A B S T R A C T

An adult health survey was undertaken on the island portion of the Province of Newfoundland as part of the Newfoundland Panel on Health and Medical Care. This study aims to develop models of medical care utilization over a seven-year period, before and after a major restructuring of the provincial health care system. A health survey on a large sample (11,789 individuals) permits both descriptive and explanatory analysis at the regional level.

The results of the survey are presented first in a descriptive format, as they were included in reports for policy makers and managers, using administrative aggregations. To study regional differences, descriptive and multivariate analyses were done on an aggregation by an urban dimension, which divides the island into three areas. As expected, there were major differences across regions, and complex interactions on selected variables. The usefulness of health surveys for planning and evaluation of health reform is discussed.

A B R É G É

Un sondage sur la santé adulte a été entrepris dans la région insulaire de la province de Terre-Neuve et du Labrador, dans le cadre de la Table ronde terre-neuvienne sur la santé et les soins médicaux. Cette étude vise à élaborer des modèles d'utilisation des soins médicaux sur une période de sept ans, avant et après une restructuration importante du système provincial de la santé. Un sondage sur la santé auprès d'un grand échantillon (11 789 personnes) permet une analyse descriptive et explicative au niveau régional.

Les résultats du sondage se présentent d'abord sous un format descriptif, tels qu'ils étaient inclus dans les rapports destinés aux concepteurs et aux gérants de politiques, en se servant des agrégations administratives. Afin d'étudier les différences régionales, des analyses descriptives et à plusieurs variables ont été entreprises à partir d'une agrégation basée sur les villes, ce qui répartit l'île en trois régions. Comme on s'y attendait, des différences importantes, et des interactions complexes entre des variables choisies sont apparues. L'utilité des sondages sur la santé pour planifier et évaluer les réformes en santé est examinée.

Newfoundland Panel on Health and Medical Care – Adult Health Survey

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This paper presents some results, emphasizing regional analysis, of an adult health survey undertaken on the island portion of the Province of Newfoundland in 1994-95.

The adult health survey was the first component of the Newfoundland Panel on Health and Medical Care (NPHMC); the purpose of the NPHMC is to develop models of medical care utilization, measured by number of visits and patterns of care, over a seven-year period. This period spans a major restructuring of the provincial health care system (regionalization with five Community Health Boards and eight Institutional Boards, which began in 1994).

The NPHMC design uses the community as an epidemiological laboratory.¹ It emphasizes the importance of demographic and socio-economic variables on health and medical care. This approach could be traced to Virchow as early as 1847.² Medical sociologists such as Hollingshead,³ Suchman,⁴ and Anderson⁵ made important contributions. More recently, two multidisciplinary research groups in the USA⁶ and the United Kingdom⁷ have provided new conceptual and empirical evidence. This approach has gained recognition from policy makers⁸ and achieved new legitimacy by the work of health economists.⁹

DESIGN AND METHODS

The design of the NPHMC includes a cross-sectional telephone health survey (Figure 1) that collected data on demographic, socio-economic, health, and medical care variables. Written consent was obtained to allow access to medical care utilization data. All non-institutionalized adults 20 years and older residing in a sample of households on the island portion of the Province of Newfoundland were telephoned. Labrador was excluded because it would have needed a different design and data collection procedure to respond to its specific cultural and geographical characteristics; this would have exceeded the resources of the research team. The survey also excludes members of the armed forces, RCMP, and foreign students, since they are not covered under the provincial health insurance plan. Individuals who were interviewed and who consented to access to medical care information became the utilization panel; utilization data are obtained retrospectively for three years, and prospectively for four years, by linking the Medical Care Plan (MCP) health insurance number to hospital separations and physicians' claims databases. The follow-up survey will update addresses and household composition.

The survey had two main objectives: 1) to provide descriptive and analytical data on health variables for the island of Newfoundland, allowing for regional analysis; and 2) to provide the variables for developing models of medical care utilization. This paper addresses the first objective.

The sample was designed to study possible variation in utilization by access to medical care, and to permit regional analy-

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ses. To accomplish this, in the original proposal we studied the amount and complexity of medical care resources (hospitals, physicians) in the 24 hospital districts into which the island was divided in 1992. This resulted in a division into three areas: Area 1. Tertiary care (includes metropolitan St. John's) – urbanized, tertiary care, most of the specialists, and general practitioners (GPs) on fee-for-service. Area 2. Secondary care – includes smaller towns (urban by provincial standards), regional hospitals, fewer specialists, most GPs on fee-for-service. Area 3. Primary care – includes small, isolated communities, small rural hospitals or clinics, no specialists, most GPs on salary. The sub-populations by sex in each of the three areas (1991 Census) were essentially identical. This fact and the utilization of random digit dialling pointed to the selection of a single-stage cluster (household) random sample for the whole island; in each household, subjects 20 years of age and older were interviewed. The original sample size was 15,000 respondents, reduced to 12,000 as recommended by the funding agency. For the less-populated community health region (Northern), it was decided to oversample for the descriptive analysis only, as the sample size for this region was too small even for descriptive purposes.

The questionnaire included 65 questions, obtained from the following sources: Canada Health Survey,¹⁰ Santé Québec,¹¹ and the National Survey of Personal Health Practices and Consequences.¹² A household information form complemented the questionnaire, to collect data on family composition, changes of address, deaths and placement of family members in nursing homes during the three years previous to the survey. A report¹³ and a Web site¹⁴ provide more information about design and methodology, as well as results.

RESULTS

Interviewing took place from October 1994 to September 1995 (48 weeks). Once we reached the expected level of efficiency, output was consistent at about 300 completed questionnaires per week. Of a total of 12,186 completed questionnaires,

TABLE I
Demographic and Socio-economic Variables (%) – Newfoundland and Community Health Boards – NPHMC

	NF	Community Health Board				
		St. John's	Eastern	Central	Western	Northern
Sex						
Male	46.5	45.8	46.7	46.7	47.0	47.8
Female	53.5	54.2	53.3	53.3	53.0	52.2
Age (years)						
20-29	21.6	23.6	21.2	19.8	20.2	21.5
30-39	23.5	25.0	22.2	23.4	23.2	22.3
40-49	23.7	23.1	25.2	22.8	23.9	22.0
50-59	13.1	13.0	12.4	13.8	13.4	15.1
60-69	9.4	8.7	9.3	10.0	10.7	10.3
70 and over	8.6	6.7	9.8	10.2	8.6	8.8
Education						
Less than high school	36.0	20.6	41.7	45.5	43.2	50.2
High school completed	19.1	18.8	19.7	19.1	18.8	20.1
Trades	25.0	27.7	25.2	22.9	22.5	19.0
University, no degree	10.0	15.5	7.6	6.5	7.7	6.4
University degree	10.0	17.3	5.8	5.9	7.9	4.2
Income Adequacy						
Very low	7.7	6.8	8.5	6.7	9.5	4.2
Low	25.0	16.4	29.7	29.6	27.8	30.7
Lower middle	35.0	29.2	36.5	39.4	37.0	47.9
Upper middle	18.4	24.1	15.6	15.6	16.0	12.6
High	13.9	23.4	9.7	8.7	9.7	4.5
Employment Status						
Employed year round	39.5	53.2	33.4	31.2	33.7	27.8
Seasonal	12.0	6.3	14.4	16.0	13.6	19.1
Looking for work	5.6	4.4	5.6	6.5	6.6	4.0
Laid off	6.3	3.6	8.1	7.2	6.9	18.8
Retired	11.1	10.3	11.5	12.1	11.1	11.4
Homemaker	16.8	12.6	17.8	19.9	20.1	11.6
Student	5.3	6.6	5.7	3.5	4.4	4.2
Other	3.4	3.0	3.5	3.6	3.6	3.2
SESCORE						
Low	4.8	3.4	5.5	4.8	6.3	2.8
2	15.9	8.4	19.6	19.7	18.8	21.8
3	18.5	11.0	20.3	23.8	22.2	29.1
4	15.5	14.3	15.8	16.6	16.1	17.4
5	14.9	15.4	15.8	14.8	13.2	13.1
6	11.6	16.0	10.9	8.4	8.8	8.9
7	8.8	13.3	7.2	6.0	7.0	3.2
8	5.3	9.1	2.7	3.8	3.8	2.6
High	4.7	9.1	2.2	2.1	3.7	1.1
N	11,789	3,831	3,249	2,372	2,111	623*

Source: Reference 13, tables 4 and 5

* Includes the extra respondents sampled for this CHB

11,789 were from the Health Survey sample and 397 were from oversampling the Northern region.

The response rate was 84.8%, (computed using the definitions and computational procedure described by Aday¹⁵). For the

TABLE II
Health Status and Health Practice Variables (%) – Newfoundland and
Community Health Boards – NPHMC

	NF	Community Health Board				
		St. John's	Eastern	Central	Western	Northern
Self-assessed Health Status						
Excellent	21.5	25.2	19.6	18.7	21.3	18.9
Good	57.9	59.0	56.4	57.8	58.2	59.2
Fair	18.1	13.9	20.8	21.0	18.0	19.1
Poor	2.5	1.9	3.2	2.4	2.5	2.7
Chronic Conditions						
None	27.1	28.2	26.2	25.5	28.0	27.0
1	26.0	27.5	25.1	25.3	25.2	24.8
2	18.9	18.5	18.9	19.4	18.9	21.5
3 or more	28.0	25.8	29.8	29.8	27.9	26.7
Smoking						
Never smoker	39.4	40.7	37.3	41.7	37.3	39.0
Former smoker	29.6	28.2	29.1	30.8	31.3	30.8
Current smoker	31.0	31.0	33.6	27.5	31.4	30.2
Drinking Status						
Never drinker	20.0	15.0	20.3	27.3	19.5	32.7
Ex-drinker	7.7	5.6	8.1	9.8	8.5	10.4
Occasional drinker*	19.0	18.9	20.1	16.5	20.7	14.8
≤ 1 drink per week	13.5	15.4	13.2	10.2	14.5	8.8
2-5 drinks per week	21.3	25.6	20.0	18.0	19.9	14.8
6-9 drinks per week	11.1	11.8	11.0	10.7	10.7	9.1
10-13 drinks per week	2.1	2.1	2.0	2.1	2.1	3.0
14-17 drinks per week	2.1	2.4	2.2	1.7	1.7	1.6
18-21 drinks per week	2.0	2.2	2.2	2.2	1.3	3.0
22+ drinks per week	1.1	1.0	1.0	1.5	1.1	1.6
Weight (Body Mass Index)						
<20 (underweight)	4.9	5.9	4.8	3.8	4.8	2.1
20-24 (correct weight)	37.7	41.6	35.8	34.2	38.2	27.3
25-26 (borderline OK)	19.2	19.2	19.2	19.5	18.6	21.7
27-29 (overweight)	20.6	18.9	20.9	22.8	20.8	23.5
30-34 (obese)	13.5	11.5	14.1	15.0	14.1	18.0
35+ (very obese)	4.1	3.0	5.3	4.6	3.5	7.4
Exercise						
Sedentary	13.6	11.1	16.2	15.3	12.3	13.3
Light activity	11.2	10.2	11.5	12.6	10.8	12.0
Moderate activity	26.2	28.4	26.3	25.6	23.1	27.8
Active	30.7	31.4	30.4	30.1	30.2	29.2
Very active	18.4	19.0	15.6	16.4	23.6	17.7

* Occasional drinkers are drinkers who report drinking less than once a month
Source: reference 13, tables 9 and 13.

Another comparison was made between the percentages for the total population (1991 Census) and the survey sample for a geographical aggregation that was not originally considered when the study was developed, the Community Health Boards (CHB). Both showed a good representation for the survey.

Tables I and II include examples taken from several tables in the report (see reference 13). We also include an index combining educational level and income adequacy (computed from household income using household size and low income cut off points) into the additive index, SESORE, consisting of nine categories of socio-economic status, with 1 being low and 9 high.¹⁶

Next we explored possible regional differences. Due to continual changes in the distribution of medical care resources, and the elimination of the 24 hospital districts, we decided to use an urban-rural dimension, in three areas: Metro St. John's, Urban Corridor, and Rural/Remote. This urban/rural dimension corresponds with the determinants of health model, and therefore is conceptually more relevant. It also follows, as is to be expected, the distribution of medical care resources, and these areas by urbanization are similar to the ones used for the sample design; therefore, the description made for the three sample areas still applies. Tables III and IV show significant differences in demographic, socio-economic and some health status variables, for the areas selected by the urban dimension. This shows that, as expected, the urban dimension is useful to demonstrate the differences in demographic, socio-economic and health variables within the island portion of the Province; what is of great importance is the magnitude of these differences. The differences between CHBs seen in Tables I and II are attributable to the different proportions of the sample within CHBs, which fall into the three areas by urbanization. For example: CHB St. John's is 92.7% Metro St. John's (urban); Eastern and Western include urban corridor and remote/rural in similar proportions (45.1% and 48.4% respectively for remote/rural); Central has 65.6% as remote/rural, and Northern is all remote/rural.

Variables included in both models (lower case letters indicate variables in the models)

s: sex: male, female
a: age: 20-39; 40-59; 60+
u: urban: St. John's; urban corridor; rural/remote
x: SESORE: 1 (low) to 9 (high)

For model 1
h: Self-assessed health status:
Excellent/good vs. fair/poor

Model 1
sax, aux, axh

Likelihood-ratio $\chi^2 = 185.42$ (p=0.5600)
Pearson $\chi^2 = 180.18$ (p=0.6652)

For Model 2
c: Smoking:
current smoker vs. never/ex-smoker

Model 2
axc, sax, auc, sac, aux

Likelihood-ratio $\chi^2 = 188.19$ (p=0.3226)
Pearson $\chi^2 = 188.41$ (p=0.3187)

Figure 2. Associations between demographic, socio-economic variables, self-assessed health status, and smoking; log-linear models

11,789 respondents in the analytical sample, 9,230 (78.3%) gave written consent to access the medical care databases.

Comparing sex and age distributions between the 1991 Census and the sample tested the representativeness of the data.

To test for possible regional differences, controlling for sex and age, we selected two variables, self-assessed health status (SAHS) and smoking, and used log-linear models, which are well suited to analyze categorical variables¹⁷ (Figure 2). Dissimilar results for the two variables were noted. The log-linear model selected for SAHS includes complex three-order interactions, but only two variables are associated with SAHS: age and SESCORE. The urban/rural variables are not included in any term including SAHS, and therefore, we can conclude, with reasonable certainty, that once age and socio-economic status are controlled, there are no substantial regional differences in SAHS.

The model selected for smoking is much more complex as smoking is included in three three-order interactions, indicating that smoking is related to sex, age, socio-economic status (SES), and region. The expected probability of smoking, as modeled, indicates that for subjects 20-39 years old with lower socio-economic status, there is a slight increase in reporting smoking for the urban corridor, with women more likely to smoke than men. The observed frequencies in the multi-way table formed by these five variables confirm the results from the model, but the differences are not significant.

These analyses demonstrate that there are complex interactions between demographic, socio-economic, and health variables. It also shows that for smoking, region of residence has an influence, which is not fully captured by differences in the demographic and socio-economic variables included in the model.

DISCUSSION

Our first priority after completion of the survey was dissemination of the results. For this, we prepared the report already cited, including 36 variables presented in tables for the whole island and for the five Community Health Boards. Tables by age (grouped) and sex for the whole island and for the CHBs were also prepared for 10 selected variables. The descriptive tables in the report are useful for health professionals and managers to ascertain the extent of health risks such as low education, low

Variable	Metro St. John's	Urban Corridor	Rural/Remote
Sex			
Male	45.8	46.1	47.4
Female	54.2	53.9	52.6
Age (years)			
20-29	24.1	21.5	19.4
30-39	24.5	22.5	23.6
40-49	23.3	24.6	23.4
50-59	13.2	13.0	13.2
60-69	8.3	9.7	10.3
70 and over	6.7	8.8	10.2
Education			
Less than high school	19.4	34.7	51.7
High school completed	18.6	19.9	18.9
Trades	29.0	27.8	19.3
University, no degree	15.9	9.2	5.3
University degree	17.2	8.4	4.8
Income Adequacy			
Very low	6.2	7.8	9.0
Low	15.1	23.4	34.7
Lower middle	29.2	34.9	40.0
Upper middle	25.6	20.1	11.0
High	23.8	13.8	5.4
Employment Status			
Employed year round	54.8	40.7	25.1
Seasonal	5.9	10.5	18.6
Looking for work	4.4	5.9	6.3
Laid off	2.6	4.6	10.9
Retired	10.3	11.4	11.7
Homemaker	12.2	18.3	19.7
Student	6.9	5.0	4.0
Other	3.0	3.6	3.6
SESCORE			
Low	3.0	4.9	6.2
2	7.6	14.6	24.1
3	10.6	18.2	25.6
4	13.9	15.9	16.6
5	16.1	15.6	13.4
6	16.7	12.8	6.3
7	13.9	9.4	4.0
8	9.3	4.6	2.2
High	9.0	3.9	1.5
N	3,946	3,364	4,874

income, higher percentage of older subjects. The reporting of lower health status and unhealthy practices (such as smoking and obesity) is also useful in planning relevant programs and services. The report was distributed to policy makers, health professionals, and professional and community organizations; we have received requests for additional copies, more than doubling the original distribution. Officers of the Institutional Boards (IB) asked for the same tabulations for the eight IBs in the island, and a supplement was prepared.

Most health surveys done for the Province – i.e., Canada Health Survey, National Population Health Survey – have used a sample size that precludes regional analysis, for obvious cost and time considerations. The results obtained correspond to provincial averages which are useful for inter-provincial and national comparisons,

but which do not reflect major differences between provincial regions. The regional differences quantified by this Adult Health Survey translate into distinct needs for the different regions.

This study demonstrates that it is possible to achieve results that are useful for a broad audience from a project initiated by researchers from a university, transcending the common distinction between academic and applied research.

The prevailing impression about the differences between Metro St. John's and what lies "beyond the overpass", a local remark rich in social and cultural meaning, has been confirmed by these analyses. The NPHMC survey has quantified the image held by both professionals and the public about the contrast between provincial regions. The individuals in the remote/rural area, constituting about 41%

TABLE IV
Health Status and Health Practice Variables (%) –
Level of Urbanization – NPHMC

Variable	Metro St. John's	Urban Corridor	Rural/Remote
Self-assessed Health Status			
Excellent	25.3	22.5	17.4
Good	58.6	57.0	57.9
Fair	14.1	18.3	21.5
Poor	2.0	2.2	3.1
Chronic Conditions			
None	28.2	26.2	26.8
1	27.4	25.8	24.8
2	18.3	20.2	18.5
3 or more	26.0	27.8	29.9
Smoking			
Never smoker	40.9	38.1	39.0
Former smoker	28.6	30.0	30.2
Current smoker	30.6	31.9	30.8
Drinking			
Never drinker	14.5	20.5	24.6
Ex-drinker	5.4	7.7	9.7
Occasional drinker*	18.9	19.5	18.9
≤ 1 drink per week	15.6	13.4	11.6
2-5 drinks per week	25.9	20.7	17.8
6-9 drinks per week	12.1	10.9	10.5
10-13 drinks per week	2.0	2.1	2.1
14-17 drinks per week	2.6	2.0	1.7
18-21 drinks per week	2.1	2.0	2.0
22+ drinks per week	0.9	1.2	1.2
Weight (Body Mass Index)			
<20 (underweight)	6.0	4.6	4.2
20-24 (correct weight)	41.6	37.1	34.5
25-26 (borderline OK)	19.5	19.4	18.8
27-29 (overweight)	18.3	20.5	22.6
30-34 (obese)	11.5	13.9	15.0
35+ (very obese)	3.1	4.3	4.9
Exercise			
Sedentary	11.3	13.8	15.5
Light activity	10.6	11.4	11.6
Moderate activity	28.6	25.4	24.5
Active	30.9	30.3	30.7
Very active	18.5	19.0	17.7

* Occasional drinkers are drinkers who report drinking less than once a month

of the island population, have a demographic and socio-economic profile that puts them at great disadvantage. Although some of this information is available from other sources, it is not easy to access and interpret. The availability of information on demographic, SES and health variables in a single source, and the possibility of conducting regional analysis for different geographical aggregations – administrative or responding to different analytical dimensions – are of great practical and theoretical value.

Although cost is a major obstacle, periodic health surveys should be considered as an important aid for the planning, monitoring, and evaluation of the changes introduced in the health care system by health reforms. These surveys should be suitable for regional analysis, using administrative aggregations useful for planners and managers, as well as other aggregations related to more conceptual approaches (urbanization, ethnicity, etc.), corresponding to the specific characteristics and needs of the province – or area – under study.

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