Catalogue no. 11-522-XIE

Statistics Canada International Symposium Series - Proceedings

Symposium 2005 : Methodological Challenges for Future Information needs

2005

Statistics Canada **Statistique Canada**

Canada

Proceedings of Statistics Canada Symposium 2005
Methodological Challenges for Future Information Needs

HEALTH STUDIES USING LINKED ADMINISTRATIVE HOSPITAL DATA

Helen Johansen[1]

ABSTRACT

Health studies linking the administrative hospital discharge database by person can be used to describe disease/procedure rates and trends by person, place and time; investigate outcomes of disease, procedures or risk factors; and illuminate hospital utilization. The power and challenges of this work will be illustrated with examples from work done at Statistics Canada. Trends in incident and recurrent hospitalized stroke will be presented to see if the effects of primary and secondary prevention are different. Regional differences in mortality and revascularization outcomes after a heart attack will be described. The characteristics of high users of hospital care are investigated to inform discussion on areas for efficiency and cost improvement.

KEY WORDS: Hospitalization, Record linkage, Health studies.

1. INTRODUCTION

1.1 Background

There are approximately three million hospital discharges in Canada every year. Each discharge record contains a unique personal linkage ID and includes data on birth date, sex, postal code, hospital, admission and separation dates, diagnoses, procedures and death-in-hospital. This data file is a large potential source of information on disease/procedure rates by person, place and time; health outcomes and hospital utilization. This article describes the database and illustrated its power and challenges with examples from work done at Statistics Canada.

1.2 Description of the Health Person-oriented Information hospital Database

Each hospital collects and codes information on every separation and sends the information to itsprovinces/territory. All provinces and territories send these files to the Canadian Institute for Health Information (CIHI) every year. They amalgamate similar data from each province/territory into a national Hospital Morbidity file. This file is sent to Statistics Canada.

Statistics Canada uses these records to create and maintain a linkable Health Person-oriented Information (HPOI) hospital Database. The records that create the POI universe are selected by excluding records from newborns and non-residents and records with invalid or blank health numbers. New identification numbers are created to differentiate between parent/child and sex -specific ICD or CCP codes. Values for date of birth/sex/discharge condition are imputed to make them consistent for each health number. In addition health region codes/ ecological census variables are added

Table 1 shows the years and regions available in the Health Person Oriented Information (HPOI) hospital database. From 1994/95 on, linkable data is available for all ten provinces. Quebec is the only province that sends scrambled identification numbers. A change in coding classifications started in 2000/01and occurred at different times for difference regions. Quebec will not change its coding system until 2006/07.

[1] Helen Johansen; Health Division, Statistics Canada; Main Building, Room 2200; Ottawa, Ontario K1A 0T6 ; johahel@statcan.ca

Table 1. Available hospital data in HPOI Database by Provinces /Territories, Year, Type of Health Number and International Classification of Disease code used (ICD-9, ICD-9-CM, or ICD-10)

	NF	PE	NS	NB	QU	ON	MA	SA	AL	BC	YK	NT	NU
1992/93	9	9		9		9	9						
1993/94	9	9	9	9	9	9	9	9				9	
1994/95	9	9	9	9	9	9	9	9	9	9		9	
1995/96	9	9	9	9	9	9	9	9	9	9		9	
1996/97	9	9	9	9	9	9	9	9	9	9		9	
1997/98	9	9	9	9	9	9	9	9	9	9	9	9	
1998/99	9	9	9	9	9	9	9	9	9	9	9	9	
1999/00	9	9	9	9	9	9	9	9	9	9	9	9	9
2000/01	9	9	9	9	9	9	9	9	9	9	9	9	9
2001/02	10	10	10	9-CM	9	9, 9-CM	9-CM	9, 9-CM, -10	9-CM	10	10	9-CM	9-CM
2002/03	10	10	10	9-CM	9	10	9-CM	10	10	10	10	10	

: **Actual Health Number** : **Scrambled Health Number**

1.3 Description of methods

All studies start with the identification of a policy-relevant research question and specific objectives. Cohort and study variables are defined. With approval, hospital data can be linked to other data sources, such as survey and mortality data. The work in parts one and three described here uses only the hospital data. The records of patients who have been hospitalized prior to the event under study may need to be removed or "washed-out" from the cohort and the cohort is "followed-up" (subsequent records of cohort group identified) as appropriate. Episodes of care are created by grouping together all the patient's records that are related to the same health incident. The data of interest are extracted, new variables are created and data are combined by person to create an analytical file. Appropriate statistical tests to meet the objectives are used.

2. STUDY EXAMPLES

Health studies linking the administrative hospital discharge database by person can be used to describe disease or procedure rates and trends by person, place and time; investigate outcomes of disease, procedures or risk factors; and illuminate hospital utilization. In the following paragraphs, examples of each type of study will be illustrated by selected high-lights from three Statistics Canada projects. Other work from HPOI is listed in the references (*Nabalamba, 2004, ;Rotermann,2004; Neutel, 2004; Johansen, 2003; Chen, 2003-2005; Zhao, 2005; Johansen, 2005; Health Division, STC*)

2.1 Incident and recurrent hospitalization with acute stroke: Preliminary data.

Johansen H, Wielgosz A, Fry R, Nguyen D, Sambell C

The objectives were to examine trends in a first (incident) and recurrent hospitalized stroke to see if the effects of primary and secondary prevention were different. Stroke patients who were free of a previous stoke hospitalization for 3 or 4 years were followed for one year (Figure 1). Both incident and recurrent stroke acute (ischemic and hemorrhagic) stroke rates decreased between 1995/96 and 2001/02 (Figure 2). While the rate of change was higher for incident stroke, the percentage change was greater for recurrent stroke. As well, the estimated severity from the average Charlson index increased over time, while the average case fatality in the first episode stayed constant.

Figure 1. Methods used in stroke study

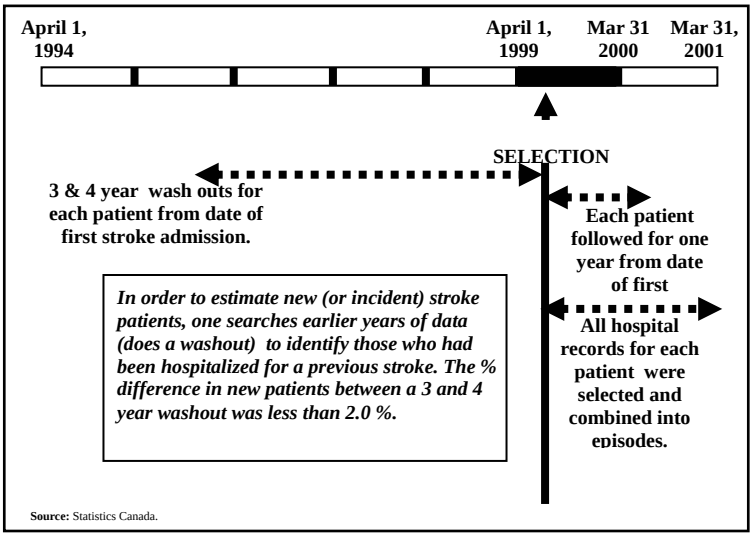
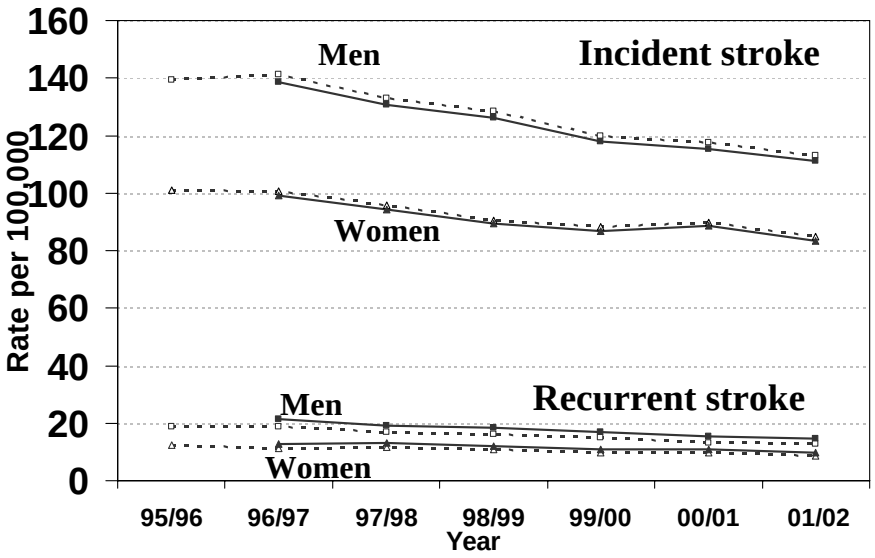


Figure 2. Hospitalization rates for acute stroke* by sex, age 20 to 79, five provinces, 1995/96 – 2001/02 (3 and 4 Year washouts)

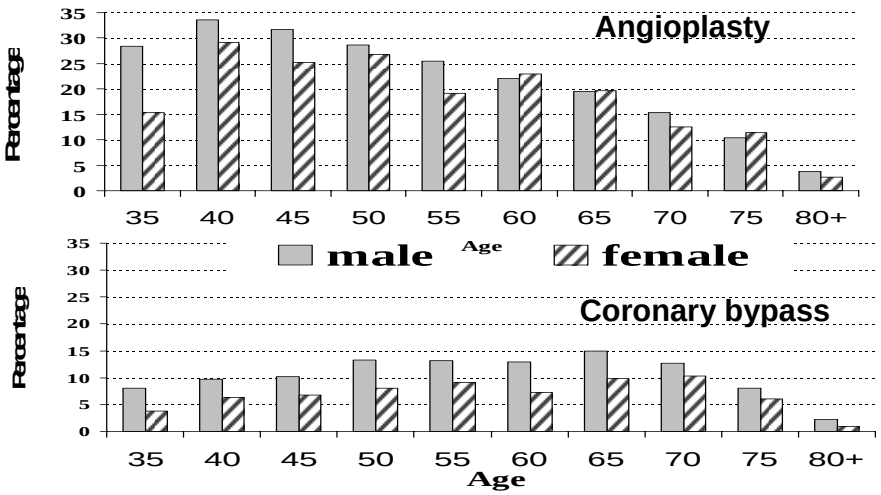


* International Classification of Disease (ICD) 9 codes 430, 431,434,436; ICD 10 codes I60, I61, I63 and I64. Rate age standardized per 100,000 to 2001 Canadian population

2.2 Outcomes: AMI and revascularization. *Johansen H, Nair C, Mao L, Wolfson M*

The objectives were to examine rregional differences in revascularization and mortality after a heart attack among patients during the year after their 1995/96 hospital admission for acute myocardial infraction (AMI) in Nova Scotia, Saskatchewan, Alberta, & British Columbia.(Johansen, 2002) It was found that in the year after hospitalization, 25% of AMI patients were revascularized. Rates of revascularization were relatively low for women, those over the age of 79, and individuals with other health problems (Figure 3). Revascularization and survival rates varied by region. Revascularization was significantly associated with a lower risk of dying for male patients.

Figure 3. Percent of AMI patients revascularized, 1995/96



Nova Scotia, Saskatchewan, Alberta, British Columbia

2.3 Characteristics of high users of hospital days in Canada: Preliminary data. *Johansen H, Lovell R, Menic J, Sambell C*

The characteristics of high users of hospital care were investigated to inform discussion on areas for efficiency and cost improvement. It was found that the 9% of hospitalized patients who were in the hospital 26 days or more during the year used 50% of hospital days. Prominent characteristics of high users were older age, multiple conditions /procedures, mental disorders, awaiting admission to adequate facility elsewhere, living in a low income region and death in hospital. Other important variables were infection-after-surgery, flu/pneumonia, cardiovascular disease and cancer, procedure complications and convalescence

Figure 4. Cumulative percent of hospital days by cumulative percent of hospital patients, Canada, 10 provinces, 1999/2000

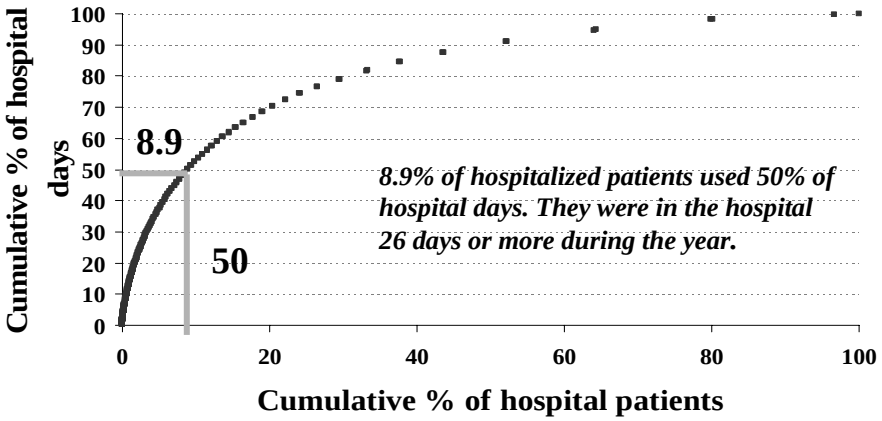
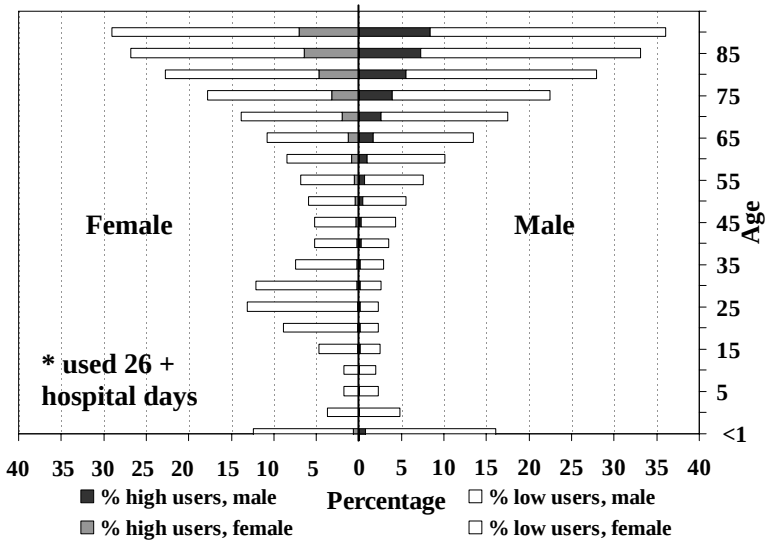


Figure 5. Percentage of the population who went to the hospital by high user*, age and sex , Canada, 10 provinces, 1999/2000.



3. ISSUES, CHALLENGES AND FUTURE INITIATIVES

3.1 Issues and challenges

- Limited information on newborns
- Linkage only within provinces and should not be used for analyses on residents of the territories due to likelihood of treatment in hospitals located in other provinces
- Provincial comparisons involving Quebec need to be done with caution (Quebec gives no diagnosis type; incomplete patient postal code and birth date)
- Important variables are missing e.g. clinical ones -vital signs, laboratory values, functional status
- Cannot differentiate between planned and un-planned re-admissions
- Conversions between ICD9 and ICD 10 (International Classification of Disease) after 2000 needed
- Without record linkage to Mortality database, caution needs to be taken when interpreting death outcome and readmissions as POI only provides information on in-hospital deaths
- Certain procedures may not be coded consistently, e.g. urinary catheter
- Outpatient events such as emergency ward visits or day surgery programs are not included. Many treatments are increasingly administered on an out-patient basis making trend analysis difficult
- Services or procedures may be miscoded; sometimes the level of detail available in ICD-9 coding makes it difficult to distinguish one type of illness from another.
- Obtaining linkage approval can be time consuming.

.

3.2 Future Initiatives

Future initiatives include working on the above issues and challenges. In particular, Statistics Canada plans to highlight increasing the ability to link to the mortality database, investigating new administrative databases, and encouraging cooperation among researchers. A main area will be developing research projects that link surveys to administrative data, such as looking at the fraction of hospitalizations, attributable to smoking-related disease (Wilkins) and looking at the relationship of personal and work stress to subsequent hospitalizations (Shields).

REFERENCES

Chen Y, Stewart P,, Johansen H, Scott G, Taylor G. Hospital readmissions for Asthma in Children and Young Adults in Canada. *Pediatr Pulmonol*. 2003; 36(1):22-6.

Chen Y, Stewart P, Johansen H, McRae L, Taylor G. Sex Difference in Hospitalisation due to Asthma in Relation to Age. *Journal of Clinical Epidemiology* 2003. 56(52):180– 7.

Chen Y, Stewart P, Dales R, Johansen H, Scott G, Taylor G. Ecological Measures of Socioeconomic Status and Hospital Re-admissions for Asthma among Canadian Adults. *Respiratory Medicine* 2004; 98:446–453.

Chen Y, Stewart P, Dales R, Johansen H, Bryan S, Taylor G. Changing age-pattern of hospitalisation risk of chronic obstructive pulmonary disease in men and women in Canada. *Age and Ageing* 2005; 10:1093.

Chen Y, Johansen H, Thillaiampalam S, Sambell C. Asthma. *Health Reports* 2005; 16(2):43-46.

Chen Y, Stewart P, Dales R, Johansen H, Bryan S, McRae L, Taylor G. In a retrospective study of chronic obstructive pulmonary disease inpatients, respiratory comorbidities were significantly associated with prognosis. *J Clin Epidemiol.* 2005; 58(11):1199-205.

Health Indicators *Health Division, STC* (365-day survival rate for acute myocardial infarction (AMI) and180-day survival rate for stroke).

Johansen H, Nair C, Mao L, Wolfson M. Revascularization and heart attack outcomes. *Health Reports* 2002; 13(2,) 35-46.

Johansen H, Strauss B, Arnold J M O, Moe G, Liu P.On the Rise: The Current and Projected Future Burden of Congestive Heart Failure Hospitalization in Canada. *Canadian Journal of Cardiology*. 2003; 19(4).

Johansen H, Thillaiampalam S, Nguyen D, Sambell C, Diseases of the Circulatory System - Hospitalization and mortality, *Health Reports* 2005; 17(1):49-52.

Nabalamba A. Inflammatory bowel disease. *Health Reports* 2004; 15(4):25-40.

Neutel CI, Gao RN, Gaudette L, Johansen H. *Shorter* hospital stays for breast cancer. *Health Reports* 2004; 16(1): 19-31.

Rotermann M. Infection after cholecystectomy, hysterectomy or appendectomy. *Health Reports* 2004; 15(4):11-23.

Shields M. Personal communication.

Wilkins K. Personal communication.

World Health Organization. *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death.* Based on the Recommendations of the Ninth Revision Conference, 1975. Geneva: World Health Organization, 1977.

World Health Organization. *International StatisticalClassification of Diseases and Related Health Problems, Tenth Revision.* Geneva: World Health Organization, 1992.

Zhao W, Chen Y, Johansen H, Sigal RJ. Comorbidity in prediction of in-hospital mortality among diabetic patients – A study-derived index. Submitted to *Canadian Medical Association Journal* 2005.