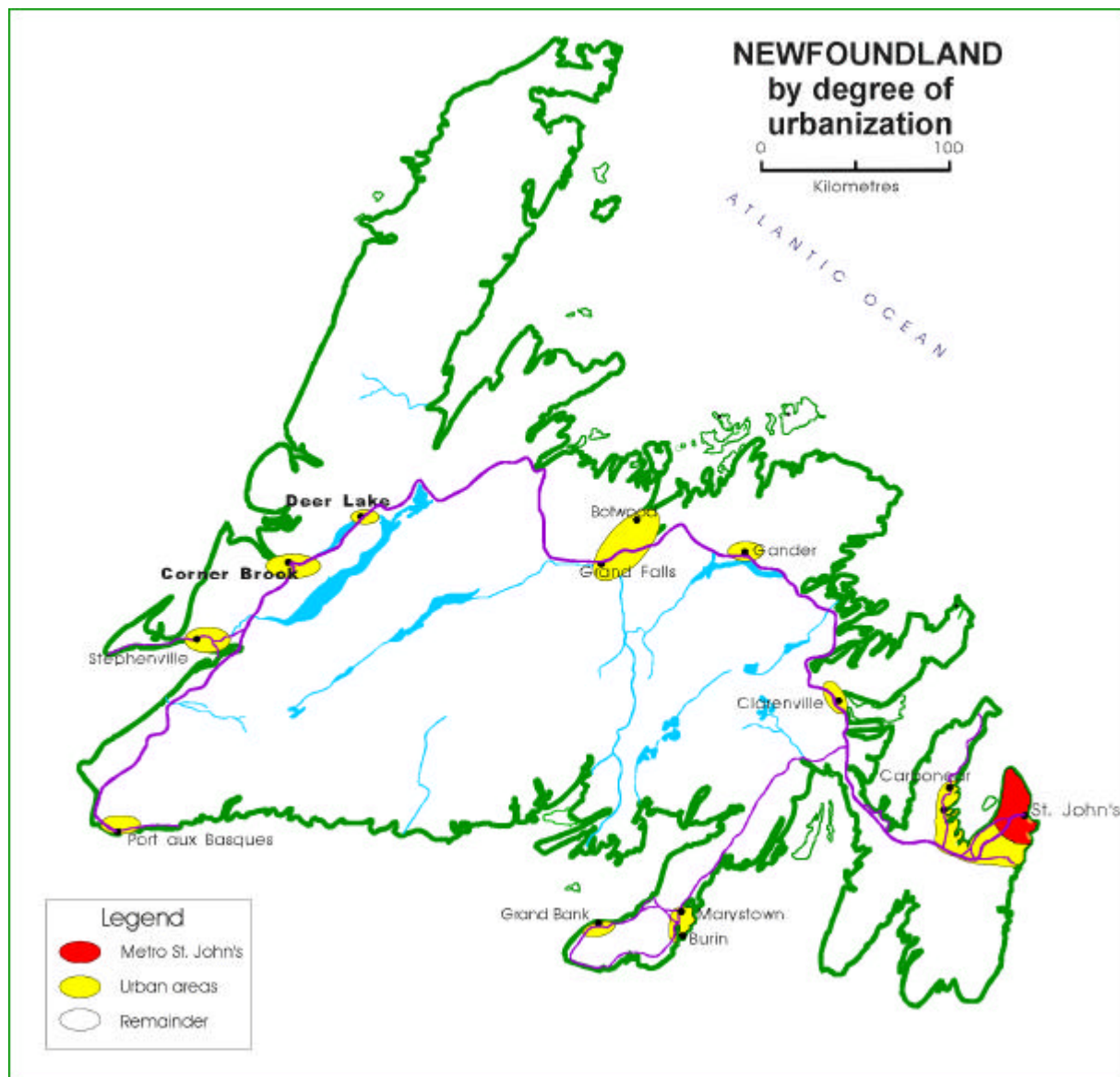
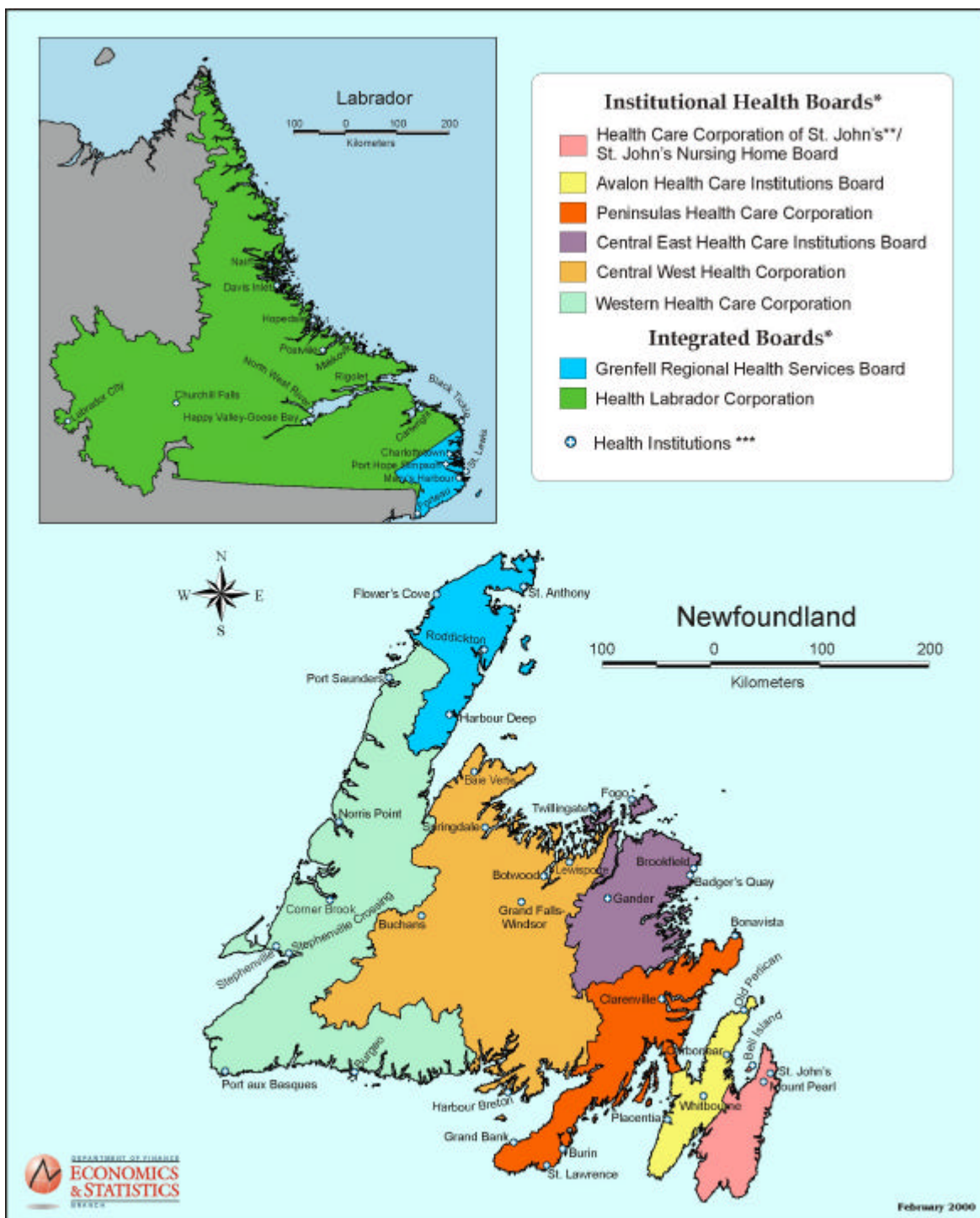


Figure A 2: Map of Institutional Health Boards, Newfoundland



* The Institutional Health Boards provide institutional health services. The Integrated Boards provide both institutional, and health and community services.

** The Health Care Corporation of St. John's has a tertiary care mandate for the entire province.

*** Locations of Hospitals, Nursing Homes, Community Health Centres, or Community Clinics administered by the Boards.

Note: The Newfoundland Cancer Treatment and Research Foundation offers services throughout the province.

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