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HTA

Using Canadian Administrative Databases to Derive Economic Data for Health Technology Assessments

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Using Canadian Administrative Databases to Derive Economic Data for Health Technology Assessments

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March 2009

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Phil Jacobs conducted the planning, co-wrote the drafts, and performed some searches for articles and data.

Rita Yim co-wrote the drafts and performed some searches for information.

Conflict of Interest

The authors declared no conflicts of interest.

ACRONYMS AND ABBREVIATIONS

ACCS	(Alberta) Ambulatory Care Classification System
ACWs	Ambulatory Cost Weights
AHW	Alberta Health and Wellness
BIA	budget impact analysis
CACS	Comprehensive Ambulatory Care Classification System
CACS RIW	Comprehensive Ambulatory Care Classification System Relative Intensity Weight
CCI	Canadian Classification of Health Interventions
CCP	Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures
CCRS	Continuing Care Reporting System
CIHI	Canadian Institute of Health Information
CMG	Case Mix Group
CMI	Case Mix Index
COPD	chronic obstructive pulmonary disease
CWC	cost per weighted case
DAD	Discharge Abstract Database
ED	emergency department
FFS	Fee for service
HCRS	Home Care Reporting System
HTA	health technology assessment
ICD	International Classification of Diseases
ICD-9	International Statistical Classification of Diseases, Injuries, and Causes of Death, 9th Revision
ICD-9-CM	ICD-9-Clinical Modification
ICD-10-CA	International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada – Canadian Modification
LABA	long-acting beta agonists
MCHP	Manitoba Centre for Health Policy
MIS	Management Information System
NACRS	National Ambulatory Care Reporting System
NIHB	Non-Insured Health Benefits
NPDB	National Physician Database
NPDUIS	National Prescription Drug Utilization Information System
NRS	National Rehabilitation Reporting System

PMPRB	Patented Medicine Prices Review Board
RCW	Rehabilitation Cost Weight
RIW	Resource Intensity Weight
RPG	Rehabilitation Patient Group
RUG-III	Resource Utilization Groups
RWPD	RUG Weighted Patient Day
WCB	Workers' Compensation Board

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APPENDIX 1: Tables and Figure

1 INTRODUCTION

A database is a compilation of information on characteristics and events that is stored in an organized manner. An administrative database in health care meets specific criteria: at least one administrative operation must use the data and consider the database to be essential; the organization that is developing the database must ensure the integrity of the data to comply with legal and administrative requirements for supporting statistical and historical information; and a broad cross section of users must refer to or maintain the data.

In Canadian health care, administrative databases are used to record the details about persons who are registered with provincial health plans and the information on characteristics of inpatient and outpatient hospitalization events, visits to or by physicians or independent health professionals, filled prescriptions, home care visits, and nursing home stays. Analysts can use the information in the databases to describe the utilization and costs that are associated with persons with specific medical conditions or who use specific drugs or services. In particular, analysts can use these data when preparing health technology assessments (HTAs) to assess the economic implications of an intervention.

"Health technology" is a broad term that refers to a specific approach to doing something (such as diagnosis or treatment), implying that the use of resources is needed for it to be done. An analyst who is preparing an HTA report can use data on the type and quantity of resources to describe and analyze the technology.

The Canadian Agency for Drugs and Technologies in Health (CADTH) defines an HTA as:[1]

> *... an evaluation of the clinical effectiveness, cost-effectiveness, and broader impact of drugs, medical technologies, and health systems, both on patient health and the health care system. During the assessment, data from research studies and other scientific sources are systematically gathered, analyzed, and interpreted. The findings from this process are then summarized in reports that translate scientific data into information that is relevant to decision making.*

CADTH identifies economics and resources as components of the HTA and describes the elements of an HTA, including the economic components.[1] According to the *CADTH Report Requirements for Health Technology Assessment*, analysts who are preparing an HTA can incorporate economic information in several ways.

- They can describe the technology, including background information. They can include a description of the technology and of other technologies that it might replace or have an impact on it. They can also include the cost of the technologies (for example, equipment) and of the use of any services that is generated by the use of the technology.
- They can describe the economic burden of the target disease, including the incidence or the prevalence of the disease, the services that are used by those with the disease, and the work loss and lost wages due to the disease (indirect costs). These studies help policy makers rank the diseases in terms of the total impact on resources.

- They can include an economic evaluation analysis, which includes the costs and outcomes of the study intervention and of comparative interventions. This helps policy makers rank the interventions.
- They can incorporate a budget impact analysis (BIA), which measures the changes in direct service costs (the payer's budget) that result from implementing the new technology. They can incorporate utilization and cost measures for a given population for the current (old) technology and for the new technology. Planners need BIAs to assess the net financial impacts of introducing the technologies.

Analysts will find provincial and national administrative databases to be relevant for three HTA economic components — the economic burden, the economic evaluation, and the BIA. They will find data on utilization and costs to be useful for establishing the economic burdens of diseases that are associated with the technologies. They will also find the same data to be useful as a base for the "before implementation" component of budget impact studies. Because there is often a lack of clinical descriptions and of patient outcome data, when preparing economic evaluation studies, analysts must supplement the information they obtain from databases with information from other sources, though the administrative data can be important in these studies.

Despite the apparent utility and the almost pervasive presence[2] of administrative data, HTA analysts do not always have access to these data. Indeed, analysts have not made use of the secondary analysis of data from administrative databases in Canada. The lack of use may be due to the difficulties in obtaining the data and the analysts' lack of familiarity with the intricacies of the data. A wider use of administrative data would enhance the relevance of HTAs to decision makers who need to plan resource use.

The objectives of this report are to summarize the economic data in Canadian administrative databases and to show how an analyst can use this information in HTAs. Our report adds to the discussion[2] about the need to increase access to and use of administrative data.

2 UTILIZATION AND COST MEASUREMENT

We can classify health care administrative data that are usable for economic studies into basic reported data and derived data. The basic systems include personal identifiers, demographic information, clinical information, and information about the services that are used. Researchers have created grouping systems that combine basic reported data to derive new variables. Analysts use these derived groupings and economic indicators with basic data to estimate costs.

We classify the economic measures that are obtained from the databases into raw units of services, weighted resource use per visit or day of service, and cost per unit. Appendix 1, table 1 presents each of these elements for hospital inpatient services, physicians' services, pharmaceuticals, ambulatory care, home care, rehabilitation, and continuing care.

2.1 Hospital Inpatient Data

2.1.1 Basic measures

a) Discharge abstracts

Doctors, nurses, and hospital administrators collect clinical data. Health records analysts summarize the clinical data into a discharge abstract summary. Each record in the database represents an inpatient hospitalization.

The basic information that is collected on the discharge record includes:

- Unique provincial identifier
- Demographics (age, gender)
- Admission and discharge (dates, arrival from, discharge to, signouts, deaths)
- Special care (days, type of unit)
- Diagnosis codes (The International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Canada — Canadian Modification [ICD-10-CA] coding system is based on the World Health Organization's *International Classification of Diseases*. ICD-10-CA contains 16,000 diagnosis codes. The diagnosis is coded as the one that is "most responsible" for the longest portion of the stay and 24 others. These codes are used in classifying patients into Case Mix Groups.)
- Intervention codes (The Canadian Classification of Health Interventions [CCI] system is maintained by the Canadian Institute of Health Information [CIHI]. This system contains approximately 18,000 codes for specific procedures.)

The discharge records are stored in the Discharge Abstract database (DAD).[3]

Measurement of costs using the management information system

Each hospital has a financial information system, from which it can estimate the total cost of operating each department, including overhead departments and unit-producing departments (wards, laboratories, pharmacy). The name of this database is the Management Information System (MIS). CIHI has developed a framework for collecting and reporting these data.[3] At the heart of the information system is the recording of transactions according to:

- What resources are used (for example, financial, such as supplies; or personnel, such as workload and wages)
- What functional centre or department they were used in (for example, diagnostic services, inpatient nursing services)
- What was done (for example, a complete blood count).

Using the MIS, most hospitals can estimate the costs that are assigned to inpatient costing units (for example, departments), outpatient costing units, and other (non-patient) units.

Each province is responsible for maintaining its own MIS. The overall framework is set by the provinces in consultation with CIHI. In addition to the chart of accounts by which costs are assigned to tasks and departments, CIHI has developed a workload measurement system so that weights in minutes are assigned to services (for example, complete blood tests). Separate workload measurement systems are now developed for services in departments such as

laboratories, pharmacy, and laundry. The total output in workload units can be obtained for each department.

At the hospital level, financial analysts can use the MIS to measure the costs of all services that are provided to inpatients. These costs can be summed to obtain a hospital-wide inpatient cost. Analysts also allocate overhead costs to individual departments. They can then obtain measures of costs and workload units for many departments and, in turn, derive a cost per workload unit for each department.

The development of financial systems is in its infancy. The Manitoba Centre for Health Policy has conducted the most extensive review of how hospitals report their costs in the MIS and found differences between hospitals. As a result, analysts should be aware that there are limitations to these data, because one hospital may report its costs differently from another. Cost allocations that are made by hospitals are measured by the resources that are used and the method by which the resources or costs are reported or allocated.[4]

Raw utilization statistics

Using DAD, analysts can measure utilization per stay or per diem (Appendix 1, table 1). Using the MIS, financial analysts can derive an aggregate (for example, hospital-wide) measure of inpatient costs. Combining total costs and total service utilization, analysts can then derive a raw measure of inpatient cost per day or per case for each hospital. Over long periods, these rough measures (for example, admissions and length of stay) are informative. The use of cost as a long-term measure is less useful, because the components of what is in a cost per stay or per day change over time.

b) Derived output and cost measures

Case mix classification

Using clinical data from diagnosis and procedure codes, CIHI has developed a method of classifying patients by diagnostic category, called the "Case Mix Group" (CMG). The purpose of the CMG system is to identify groups of cases with similar resource use patterns.

The CMG+ system, which CIHI implemented in April 2007, incorporates ICD-10-CA and CCI. CIHI assigns cases to a case mix class or group depending on the Major Clinical Category, whether an intervention was done, and the specific diagnosis or procedure. In 2007 there were 558 CMGs and 21 Major Clinical Categories in the CMG+ system.[5] CMGs are divided by age group (for example, zero days for newborns, zero days to seven days, eight days to 28 days, 29 days to 364 days, one year to seven years). The base CMG categories are formed by the 558 CMGs and the age categories. In theory (if all groups were populated), there would be 558 × 9 age CMG categories. Each category is assigned an expected length of stay and a trim point. If the stay is beyond the trim point that is designated using a statistical formula, it is considered to be a long-stay outlier.

Resource Intensity Weights

CIHI calculates index number values called "Resource Intensity Weights" (RIWs). These are estimated annually and represent the relative cost of patient types. Resource intensity is expressed in terms of an index value, with 1.0000 being set as the average per case value. All other values are expressed in relation to this value. CIHI has developed an algorithm to assign

weights to cases. The algorithm is based on the data from the provincial case costing facilities in Ontario, Alberta, and British Columbia.[5] Each CMG+ age group is categorized according to whether it is:

- Typical, referring to whether a specific case is a long-stay outlier (whether the patient's stay in hospital is more than the trim point for that CMG and age group) or if the case is not a sign-out, a transfer, or a death
- Atypical, referring to long-stay outliers, transfers, sign-outs, or deaths.

In addition, using the ICD-10-CA and CCI codes, cases are identified according to:

- One of five comorbidity levels, according to severity
- Intervention factors (whether an intervention was a high-cost intervention, such as mechanical ventilation or tracheotomy, or whether there were multiple interventions).

The RIW of typical cases are calculated per case. CIHI assigns a base weight to each CMG+ age group and makes adjustments according to comorbidity level and intervention factors. It attaches per diem weights to atypical cases. It assigns a basic per diem weight to each CMG+ age group. It then adjusts these weights, on a case-by-case basis, for the length of stay, the specific atypical factor, comorbidity level, and intervention factor. As a result, every case is assigned an RIW.[6]

Costing individual cases

Using the CIHI system, an HTA analyst can derive a cost of a case in two ways: "case mix costing" and "case costing."

Cost per weighted unit (case mix costing)

By combining the inpatient costs for a group of hospitals and the total RIWs for the same group of hospitals in the province, CIHI derives estimates of the cost per weighted case (CWC) for each province. Case mix costing is a method that can be used to obtain a cost for each case. The analyst can do this if he or she knows the CWC and the RIW. There are two steps in developing a CWC for a case using case mix costing. First, the analyst can sum all the costs that are attributed to inpatient care. These can include nursing unit costs, laboratory costs, and allocated overhead. The analyst then assigns cases to a CMG using the CMG+ grouper. The individual cases are assigned an RIW using the CMG+ listing. Then, all the inpatient RIWs are added up. A unit cost per RIW is obtained when the total inpatient cost is divided by the sum of the RIWs. This can be done at the hospital level, the regional level, or the provincial level.

In the second step, the analyst derives a unit cost for a case by multiplying the assigned RIW for that case by the CWC. As CIHI calculates a CWC for most provinces and hospitals, and RIWs for all cases, a hospital can obtain its cost per RIW and hence the cost for any case. An average provincial cost can also be obtained for any case. In an HTA analysis, the provincial average would generally be used to better reflect an average cost for the population.

Cost per individual patient (case costing)

Some hospitals in Alberta, Ontario, and British Columbia have an advanced MIS capability of being able to assign workload-based costs to individual cases. As a result, Ontario and Alberta have published costs by CMG group for their hospitals. CIHI has used these case costs to derive

RIWs. This direct type of costing is called "case costing" because costs are derived for each individual case as opposed to using the RIW method.

2.2 Physician Costs

Approximately 61% of physicians in Canada are paid on a fee-for-service basis. This percentage varies by province (Figure 1). Physician databases record patient billings by collecting information for each service billed based on:

- Patient identifier
- Date of service
- Up to three 3-digit ICD-10-CA diagnosis codes
- Services that are billed for using the province's service breakdown
- Amount billed.

The cost per person is the total value of services that are billed for that person. Service categories (the fee schedule) are unique to each province. CIHI aggregates these services into categories in its National Physician Database (NPDB). These aggregated categories do not provide information on specific physician services — information that could be useful in an HTA. For those services that are not billed for (under alternative funding arrangements) we recommend that researchers use the fee schedule to obtain unit costs, where possible, because alternative means of obtaining the cost are unavailable.

2.3 Prescription Drug Databases

The characteristics of persons who are covered by a provincial drug plan vary by province. The public availability of drugs depends on provincial criteria, which include age and in some cases income. In addition, each province sets its own copayment policy and maintains a formulary of drugs that are covered. The lists include those drugs that are covered under all stipulated circumstances and those that are provided only under exceptional circumstances (approval is required). The formularies vary from province to province.

All provinces collect data on each prescription that is filled for covered persons. In addition, Saskatchewan, Manitoba, and Alberta collect data for all persons in the province, including those who are not covered under the provincial drug plan. The provincial data that are collected include:

- Patient identifier
- Date of service
- Drug, strength, and dosage according to the Drug Identification Number
- Number of units dispensed
- Price paid by the province for the drug, the mark-up, and the pharmacy professional fee
- Amount charged less the amount paid by the province (out-of-pocket payment by the consumer).

2.4 Ambulatory Visits

2.4.1 Ambulatory care reporting

In Alberta, hospitals and provincially funded, free-standing clinics report ambulatory visits to Alberta Health and Wellness (AHW). The information that is collected for each patient visit includes personal identifier, age, gender, intervention and diagnosis code, and patient disposition (where the patient is discharged to). Since 2002, diagnostic information has been coded using ICD-10-CA codes.

a) Classification

Since April 2002, AHW has grouped ICD-10-CA and CCI codes into 426 categories for data analysis.[7] AHW intended that the Ambulatory Care Classification System (ACCS) would be a comprehensive case-mix grouper capable of incorporating physician services (for example, day procedures) and non-physician services (for example, community rehabilitation)[7] and implemented in hospitals and communities.

b) Ambulatory Care Classification System costs

Cost data were collected by the participating Regional Health Authorities in Alberta. AHW is responsible for processing the raw cost data. AHW uses these data to develop patient-specific case costs that are grouped into ACCS categories. These costs appear in the annual AHW cost manual.[8]

2.5 Other Health Care Services

Some costs of health services cannot be measured directly. As a result, CIHI and provincial governments are developing patient classification systems and weights to group and eventually measure these costs. The data that are available appear in Appendix 1, table 1.

3 USING COSTING INFORMATION

HTA analysts can use administrative databases to conduct economic burden analyses, economic evaluations, and BIAs. Appendix 1, table 2 outlines the role that the databases can play. For each type of study we present:

- Which population groups are included in the analysis, for example, whether we should include all persons who are potential users of the technology or those persons who have already used a specific technology
- Desired time frame of the study, such as a one-year analysis or an analysis that includes all downstream effects and hence may require data for many years to capture these effects
- Databases that are needed for the analysis
- Additional data that would be needed for the analysis and that are not contained in the administrative databases
- Whether the analysis requires a linking of administrative databases.

3.1 Economic Burden

When conducting an HTA, we define the economic burden of an illness as the excess costs that are generated by all persons in the population who have the condition and who can be treated with the technology. Usually we would estimate the economic burden during a period before the introduction of the new technology. Economic burden includes direct medical costs and indirect productivity losses. We can estimate the former using administrative databases. We can estimate an economic burden of a disease by using an incidence approach or a prevalence approach.

3.1.1 Case definition

When using administrative data we must develop criteria to identify those cases that the technology is targeting. Blanchard et al.[9] developed such criteria for identifying diabetes cases using Manitoba administrative data. He defined a diabetes case as a patient record with two or more diabetes diagnoses at different visits in the physician billings data during a two-year period or one diagnosis in the hospital inpatient data. Simpson et al.[10] used an expanded definition with Saskatchewan administrative data to measure costs during a 10-year period for persons who had no previous diabetes records. In that definition, the dispensing of insulin or an oral antidiabetic drug was added to the list of possible indications.

3.1.2 Incidence approach

If we use an incidence approach, we would track costs from the time when the disease is diagnosed until a desired end point (for example, cure or death). For a chronic disease, the tracking may require years of observation. Before the costs are summed, we must address two issues. First, we must express costs in terms of a single year, to adjust for inflation. A general consumer price index is the best to use. Second, all costs must be discounted to yield a present value.

Using Simpson's definition of diabetes, Johnson et al.[11] measured the cost of hospital, physician, and drug services for all persons with diabetes, for 10 years from the time of incidence.[11] If the technology being considered in the HTA has a narrower target focus, such as persons with diabetes who have nephropathy, then the algorithm that the analyst develops to define the disease has to be more detailed than "diabetes." Using Manitoba administrative data, Bernstein developed a case definition for inflammatory bowel disease.[12] Bernstein defined a case as IBD if the physician billing records showed at least five physician visits that were coded as inflammatory bowel disease during any time span that was greater than two years. Using this definition, Longobardi et al. measured longitudinal incidence based on the use of physician visits and hospital nights.[13] They did not translate the physical utilization measures into costs.

HTA analysts will find the incidence approach to be useful in determining resource use that is avoided because of cases that are avoided. This approach would be useful to planners who want to determine the economic impact of a preventive measure.

3.1.3 Prevalence approach

The prevalence approach focuses on the costs of all persons with the disease during a fixed period, such as a year. Using this approach, the analyst will include all cases with the diagnosis, even if the incidence of the disease occurred in a prior year. Jacobs et al.[14] used the prevalence approach to calculate the economic burden of diabetes using databases from Manitoba. Simpson et al.[10] did the same using data from Saskatchewan. These two studies examined only the direct medical care costs of diabetes. Jacobs et al. studied the net (attributable costs) by subtracting the costs per person with diabetes from the per-person costs of the non-diabetic population. Simpson et al. used diagnostic codes to identify services that were related to the diagnoses of diabetes.

3.2 Economic Evaluation Studies

An economic evaluation study compares the per-person costs and outcomes of health technologies. It is an analysis of the alternative interventions or technologies under actual conditions. This makes administrative data particularly valuable, because administrative data are records of events that have occurred under everyday conditions. CADTH has guidelines for conducting an economic evaluation.[15]

3.2.1 Type of study

There are several types of economic evaluations, all of which involve comparisons of alternative interventions for a similar set of patients, for example, those who are equally eligible for the intervention. All these types of studies involve the comparison of costs between the interventions but they differ in terms of how outcomes are addressed.

- A cost-minimization analysis is a comparison of costs between the interventions, without including health outcomes. These studies are valid economic evaluations only if it has been established, by a randomized trial or by another credible approach, that the outcomes are similar.
- A cost-consequences analysis is a comparison of costs with a series of two or more outcomes, without combining the outcomes into a single indicator. These studies are important when one needs to summarize the outcomes in more than one indicator.
- A cost-effectiveness analysis is a comparison study where the outcomes are expressed as one indicator, such as life-years or mortality. In many instances, health outcomes can be expressed as one health-related quality-of-life index, called a "quality-adjusted life-year" (QALY). These studies are sometimes called "cost-utility analyses" (CUAs). QALYs are not found in any administrative databases, although this could change. Some private clinical databases that are being developed to include QALYs can be linked to administrative databases. Statistics Canada's Canadian Community Health Survey also records utility data.
- A cost-benefit analysis is a comparative study where the health outcomes are expressed in dollar values (called "benefits").

3.2.2 Comparison technologies

The most defensible alternative to the study intervention is the technology that is most commonly used.

3.2.3 Perspective of study

The perspective of the study is that of the group whose interests are directly included. These can include government, private persons who pay out of pocket, or health care providers. When all resources are included, the perspective is called the "societal approach." In administrative databases, resources that are provided by the government are included. This is often called the "government payer approach." In Canada, patients also pay out-of-pocket for drugs. These payments would be included for a societal approach, but they may not be contained in administrative databases.

3.2.4 Timelines

The guidelines recommend that all downstream events that are related to an intervention be included. Administrative data in Canada can address multi-year utilization. As a result, the analyst can incorporate downstream utilization events that occur in future years. The assignment of multi-year costs may pose a problem because CIHI and the provinces develop costs measures that are unique to each year.

3.2.5 Costs

The study should compare all costs that occurred with each intervention, according to the perspective taken. The guidelines recommend that HTA analysts should report physical units (for example, physician visits, patient days) and costs. Canadian administrative data include physical units from which costs are derived. Detailed hospital costs are unavailable in the RIW and CWC measure. As a result, in some cases analysts will find the more detailed case costing method more suitable, though it is cumbersome to use.

3.2.6 Health outcomes

The guidelines recommend that health outcomes be included in each study. Canadian administrative data are weak on health outcomes, and so in some cases analysts can use utilization data as a proxy for health outcomes. For example, a hospital readmission is sometimes an indicator of the success of a procedure. In many instances, however, analysts must supplement the results from administrative data with more direct information on health outcomes that is obtained from other sources.

3.2.7 Addressing weaknesses of administrative data

Analysts can address some of the weaknesses of administrative data by adding data from other datasets or from other studies (for example, a clinical trial) in the form of a model. First, many investigators have developed (private) clinical databases that include clinical indicators and quality-of-life indicators. The clinical indicators can be used to more precisely identify patient severity and to measure health outcomes. There are many examples of clinical databases. In only a few instances these have been merged with administrative data. By merging these databases, the investigator can obtain a powerful analytic tool, especially in those instances where all the relevant patients who are receiving the alternative interventions are included in the database. In other cases, the comparator group is not included in the databases (for example, undiagnosed or

untreated persons). In these instances, the analyst must supplement the results of the database analysis with additional data.

In one of the first economic evaluations using Canadian administrative data, Rahme et al.[16] used Québec databases to measure the difference in costs between persons who used non-steroidal anti-inflammatory drugs and those who used acetaminophen. The costs were those of the drugs and of any adverse (gastrointestinal) events that resulted from the use of the drugs. The authors developed a "shadow price," which consisted of the drug price and the cost of physician and hospital services that resulted from the use of the drug. The authors controlled for case severity using a series of indicators including age, sex, chronic disease score, and prior use of health services. They did not include specific time horizons for the two arms of the study. Instead they used a daily measure of cost, which bypasses the requirement that downstream costs should be identified when they occur. Because acetaminophen is less effective than non-steroidal anti-inflammatory drugs (NSAIDs) and the NSAIDs with the shadow price are more costly (and more effective), the authors' cost-minimization analysis cannot be used as an economic evaluation.

3.3 Budget Impact Analyses

A BIA is a measure of the budget authority's changes in expenditures when adopting new technology. The BIA is a population-based measure. The perspective that is chosen in the study is a defining element for the BIA.

The CADTH economic evaluation guidelines recommend that the HTA analyst uses a government perspective. In this case, the analyst would include all services that are associated with the current technology and with the technology that is replacing it. Because the new technology might still be under consideration, the analyst will have access only to data on the existing technology, and modelling must be used for the replacement technology. The Patented Medicines Prices Review Board (PMPRB) recommends that only pharmaceutical expenditures be included.[17] This raises the issue of whether a government or societal perspective should be used. In most provincial drug plans, there is a copayment, which is not part of the government perspective.

The PMPRB has developed an analytical framework to provide guidance for conducting a BIA that is related to the introduction of new pharmaceuticals.[17] In this framework, PMPRB suggests that the defined population of interest in the BIA be based on the drug plan eligibility and any restrictions to drug access intended by the manufacturer.

According to the PMPRB guidelines, the BIA should include only the direct drug-related costs that are reimbursed by the drug plan. The amount of resource use from other (non-drug) services, indirect costs, and outcomes of the treatment are not included in the calculations. PMPRB suggests a one-year baseline and three-year forecast for any BIA, and a sensitivity analysis is recommended.

4 ADMINISTRATIVE DATABASES FOR HEALTH TECHNOLOGY ASSESSMENT

4.1 Provincial Databases

All provincial governments are funders of the following "insured" services: inpatient and outpatient hospital services and physician services.[18] In addition, some provincial governments fund wholly or partly "non-insured" (not federally insured) services: non-physician professional services (chiropractic, optometry), prescription drugs, vaccines, home care, and long-term care. For many of these services, the provincial governments maintain records of utilization, which form the basis for the utilization databases. Provinces also maintain population registries for each resident — a unique number is assigned to each resident. This unique identifier allows the analyst to obtain linked records.

Appendix 1, table 3 shows the available data regarding those services that are provided in each province. The services that are included in provincial databases are inpatient admissions, ambulatory care visits, physician (fee-for-service) visits, outpatient prescription drugs, home care, and continuing care. The services for which data are available from all provinces are inpatient hospitalization and physician fee-for-service. Prescription drug data are available from all provinces, though not for the entire population. Home care and continuing care data are available in fewer provinces, and ambulatory visit data are available only from Alberta and Ontario.

4.2 Canadian Institute for Health Information Data

The Canadian Institute for Health Information (CIHI) facilitates the development and maintenance of an integrated health information system at a national level. In particular, CIHI in co-operation with the provincial governments develops data standards for some databases (inpatient care, ambulatory care, and pharmaceuticals). Provinces maintain their own data systems, but most of the provinces and territories submit their patient or client data on hospital care and physician care to CIHI using the CIHI standards on a quarterly or annual basis. Using these data, CIHI maintains several databases that are useful for analysis.

4.3 Which Data Sources to Use?

Data on many services are available from provincial and CIHI databases. In both instances, the data elements are the same because they were developed using joint CIHI and provincial processes. In the provincial databases, each service record contains a unique patient identifier. This means that all service records for drugs, physician visits, hospital discharges, and some outpatient visits can be linked to form a unique patient record. This record could include all information for all the patient's services. This feature is useful for measuring the number of unique patients who have a specific diagnosis. It also allows the analyst to obtain the cost per person for all the services that have been generated by each person. When conducting an economic evaluation or a BIA, this is a useful feature.

The CIHI databases are more useful when one wants to obtain data on overall counts of services and on overall costs, without identifying how many people have received these services. CIHI does have (scrambled) unique identifiers, but they do not have registry data, and the unique identification seems to be less accessible to researchers outside CIHI. For example, one can develop a descriptive measure of how many blood glucose tests were done and the costs for a population. But the CIHI data do not tell how many individuals received such tests or what other services they received.

5 POPULATION REGISTRIES

Each province maintains a population registry. All population registries contain standard information on patient characteristics, including:

- Unique patient identifier
- Date of birth
- Gender
- Place of residence
- Number of places of residence over time.

Several provinces have additional information. For example, BC and Alberta (until the end of 2008) charge registrants a health care premium; but full or partial subsidies are offered to low income persons. The use of the premium subsidy allows one to identify lower income persons. Provinces also have an identifier for First Nations status.

Of interest in the registries is the unique patient identifier that is maintained by each province but unavailable through CIHI. The use of this personal identifier allows analysts to link individual records, forming records of each person's experiences with the health care system.

6 HOSPITAL INPATIENT DATA

6.1 Discharge Abstract Database — Basic Data

6.1.1 Provincial holdings

Electronic records of discharge abstracts are held by all provinces. While the DAD was developed to collect acute inpatient data, it has also been used to report other data. Appendix 1, tables 3 and 4 show the participation of provinces and territories in the 2006 to 2007 DAD. Québec does not submit any data to the DAD (it maintains data separately). All other provinces and territories provide acute care inpatient data to CIHI. Eight provinces and territories submit same-day surgery data. Alberta does not report the same-day surgery data. Alberta maintains its own ambulatory database (the ACCS database). Ontario and Nova Scotia submit the day surgery data using the National Ambulatory Care Reporting System (NACRS). A few provinces submit partial data on rehabilitation, special rehabilitation, chronic care, psychiatric care, and nursing homes to the DAD.

6.1.2 CIHI holdings

The DAD is a data holding at CIHI. CIHI's holdings contain data in a standard format that are reported by all provinces except Québec, which maintains its own databases.[19]

The DAD includes inpatient hospital discharges (acute care, chronic care, and rehabilitation) and same-day surgeries**.** Approximately 75% of all hospital discharges are submitted to CIHI and are included in the DAD.[20] Québec's non-reporting is a reason for the low percentage.

6.2 Case Costing Data: Alberta and Ontario

CIHI receives case costing data from Ontario, Alberta, and British Columbia to develop national weights. These provinces also develop their own cost measures.

The Ontario Case Costing Initiative (OCCI) and Alberta Costing Partnership have developed a common costing framework using data from participating facilities. BC has developed a similar costing system with data from two hospitals. The costing data of 500,000 patient records from 32 hospitals in these provinces are submitted to CIHI to develop national weights for inpatient and ambulatory care. The case cost data are mapped to the DAD records and CMG+ grouping. This allows CIHI to develop national comparative RIWs by CMG and additional comorbidity.

The primary objective of the OCCI has been to produce an Ontario-specific case cost database from which to develop case weights for use in hospital funding.

The goal of the costing method is to apportion the total hospital costs of direct patient care and overhead functional centres for individual patients during a given costing period. To achieve this, the OCCI has developed a case costing method that is based mainly on CIHI MIS standards.[21]

The CIHI MIS provides a framework to standardize the collection, processing, and reporting of information and allows for comparison of costs across hospitals. The MIS standard is used to organize hospital activities into functional centres (the Functional Centre Framework), which are based on the departments of a hospital (for example, Operating Room, Emergency Department, and Pharmacy). Hospitals use the Chart of Accounts to organize each functional centre's expenses.[21] Based on the information that hospitals collect, total expenses for each functional centre are calculated.

Twelve (soon to be 46) case costing facilities submit cost data on acute inpatient and ambulatory care (including day surgery) to OCCI in Ontario.[22] The data elements that are submitted include hospital admission and discharge dates; CMG code (not mandatory); function centre code; and direct or indirect, and variable or fixed labour and supply costs.[23] Analysts can obtain per-case costs from the "OCCI costing analysis tool" found on the OCCI website (http://www.occp.com/).[22] This tool allows one to obtain an average cost based on the CMG, primary procedure, the most responsible diagnosis, and patient age.

The Alberta Costing Partnership has developed patient-specific case cost data since 1998 for inpatient and ambulatory care. Health costing data are collected from specific sites using a

common costing framework from Alberta Health Care Services. The costs from these sites reflect 55 per cent of the provincial hospital-based inpatient activity (196,000 patient records) and 29 per cent of the ambulatory care activity (2 million visits).[8] The case costing data are linked with the inpatient and ambulatory data. The average inpatient cost is calculated for each CMG. Ambulatory care costs are grouped using the ACCS (ACCS grouper).

Alberta Health and Wellness (AHW) publishes *Health Costing in Alberta*.[24] The report covers the data collection, cost calculation process, and the cost details of each CMG (with 4 complexity levels) and ACCS group.

6.3 Manitoba Centre Case Mix Costing Data

The Manitoba Centre for Health Policy (MCHP) developed its first CMG-based average cost per weighted case in 1999 using 1995 to 1996 MIS and discharge abstract data.[25] This allowed analysts to determine standard costs for all inpatient and day surgery cases. The CMG-based cost was updated for 1997 to 1998.[26] The Research Data Repository held at MCHP and the cost data have been used in several projects including a 10-year follow-up study of low birth weight babies, the development of a population-based funding allocation method for health services,[27] and a yet-to-be released assessment of the additional cost of medical care for people with chronic diseases. A new list that is being issued in 2009 can be obtained from MCHP.[28] Analysts will be able to use this cost list with the MCHP's utilization databases. MCHP is updating its online research, the Concept Dictionary, which will be a resource for researchers who are interested in methods for applying costing to administrative data.

7 PHYSICIAN SERVICES

7.1 Provincial Databases

Each province has its own fee schedule and list of services. Each province maintains a provincial billing database (Appendix 1, tables 3 and 5).

7.2 National Physician Database

The NPDB is derived from physician fee-for-service claims that are submitted by provincial and territorial medical insurance programs to CIHI. The NPDB contains data on the demographic characteristics, specialty, and activity levels of fee-for-service physicians. Information on activity levels includes total payments, total services, average payment per physician, and full-time equivalent physician counts. Patient demographic information is included in the database. The NPDB publishes aggregate data with service categories. These data are less detailed than those found in the provincial fee-for-service schedules.

CIHI is working with the provinces, territories, and ministries to include data on clinical activities that are remunerated under alternative reimbursement plans (such as salaries, contracts, and sessional fees).[8,29]

8 AMBULATORY CARE

8.1 Data from Alberta Ambulatory Care Classification System

The Alberta volumes and costs of each ambulatory care group are reported in the annual *Health Costing in Alberta,* which is available from the Alberta Health and Wellness website.[24]

8.2 National Ambulatory Care Reporting System

CIHI developed the NACRS, which was first released in 1997. The 2001 to 2002 database is the first complete year of information that was received for NACRS.[30] The NACRS can be applied to ambulatory care, including emergency care, day surgery, outpatient clinics, and home services.[31]

The NACRS uses Alberta's ACCS product as a model. Both systems collect similar information on the identifier; demographics and classification of the patient; type of intervention; MIS Functional Centre Account Code; patient arrival date and time; admission by air or ground ambulance; triage date, time, and level; type and duration of intervention; and service provider.

The NACRS dataset is used in Ontario for all emergency departments and in selected emergency departments in BC, PEI, and NS (Appendix 1, table 5). For 2003 to 2004, the NACRS received eight million abstracts from:

- All Ontario hospitals' emergency departments, day surgery, renal dialysis, oncology, and cardiac catheterization visits
- Three BC hospitals' emergency department visits
- One PEI hospital's emergency department visits
- Four NS hospitals' emergency department visits and two NS hospitals' day surgery visits.

Since 2002, all clinical data that are submitted to the NACRS are coded in ICD-10-CA/CC I.[31]

8.2.1 Comprehensive Ambulatory Care Classification System

The Comprehensive Ambulatory Care Classification System (CACS) is a national grouping method for ambulatory care patients. It includes emergency departments, clinics, and same-day surgery.[32] The ambulatory care classification system was first developed by Alberta (ACCS) and modified by CIHI to include mental health and rehabilitation therapy.[33,34]

Patients are grouped according to primary procedure, main diagnosis, and visit disposition data that are collected through the NACRS. Variables that are used to assign clients to groups include diagnosis, age, gender, intervention, visit disposition, and anesthetic technique.

a) Ambulatory Cost Weights

Ambulatory Cost Weights (ACWs) were developed by CIHI using exclusively Canadian data. ACWs build on the CACS grouper and are driven by ambulatory care case cost data.[33] CIHI has constructed the ACWs so that they are relative to the average cost of a specific group of patients.

This is known as a "fixed" anchor point. The mean cost against which all other groups are compared is that for CACS cell 75, "Hemodialysis," which is assigned a value of 1.0000. The CACS cell for hemodialysis was chosen because it represents a specific patient population and makes up a large proportion of the cost database (> 100,000 records). This large sample size ensures a stable estimate of the true cost of performing the service.[33,34]

Up to 2006, only data from Alberta have been used to develop these weights. It is expected that data from Alberta and Ontario will be used in the future.[8]

CIHI has developed the Comprehensive Ambulatory Care Classification System Relative Intensity Weights (CACS RIWs) to reflect the most recent Canadian cost data available. CIHI publishes CACS RIW tables that can be used to assign RIWs to specific services.[35]

8.3 Data Limitations of NACRS

In 2002 to 2003, the NACRS changed classification systems to ICD-10-CA/CCI.[36] Analyses may be difficult using the 2001 to 2002 NACRS data, which were originally submitted using the International Statistical Classification of Diseases, Injuries, and Causes of Death, 9th Revision, Clinical Modification (ICD-9-CM), and Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures (CCP) classification systems.

CIHI has created conversion tables that standardize ICD-10-CA diagnoses and CCI Interventions back to ICD-9/CCP. Users are advised to analyze data using the original classification system that the data were submitted in rather than using CIHI's conversion tables.

9 PHARMACEUTICALS

9.1 Provincial Databases

Appendix 1, tables 3 and 5 present information on the availability and accessibility of drug data. Appendix 1, table 7 presents the web links for all provincial drug formularies.

9.2 National Prescription Drug Utilization Information System

In 2002, the National Prescription Drug Utilization Information System (NPDUIS), a database that tracks and analyses prescription drug utilization, was launched by CIHI. NPDUIS is a joint initiative of PMPRB and CIHI.[37] It provides the public drug programs with actual drug utilization information to obtain a better understanding of the factors that drive drug expenditures.

Since November 2003, all public drug plans (except Québec) agreed to share drug data with NPDUIS and PMPRB[38] in a standard format. These data will include claims that are financed by public drug benefit programs, by private insurers, and through out-of-pocket expenses by

Canadian residents. The availability of privately funded claims data (the expanded NPDUIS) will be limited to what is collected by federal, provincial, and territorial jurisdictions and what is permitted to be disclosed to CIHI.[39]

9.3 Non-Insured Prescription Drug Plan

The Non-Insured Health Benefits (NIHB) Program of the First Nations and Inuit Health Branch of Health Canada provides goods and services to eligible First Nations and recognized Inuit clients in Canada. These goods and services include prescription medications and supplemental benefits that are provided through private, federal, provincial, and territorial health care programs. The program publishes a Drug Benefit List for the drugs that have been approved for coverage by the NIHB Program. The listed drugs are primarily used in a home or ambulatory setting. Data that are collected for the NIHB prescription drug claims are similar to the provincial drug data, which can be used for HTA studies. NIHB data are not linked to provincial databases.

10 HOME CARE REPORTING SYSTEM

The Home Care Reporting System (HCRS) is a reporting initiative that was designed by CIHI to capture and maintain information about clients who have been accepted into publicly funded home care programs across Canada.

CIHI has designed HCRS to capture standard, client-specific, clinical, demographic, administrative, and resource utilization information in one reporting framework. This longitudinal reporting system captures data on home care clients at multiple points during the times when they receive home care services. Organizations that are responsible for providing publicly funded home care services submit data.

Using the HCRS, CIHI classifies home care patients into five groups.[40] Patients in Acute, Rehabilitation, and End-of-Life care are considered to be short-term home care patients. It is expected that patients in Long-Term Supportive Care and Maintenance will receive services for several years.

CIHI is collaborating with BC, Alberta, and Yukon as they prepare to submit data to HCRS.[41] Yukon is the first jurisdiction to submit data to the HCRS. BC and Alberta are planning to submit in 2008.[41] The Winnipeg Regional Health Authority plans to submit to HCRS starting in 2007 to 2008. Ontario and Nova Scotia are collecting home care data, and discussions are underway regarding potential submissions to HCRS.[42]

The tools for patient classifications (for example, CMG) and clinical assessment will be developed later.

11 NATIONAL REHABILITATION REPORTING SYSTEM

CIHI implemented its National Rehabilitation Reporting System (NRS) in April 2000 to support data collection by hospitals for rehabilitation patients who are aged 18 years or older. The services are provided in specialized rehabilitation hospitals and in general hospitals in rehabilitation units, programs, or designated rehabilitation beds. Optionally, the providers can collect additional information in a follow-up assessment that is conducted between three and six months after a client completes a rehabilitation stay. With this information, analysts will be able to assess the sustainability of functional outcomes that are attained during rehabilitation.[43]

Effective October 2002, the Ontario Ministry of Health and Long-Term Care mandated the submission of NRS data for all facilities with designated adult inpatient rehabilitation beds in Ontario. Because of the mandate in Ontario and the size of the population, most of the records in the NRS relate to inpatient rehabilitation activity in Ontario. As of May 15, 2007, the NRS database contains more than 166,000 admission and 151,000 discharge rehabilitation records[43] that were submitted by more than 90 participating facilities in Newfoundland and Labrador, Nova Scotia, New Brunswick, Ontario, Saskatchewan, Alberta, and British Columbia.

As a result of its partly voluntary nature, the NRS does not have comprehensive coverage of all inpatient rehabilitation services in Canada. Therefore, the information does not necessarily reflect the full picture of hospital-based inpatient rehabilitation in Canada.

Inpatient rehabilitation clients receive services that are provided by health professionals such as nurses, physiotherapists, occupational therapists, and physicians specializing in physical medicine and rehabilitation. Clients who are reported in the NRS include only those with a primary health condition that is physical. The term “rehabilitation” in the context of NRS reporting does not include rehabilitation services that are provided for a mental health condition or for drug or alcohol addiction.[44]

The NRS dataset consists of 75 data elements that are grouped into[44] identifiers, socio-demographics, administrative data (for example, wait times for admission and discharge, resource use), health characteristics (diagnoses), and clinical assessments.

Rehabilitation Client Group
Each patient in the NRS is classified according to the nature of the illness or injury in a Rehabilitation Client Group,[44] which includes those with impairments, activity limitations, or participation restrictions that are associated with the 17 groupings.[44] The Rehabilitation Client Group represents the rehabilitation condition that best describes the primary reason for admission to the rehabilitation program.

11.1 Rehabilitation Cost Weights

The Ontario Joint Policy and Planning Committee is developing a case mix system for adult inpatient rehabilitation.[45] The patient grouper and the associated weights will be ready for use in 2008 to 2009.[46]

The Rehabilitation Cost Weight (RCW) represents an average relative resource use for patients in a Rehabilitation Patient Group (RPG) (excluding short-stay and long-stay outliers). The data that were used to develop cost weight for the RPG were drawn from two sources of Ontario data: NRS and the Ontario Cost Distribution Methodology.[45] At discharge, each patient episode is assigned an RCW. The RCW depends on the assigned RPG and length of stay of the episode of care.[45]

12 CONTINUING CARE REPORTING SYSTEM

Health Canada defines continuing care as "the range of medical and social services for individuals who do not have, or have lost some capacity for self-care and require assistance in activities of daily living. These services often begin in the home, but can include more intensive levels of care normally associated with institutional care."[47]

The Continuing Care Reporting System (CCRS) database includes clinical, functional, and service information that identifies residents' preferences, needs, and strengths, and provides a snapshot of the services that they use.

Resource Utilization Groups
The use of patient classification methods in the CCRS allows the facility-based continuing care residents to be grouped into one of 44 Resource Utilization Groups (RUG-IIIs).[48] RUG-IIIs are clustered into seven groups. The classification is based on a resident's clinical condition, physical functioning, and treatment that was received during the last 14 days. Each of the 44 RUG-IIIs has an associated Case Mix Index (CMI) that approximates the relative cost of caring for a resident.[49]

RUG Weighted Patient Day and Case Mix Index
In September 1999, the Ontario Joint Policy and Planning Committee Complex Continuing Care Technical Working Group published the initial CMI values for RUG Weighted Patient Day (RWPD) estimation. These initial CMI values were used in annual RWPD reports from that point on, up to and including the 2001 RWPD Reports. From 2003, CMI values have been updated annually using the most recent wage and patient-day information available.[50]

RUG-III weighted patient days are calculated as the number of days that are associated with a RUG-III multiplied by the group-specific CMI value.[51] CIHI calculates the CMI for a given RUG using the average resource use per day for each group, health care provider wage rate, and staff time for that RUG. The RUG average resource use per day estimate is then multiplied by the patient days of that RUG. These products are then summed across all RUGs and divided by

the provincial total patient days to provide an estimate of the provincial average resource use per day.[50]

The CIHI CCRS captures information on individuals in two types of publicly funded facilities:[47] hospitals that have beds designated and funded as continuing care beds such as extended, auxiliary, chronic, or complex care beds; and residential care facilities, such as nursing homes, personal care homes, or long-term care facilities.

Facilities in Ontario and Nova Scotia submit data to CCRS. British Columbia, Alberta, the Yukon, Saskatchewan, and Manitoba are scheduled to begin data submissions between 2006 and 2008.[47] Data from the Ontario Chronic Care Patient System (CCPS), which was created in 1996, have been converted into CCRS to allow for trend analysis.[50]

13 WORKERS' COMPENSATION DATABASES

The Workers' Compensation Board (WCB) in each province is a not-for-profit organization that is legislated to provide compensation to workers for workplace injuries and occupation diseases. WCBs administer claims and collect data on worker demographics, injury, disease, time lost from work, and quantity and cost of service provided. Each province has its own data system, coding standard, and claim policy. Every year, WCBs submit lost time claim data (not cost data) to the National Work Injuries Statistics Program of the Association of Workers' Compensation Boards of Canada. To access WCB cost and service data, one has to contact the provincial WCB. All provinces use the same set of injury and disease codes, but not the same industry and occupation codes. The National Work Injuries Statistics Program uses Standard Industrial Classification 1980 and National Occupational Classification 1991 to standardize the provincial codes for comparison. WCB claims are most useful for estimating the economic burden of work-related injuries and illnesses; but because the WCB is an insurance system, the diagnoses will be limited to those of covered conditions.

14 PRIVATE CLINICAL DATABASES

A private database that is developed in a clinical setting contains clinical data on patients. Data can be collected each time that the patient has a visit to the clinic. The clinician can collect data on clinical measures, such as glucose levels and blood pressure; on patient severity; and on health related quality of life indicators. Private databases will usually not contain utilization data beyond visits to the clinical group, known prescriptions, and known hospitalizations. These data rarely have costs attached.

Such databases can be linked to provincial databases, providing a supplement to the data that are available for analysis. An example is the Dalhousie Multiple Sclerosis Research Unit database, which contained 25 years of clinical data and was linked to Nova Scotia provincial data for six years.[52] The basic data set contained a set of clinical indicators, severity measures, and outcome measures for persons who had visited the provincial multiple sclerosis clinic. When the

investigators linked the data with the provincial utilization databases, they added indicators that allowed them to incorporate these variables into their analyses.

Another example is an Alberta kidney disease database that was developed by nephrologists in Alberta. The database contains clinical indicators and has been linked with provincial databases. To date, no economic studies have been conducted using the database, but there is a capacity to do so.[53]

There are many such clinical databases in Canada, and increasingly they will be linked to provincial databases, but this is uncommon. In addition, these databases are usually proprietary and unavailable to researchers outside the clinical group. We only mention them as an extra resource that can be used with the provincial databases.

Three research institutes have access to their provincial databases and conduct studies with them. Interested reviewers can consult the web pages of the Institute of Clinical and Evaluative Sciences[54] in Toronto, the Manitoba Centre for Health Policy[55], and the Centre for Health Services Policy and Research at the University of British Columbia.[56] In addition, the PATH Research Institute[57] at McMaster University conducts HTAs using provincial databases.

15 DATA ACCESS

Health service databases contain patient, clinical, administrative, and financial information that can help analysts to assess writing reports on HTAs. CIHI collects most of the health care data that are submitted by provinces and territories (Appendix 1, table 6). CIHI databases that are linkable, however, are generally unavailable to independent researchers. Patient information across services generally cannot be obtained.

Each province has its own health databases for claims and administration, and some are accessible to the public (Appendix 1, table 3). Provincial databases include detailed patient information that allows for the linkage of the databases. Patient information by case and across health services can be obtained through the provinces (Appendix 1, table 7). Availability is not automatic or immediate.

16 DATA QUALITY

Roos et al.[58] reviewed the published studies that assessed the quality of data in population registries, hospital discharge abstracts, physician billings, and prescription drug claims. The studies examined the agreement between databases of personal identifiers and demographics for registries, and diagnoses and procedures for hospital and physician records. Little information was found on pharmacy databases. Most of the published studies found that the quality of data was good. The study also concluded, however, that little has been done in the evaluation of the quality of administrative data, leaving gaps in what we know about the quality of the data. Iron and Manuel present a framework on measuring the quality of Canadian administrative databases.[59]

Roos et al. also concluded that little is known about economic variables. The Manitoba Centre, however, has been conducting studies on the consistency of reporting MIS data between hospitals. These studies found inconsistency in reporting between hospitals in Manitoba.

17 EXAMPLE

Our example of how to use administrative data in an HTA is based on Alberta data. We have chosen two drugs that are used to treat chronic obstructive pulmonary disease (COPD) as the selected and alternative technologies. Because the province funds drug costs only for persons over 65 years of age, we select this population as our target group. We assume that we have access to a province's (Alberta) administrative databases, though this may be a big assumption.

The two technologies or drugs are long acting beta agonists (LABA) and combination therapy, which is made up of LABA and inhaled corticosteroids. Combination therapies are more expensive than LABAs, but researchers have shown in clinical trials that combination therapy is more effective. The government wants to know if it should encourage the shift from LABA to combined therapy. We will show how the databases can be used to conduct the economic components of HTAs.

Three types of economic studies can be used in an HTA:
- A measure of the economic burden of COPD with current technologies
- An economic evaluation
- A BIA.

Whether the administrative databases can be used depends on the characteristics of the technologies that we want to analyze and the availability of appropriate data. It is likely that we would be able to obtain adequate data if we conducted an actual study. In many provinces, we might have to wait for the data.

17.1 Economic Burden

Because administrative databases cover the entire population, we can get an estimate of the number of persons who have received the diagnosis of COPD during visits to doctors and hospitals. No one has developed a validated algorithm for this. There is one for diabetes[9] and one for inflammatory bowel disease.[60] One possible criterion for identifying a COPD case would be:
- Two visits to a general practitioner within a two-year period with a COPD diagnosis (International Classification of Diseases [ICD] J43 or J44), obtained from the fee for service billings, or
- One visit to a pulmonary specialist with a COPD diagnosis, also obtained from the fee for service (FFS) billing data, or
- One visit to an emergency department with a COPD diagnosis, obtained from the ambulatory care database, if one is available, or
- One hospitalization with a COPD diagnostic code as a primary or secondary diagnosis, obtained from the DAD.

We can use any of these criteria as a flag for a COPD case. If a person was hospitalized with a COPD diagnosis, but did not see a specialist, he or she would be listed as a COPD case. Using these definitions, an analyst would sift through the provincial data records (with appropriate permission) and would identify each person in the database who received COPD-related services. Because there is a unique patient identifier, all COPD-related services for these persons can be identified. There may be undiagnosed or misdiagnosed cases, which would be identified only in a clinical study. One shortcoming of the database method is that there can be missed cases.

In our analysis, we select the prevalence approach because we want to know how much of the annual government health budget is spent on persons with COPD. Using these prevalent cases, we can determine the direct-cost portion of the economic burden due to the illness in Alberta. Using our hypothetical method, we identified 18,000 persons over 65 years of age who have been diagnosed with COPD. This represents approximately 5% of the over-65-years-of-age population of 360,000 persons. Using the Alberta databases for hospital (DAD), physician (FFS), ED (AACCS), and pharmaceutical information, we estimated the COPD-related services that are used by those persons who are in our sample (Appendix 1, table 1).

Using the provincial FFS database, we directly estimate the family doctor and specialist services that are related to COPD and costs for all those with COPD. We selected those visits with an ICD-10-CA diagnosis code of J43 and J44 (emphysema and COPD). These persons with COPD used 57,600 general practitioner services and 10,800 specialist services. We obtained records that showed total billings for these services were $1.8 million and $0.5 million respectively. We calculated these costs from data on the services provided and the individual fees. We obtained data on fees from each provincial schedule of medical benefits.

Emergency department visits, which are available only in Alberta and Ontario databases, are also obtained using the ICD-10-CA codes. There are 6,000 such visits in our hypothetical example. The unit cost for an emergency department visit has a facility component and an emergency physician fee. We obtained the average provincial facility fee direct from the provincial health department because it did not publish an average emergency department visit cost. We obtained the physician component from the Alberta provincial fee schedule (Appendix 1, table 9).

Inpatient hospitalizations, the most costly component, are obtained from the provincial DAD. Using the database, we (hypothetically) found that there were 18,000 hospitalizations, with an average length of stay of 8.5 days, for a total of 153,000 days of stay. Hospital facility costs are obtained from *Health Costing in Alberta 2006* (Appendix 1, table 10). Using this manual, we determined the Alberta cost per case for COPD (CMG 140). AHW provides a cost for each of four complexity levels and one for an overall average. We selected an overall provincial average and used the full cost, including overhead ($6,757).

For Alberta, there is a second way of estimating hospital facility costs (physician costs would be estimated the same way). Using CIHI's RIW and CWC method, we can obtain an estimate of the average RIW for COPD hospitalizations (Appendix 1, table 11). The CIHI manual does not contain an overall average RIW for COPD (CMG 139 in the 2008 version), so we will select the

typical RIW for persons aged 60 to 79 years (the expected-length-of-stay effect) at comorbidity level 1, which is 1.2939.

This RIW must be translated into a cost for a case of COPD. This is done using the CWC for Alberta, which is obtained from CIHI. Appendix 1, table 12 presents CIHI's CWC for most provinces in 2006 to 2007. For Alberta, the CWC is $4,955. Multiplying by the appropriate RIW (1.2939) we obtain an estimate of $6,411 per COPD discharge. This is below the AHW estimate of $6,757 that we use in our example. The AHW estimate is an average for all comorbidity levels, so we would expect it to be higher than the value for level 1.

Analysts in other provinces can use the CWC for their province and multiply it by the CIHI RIW. Analysts in Ontario can also use the OCCI case costing tool to obtain costs. Using the interactive tool, which is available from the OCCI website[22], an analyst can search the costing database for per-case costs according to CMG, ICD-10-CA diagnosis, procedure, age group, and hospital type. For example, a search for all typical COPD cases resulted in a per-case cost of $7,670.

A hospitalized patient is visited at least once daily by an attending physician. We have included the Alberta visit fee by a respirologist for each day that the patient is in hospital (Appendix 1, table 9). Although we made an estimate based on the number of days that the patient is in hospital, the provincial fee schedule can be used to directly estimate the actual services billed for and the costs.

The inpatient drug costs are included in the CWC or AHW estimates. The outpatient costs are not. If we are taking a government perspective, and the government does not pay for the drugs, then we would not include the government. If the government does pay for the drugs, the government should be included in this perspective. In our example, 8,000 persons take LABA, 4,000 are on combination therapy, and 4,000 do not take COPD drugs. The drug costs are obtained from the provincial formulary, and we should add a pharmacist dispensing fee to them. Drug prices are contained in all provincial lists. Costs that are included in our example are $1.61 per day for LABA and $2.77 for combination drugs. (We do not include the pharmacist fee, which should be included in an economic burden analysis.)

Appendix 1, table 9 shows the total economic burden for persons who are more than 65 years old with COPD in Alberta. We estimate this to be approximately $142 million. Much of the burden is due to hospitalization ($121 million).

For the economic burden calculation, we have not included indirect or work-loss costs. These data are unavailable from the provincial databases, and we would have to supplement from other sources. Second, if there was a copayment by patients, this amount would be excluded if we took a government perspective. If we take a societal perspective, the patient's component should be included but recorded separately from the government component. Third, the burden of $142 million does not automatically indicate that government action is warranted. A full economic evaluation and other information that is used by policy makers would be needed to make such a judgment.

17.2 Economic Evaluation

An economic evaluation is a comparison of the costs and outcomes of two or more interventions. In the full economic evaluation, the difference in per-patient costs for each alternative is compared with the difference in outcomes. Although analysts may sometimes use provincial administrative data to obtain outcome measures (for example, recurrence of a disease), they must generally add supplementary health outcomes data to their data from other sources. Therefore, the comparative analysis that is obtained from the databases focuses on costs. Cost is an important component of an economic evaluation, especially because databases identify utilization and costs in a real-world setting. Additional outcome data are usually needed to complete an economic evaluation.[61]

In the "economic evaluation" component, we focus on the differences in costs between two treatment regimes for persons with COPD. One "arm" of the analysis contains persons who take LABA, and the other contains persons who take combination therapy. We can initially identify these two groups from the list of persons who were diagnosed with COPD. Using the databases, we identify the COPD-related services that were used. These are translated to a per-person basis. The results appear in Appendix 1, tables 13 (LABA) and 14 (combination therapy). With the same prices that we used in the economic burden analysis, we estimate the per person costs for those who are using each technology. Appendix 1, table 13 shows there is an annual cost of $9,104 for persons who took LABA and an annual cost of $7,435 for persons who receive combination therapy. In reality, there will be more options, but the principle that is used in calculating costs remains the same.

We calculated the costs for one year. In a realistic economic evaluation, persons with COPD will receive services over several years. Analysts have used provincial databases to measure multi-year costs.

17.3 Budget Impact Analysis

In a BIA the HTA analyst assesses the cost to the payer of replacing the old technology with the newer one. In our example, the old technology is LABA, and the new one is combination therapy. We will assume in this analysis that of the 18,000 persons with COPD, 8,000 use LABA, 6,000 use combination therapy, and 4,000 use neither. The government would like everyone who uses LABA or no therapy to switch to combination therapy. We assume that the cost per person is the same as in the previous analysis of the two drugs. We add the cost per person for other health care services ($7,900) that are used by those who received no drug treatment (Appendix 1, table 15). These data are obtained in the same way as the other costs.

If the analyst is concerned only with the drug budget, than the additional drug costs will be more than $7 million, increasing from almost $11 million to $18 million (Appendix 1, table 15). The increase is the change in cost due to 12,000 people switching from LABA ($1.61 per day) or no drugs to combination therapy ($2.77 per day).

If the analyst is concerned with the government budget, the result will have to include all government costs. The non-drug cost per person is $8,517 for persons who take LABA, $6,424

for persons who take combination therapy, and $7,900 for persons who take neither (Appendix 1, table 15). These results, except those for the no-treatment group, which is new, were taken from the economic evaluation analysis. The total impact on the government budget is a reduction of approximately $15 million, from $149 million to $133 million.

18 SUMMARY AND CONCLUSIONS

We reviewed the needs for economic data in HTAs and assessed what Canadian administrative data can contribute to conducting a more relevant HTA. We identified three potential types of economic studies: economic burden studies, economic evaluations, and BIAs. In all three types of studies, administrative data are most valuable, but such data alone would be insufficient.

In Canada, the administrative databases that have the widest coverage are hospital inpatient discharge abstracts. These are population-based, and they cover most hospitals in the country. Physician claims are next. Though they cover the entire population, they do not cover services that are provided under alternative funding arrangements. Prescription drug databases are, except in Alberta, Saskatchewan, and Manitoba, available only for covered populations; and coverage varies between provinces. Other databases — for example, ambulatory care, personal care homes, home care — are available for certain provinces or groups only. Coverage has increased recently, and this trend towards increased data coverage should continue.

To perform the required HTA-related tasks, supplemental data are often needed. These additional data include productivity data for economic burden studies, clinical and health outcomes data, and data on privately or federally funded drugs. Clinical and health outcome data can be obtained from private clinical databases, which cover specific patient groups who see specific physicians. An HTA investigator would have to contact the proprietors directly to obtain access to these private databases. Productivity data, which are available only from work loss claims under WCBs or from private insurers, would cover only populations with occupational injuries. In British Columbia and Alberta, WCB data includes the provincial health care number and can be linked to provincial databases. Data on private drugs are collected by third-party insurers, but these data have not been linked, and availability is rare.

In their review, Roos et al.[58] have shown that in the few studies that have been undertaken, the general quality of utilization administrative data is good. Financial issues, however, have not been addressed in evaluation research, and so we do not know much about the quality of financial data in the MIS.[4]

In addition, data access across Canada to provincial databases is not good.[2] CIHI data are more available, but CIHI databases cannot readily be linked. This shortcoming reduces the researcher's ability to conduct economic studies in HTAs that incorporate real-world data.

The number and scope of databases are growing because of the leadership shown by CIHI and some provincial governments in providing comprehensive data coverage across the health care system. This should be good news for HTA researchers who are conducting studies in broadening contexts. The databases for HTAs, however, are useful only if they can be linked to

one another. In general, databases can be linked. This still leaves open the question of data access.

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APPENDIX 1: TABLES AND FIGURE

Table 1: Healthcare data - classification, unit cost measures and databases

Type of service	Patient classification system	Physical units of measurement	Weighted units	Unit cost	Database	
					Provincial	CIHI
Physician's services	NA	Services as listed in the provincial schedule of medical benefits.	NA	A fee is attached to each service	Provincial physician claims databases	National Physician Database (NPDB)
Pharmaceuticals	NA	Specific drugs are coded by dose and form (e.g., oral) according to the Health Canada Drug Identification Number (DIN)	NA	Provincial data includes drug price, mark-up and pharmacist fees. Also included are government and non-government payments.	Provincial drug formulary lists	National Prescription Drug Utilization System (NPDUIS)
Hospital in-patient – clinical data	None	Days, discharges	None	None	Discharge Abstract Database (DAD)	DAD
Hospital inpatient – cost and workload data	None, but contains workload systems for specific services	Services (lab tests, blood counts etc.)	Workload units	Cost per workload unit	Management Information System (MIS)	MIS
Hospital inpatient – Cost per weighted case	Case mix groups (CMG)	Weighted cases	Resource intensity weight (RIW) according to CMG+ system	Cost per weighted case (CPWC) applied to RIWs according to CMG+ system, Cost per weighted case derived by CIHI	Province uses its own discharge data, applies CIHI-derived RIWs	Discharge Abstract Database (DAD)
Ambulatory care (ED, outpatient surgery, special clinics)	Alberta Ambulatory Care Classification System (ACCS)	Visits by ACCS group	NA	Cost per visit for each ACCS category	(ACCS)	
	- Canadian Ambulatory	NA	- CACS RIW - Ambulatory	NA	National Ambulatory Care Reporting System (NARCS)	

Type of service	Patient classification system	Physical units of measurement	Weighted units	Unit cost	Database	
					Provincial	CIHI
	Classification System (CACS) - Day Procedure Groups (DPG)		cost weight (ACW)			
Home care	NA	NA	NA	NA	Home Care Reporting System (HCRS)	
Rehabilitation	- Rehabilitation Client Groups (RCG) - Functional related groups	Patient stay	Rehabilitation Cost Weight (RCW)	NA	National Rehabilitation Reporting System (NRS)	
Continuing care	Resource Utilization Groups III (RUG III)	RUG weighted patient day	Case Mix Index (CMI)	NA	Continuing Care Reporting System (CCRS)	

NA – Not available

Table 2: Costs needed in specific HTA related analyses

Task	People included in analysis	Time frame of analysis	Items needed from databases	Additional data needed to complete analysis	Are inter-database linkages needed to conduct analyses?
Economic burden of condition	Population based, includes all potential users of the new technology	If incidence-based, include all downstream costs. If prevalence based, data for one year is sufficient.	Hospital, physician services, and prescription drug databases all needed. Other services if data available.	Indirect costs (lost productivity)	Yes
Economic evaluation	Users of each technology for the same condition	Include all downstream events, multi-year.	Hospital, physician services, and prescription drug databases all needed. Other services if data available.	More detailed clinical indicators needed. Health outcomes required. If taking a societal perspective, lost productivity also needed.	Yes
Budget impact analysis	All users of each technology	Downstream events might be needed, if a multi-year BIA is desired.	Depends of perspective – whether a prescription drug budget or total provincial budget analysis is desired.	Estimated expenditures for the new technology, as not likely included in data base.	Depends on whether a government or drug budget perspective is desired.

Table 3: Data availability by province and service

	NL	NS	PEI	NB	QC	ON	MB	SK	AB	BC
Inpatient	●	●	●	●	●	●	●	●	●	●
Outpatient hospital (inc. ER)	o	o	o	o	●	●	o	o	●	o
Physician	●	●	●	●	●	●	●	●	●	●
Outpatient prescription drugs	o	●	●	●	●	●	●	●	●	●
Home care	o	o	●	o	o	●	●	o	●	o
Continuing care	o	o	o	o	o	●	●	o	●	●
Case costing	o	o	o	o	o	●	o	o	●	●

● data available **o** data not available or not publicly announced

Table 4: DAD Participation, by Province/Territory and Institution Type, 2006-07

Institution type	NL	PEI	NS	NB	QC	ON	MB	SK	AB	BC	NWT	YT
Acute	√	√	√	√	NA	√	√	√	√	√	√	X*
Same day surgery	√	√	X†		NA	NA±	√	√	NA±	√	√	√
Rehabilitation	NA	NA	X	X	NA	NA	X	NA	X	X	NA	NA
Special Rehabilitation	NA	NA	X	NA	NA	X	NA	NA	NA	NA	NA	NA
Chronic care	X	NA	NA	X	NA	X	X	X	NA	X	X	NA
Nursing home	NA	NA	NA	NA	NA	NA§	NA	NA	NA	NA	NA	NA
Psychiatric	NA	NA	X	X	NA	X	X	NA	X	NA	NA	NA

Notes:

*One institute in the Yukon Territory has been a source of under-coverage in the DAD since 1997- 1998.

It is an acute care hospital and fits the criteria of a facility that should report to the DAD. However, it has not submitted data to the DAD in any fiscal year due to resources shortages and is not anticipated to submit data in coming years. On average, this institution has approximately 400 separations per year.

†Three institutions on Nova Scotia submitted their day surgery data to the NACRS in fiscal 2006-2007. Two of these three institutions started submitting data to NACRS in 2003 and one started submitting data to NACRS in 2005.

± Ontario submits all day surgery abstracts to NACRS. Alberta does not submit day surgery abstracts to CIHI at all.

§ One facility with an institution type of "nursing home" that had previously reports to the DAD discontinued reporting in 2006-2007.

√ = all valid institutions reporting to DAD in 2006- 2007

X = partial reporting to the DAD 2006-2007

NA = no reporting to the DAD 2006-2007

Source: Canadian Institute for Health Information, 2007[19]

Table 5: NACRS Participation, by province/territory and service type, 2005

Ambulatory Care Type	ON	BC	PEI	NA
Emergency room	O	X	X	X
Day surgery	O	X	X	X
Cardiac catheterization	O	X	X	X
Renal dialysis	O	X	X	X
Oncology	O	X	X	X
Other	X	X	X	X
O = all known facilities reporting; X = some, but not all known facilities reporting				

Source: Canadian Institute for Health Information, 2005[31]

Table 6: National health care database holdings of CIHI

	NL	NS	PEI	NB	QC	ON	MB	SK	AB	BC	YK
Inpatient - DAD	•	•	•	•		•	•	•	•	•	•
Physician - NPDB	•	•	•	•	•	•	•	•	•	•	•
Ambulatory care - NACRS		•	•			•				•	
Continuing care - CCRS		•				•					
Rehabilitation - NRS	•	•		•		•		•	•	•	
Home care - HCRS											•
Outpatient drug - NPDUIS	•	•	•	•		•	•	•	•	•	•

• data available

Table 7: Provincial health care database request route

	Data request processing agent	Data request weblink/email	Database and disclosure guideline	Request form
BC	BCLHD: Data Services	http://www.chspr.ubc.ca/data		
AB	Request through a single point of entry to the Manager, Research & Knowledge Programs	Health.resdata@gov.ab.ca	http://www.health.gov.ab.ca/key/DataDisclosureGuide.pdf	
Sask	Research Services Epidemiology, Research & Evaluation Unit Population Health Branch Saskatchewan Health 3475 Albert Street Regina, Saskatchewan, CANADA S4S 6X6 Tel: (306) 787-2923 Fax: (306) 787-3237	lyeo@health.gov.sk.ca	http://www.health.gov.sk.ca/mc_dp_phb_infodoc_0905.pdf	
MB	Data request sent to: Health Information Privacy Committee 300 Carlton Street Winnipeg, Manitoba R3B 3M9	http://www.gov.mb.ca/health/ hipc/	http://www.gov.mb.ca/health/hipc/HIPC_Guidelines.doc http://www.umanitoba.ca/centres/mchp/protocol_external/database_sitemap.shtmp	http://www.gov.mb.ca/health/hipc/submission.doc
ON	Ontario Health Planning Data Guide, 2005 lists all the data holding and the data request procedure		http://www.health.gov.on.ca/transformation/providers/information/resources/healthplan_guide.pdf	
QUE				
NB			http://www.gnb.ca/0051/personal%5Fhealth%5Finformation/pdf/ConsultationGuide.pdf	
PEI				
NS	Nova Scotia Data Catalogue 2004 lists the details of healthcare data holding and the data request procedure		http://www.gov.ns.ca/health/downloads/Data%20Catalogue%203rd%20EditionDecember 2004.pdf	Data request through Dalhousie University: http://www.phru.dal.ca/data_access/Data%20Access%20Request%20Guidelilnes%20and%20Procedures.doc

	Data request processing agent	Data request weblink/email	Database and disclosure guideline	Request form
NL	Newfoundland and Labrador Centre for Health Information Submit@nlchi.nl.ca	http://www.nlchi.nf.ca/research_submit.asp	http://www.nlchi.nf.ca/research_submit.asp	http://www.nlchi.nf.ca/pdf/pia.pdf
CIHI		http://secure.cihi.da/cihiweb/dispPage.isp?cw_page=regdata_e#research	http://secure.cihi.da/cihiweb/en/downloads/privacy_policy_priv2002_e.pdf	

Table 8: Provincial drug formularies

	Weblink	Note
BC	http://www.healthservices.gov.bc.ca/pharme/lca/lcabooklet2008.pdf	PharmaCare Low Cost Alternative Reference Drug Program Booklet
	http://www.health.gov.bc.ca/pharme/lca/lcabooklets.html	Web page
AB	https://www.ab.bluecross.ca/dbl/idbl_main1.html	Interactive Drug Benefit List
Sask	http://formulary.drugplan.health.gov.sk.ca/	Formulary Search
MB	http://www.gov.mb.ca/health/mdbif/mdif58.pdf	Manitoba Drug Interchangeability Formulary
	http://www.gov.mb.ca/health/mdbif/index.html	Web page
ON	https://www.healthinfo.moh.gov.on.ca/formulary/index.jsp	Formulary Search
Que	https://www.prod.ramq.gouv.qc.ca/DPI/PO/Commun/PDF/Liste_Med/Liste_Med/liste_med_2008_06_02_en.pdf	List of Medications
	http://www.ramq.gouv.qc.ca/en/regie/lois/liste_med.shtml	Web page
NB	http://www.gnb.ca/0212/pdf/NBPDP_Formulary/NBPDPFormularyJune2008english.pdf	NEW BRUNSWICK PRESCRIPTION DRUG PROGRAM FORMULARY
	http://www.gnb.ca/0212/NBPDPFormulary-e.asp	Web page
PEI	http://www.gov.pe.ca/hss/formulary/index.php3	Formulary Search
NS	http://www.gov.ns.ca/health/Pharmacare/formulary.asp	Formulary Search
NL	http://www.gov.nf.ca/health/nlpdp/bensearch.asp	Formulary Search

Table 9: Example of calculation for medical costs for persons with COPD, Alberta

Type of service	Number	Unit cost	Services used	Total cost	Source of data
Family doctor visits		N.A.	57,600	$1,843,200	Information obtained from provincial billing records, visits with ICD10 codes 143 and 144
Specialist visits		N.A.	10,800	$518,400	Information obtained from provincial billing records, visits with ICD10 codes 143 and 144
ED visits			6,000		
--Facility cost		$225	6,000	$1,350,000	In total there were 6,000 ED visits, according to the AACCS records. The unit facility costs per visit were obtained from Alberta Health and Wellness.
--ED doctor fee			6,000	$756,000	The ED doctor vost per visit was estimated by assuming 1 visit per ED visit
Hospitalizations					
-- Facility costs		$6,757	18,000	$121,626,000	Number of COPD hospitalizations with CMG code 140 (18,000) obtained from provincial DAD. Alberta inpatient facility cost per case ($6,757) obtained from Health Costing in Alberta 2006, Schedule 1.
--Physician visits		$45.61	153,000	$6,979,860	We assumed 1 specialist visit per day. Average length of stay for COPD cases is 8.5 days (Health Costing in Alberta 2006, Schedule 1, CMG140). The fee for a daily visit of a pulmonologist is $45.62, obtained from Alberta Schedule of Medical Benefits, 2005, Code 0303D (RSMDH1, $45.61 per hospital visit.)
Drugs					
-- LABA		$1.61	8,000	$3,413,200	A total of 8,000 persons received LABA, at a daily cost of $1.61, as obtained from the Alberta Health and Wellness Drug Benefit List.
--Combination		$2.77	6,000	$6,066,300	A total of 6,000 persons received combination therapy at a daily cost of $2.77, as obtained from the Alberta Health and Wellness Drug Benefit List.
-- Other			2,000	$0	2,000 people received no COPD drugs
Total cost				**$142,552,960**	
Number diagnosed	18,000				

Table 10: A page from Health Costing in Alberta 2006.
Reproduced with permission from Alberta Health and Wellness, Health Costing in Alberta: 2006 Annual Report.[8]

Alberta Health and Wellness

Health Costing in Alberta
2006 Annual Report

Schedule 1 – Inpatient Cost Results

CMG Code	Description	Complexity Level	Average LOS	Average Direct Cost	Average Indirect Cost	Average Cost	Cost per Day	Costed Cases
138	Respiratory Neoplasms		10.8	6,569	1,824	8,392	778	1,312
138		Plx1	8.2	4,919	1,371	6,290	767	613
138		Plx2	12.7	7,252	2,053	9,305	735	394
138		Plx3	12.7	7,804	2,210	10,014	786	192
138		Plx4	17.6	12,358	3,190	15,548	885	120
139	Interstitial Disease		8.6	5,952	1,584	7,536	879	289
139		Plx1	6.4	3,846	1,039	4,885	763	184
139		Plx2	13.3	7,689	2,145	9,835	737	35
139		Plx3	11.8	7,662	2,099	9,761	826	39
139		Plx4	25.0	22,818	5,821	28,639	1,146	38
140	Chronic Obstructive Pulmonary Disease (COPD)		8.5	5,264	1,493	6,757	791	2,431
140		Plx1	6.6	3,456	1,004	4,460	672	1,386
140		Plx2	10.7	5,717	1,702	7,419	691	398
140		Plx3	10.7	6,718	1,925	8,642	808	359
140		Plx4	17.2	14,402	3,912	18,314	1,064	341
141	Pulmonary Edema		7.3	10,123	2,219	12,342	1,692	198
141		Plx1	4.4	3,634	938	4,572	1,042	103
141		Plx2	7.7	5,111	1,370	6,481	842	26
141		Plx3	9.6	8,177	1,996	10,173	1,055	25
141		Plx4	16.0	32,861	6,492	39,353	2,457	51
142	Chronic Bronchitis		6.9	4,059	1,132	5,191	755	3,228
142		Plx1	5.8	3,043	878	3,921	680	2,357
142		Plx2	9.4	5,269	1,504	6,774	722	364
142		Plx3	10.0	6,886	1,833	8,719	872	337
142		Plx4	15.8	14,085	3,635	17,719	1,124	183
143	Simple Pneumonia And Pleurisy		6.0	4,226	1,160	5,386	892	5,337
143		Plx1	4.7	2,930	853	3,782	810	3,750
143		Plx2	9.3	5,600	1,582	7,181	775	747
143		Plx3	9.6	7,107	1,852	8,959	930	503
143		Plx4	14.0	16,709	3,907	20,616	1,477	355

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Table 11: A page from CIHI's RIW table for COPD (CMG+ number 139)
Reproduced from the Canadian Institute for Health Information, DAD Resource Intensity Weights and Expected Length of Stay for CMG+ 2008[6]

CMG	CMG Title	Age Group	Factor Effect	Comorbidity Level			
				1	2	3	4
139	Chronic Obstructive Pulmonary Disease	F: 29–364 Days	ELOS Effect	1.46704	1.77807	2.75093	3.87154
			RIW Effect	1.31589	1.88998	2.45731	3.72541
			PD Effect	1.21780	1.21709	1.21705	1.03484
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		G: 1–7 Years	ELOS Effect	1.46840	1.77971	2.31374	3.25626
			RIW Effect	1.31589	1.88998	2.45731	3.72541
			PD Effect	1.21780	1.21709	1.21705	1.03484
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		H: 8–17 Years	ELOS Effect	1.46671	2.02301	2.55547	3.59646
			RIW Effect	1.43162	2.05620	2.67342	4.05305
			PD Effect	1.32555	1.10942	1.10939	1.19989
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		R: 18–59 Years	ELOS Effect	1.41817	1.95606	2.47090	3.47744
			RIW Effect	1.43162	2.05620	2.67342	4.05305
			PD Effect	1.06825	1.15942	1.15939	1.25397
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		S: 60–79 Years	ELOS Effect	1.29379	1.73154	2.18728	3.07829
			RIW Effect	1.33965	1.92411	2.50168	3.79268
			PD Effect	1.06980	1.17037	1.17034	1.18552
			LSPD Effect	0.97632	0.97632	0.97632	0.97632
		T: 80+ Years	ELOS Effect	1.26384	1.68240	2.08397	2.93290
			RIW Effect	1.24624	1.75901	2.28702	3.46724
			PD Effect	1.05427	1.13345	1.13342	1.14812
			LSPD Effect	0.97632	0.97632	0.97632	0.97632
140	Bronchiectasis	F: 29–364 Days	ELOS Effect	1.46443	1.77490	2.74603	3.86465
			RIW Effect	1.50626	2.16340	2.81281	4.26437
			PD Effect	1.17457	1.17388	1.17385	0.99811
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		G: 1–7 Years	ELOS Effect	1.46579	1.77654	2.30962	3.25047
			RIW Effect	1.50626	2.16340	2.81281	4.26437
			PD Effect	1.17457	1.17388	1.17385	0.99811
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		H: 8–17 Years	ELOS Effect	1.46410	2.01941	2.55092	3.59006
			RIW Effect	1.63873	2.35367	3.06019	4.63941
			PD Effect	1.27849	1.07004	1.07001	1.15730
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		R: 18–59 Years	ELOS Effect	1.41565	1.95258	2.46650	3.47125
			RIW Effect	1.63873	2.35367	3.06019	4.63941
			PD Effect	1.03033	1.11826	1.11824	1.20946
			LSPD Effect	1.08504	1.08504	1.08504	1.08504
		S: 60–79 Years	ELOS Effect	1.29149	1.72846	2.18339	3.07281
			RIW Effect	1.53346	2.20247	2.86360	4.34137
			PD Effect	1.03182	1.12883	1.12880	1.14343
			LSPD Effect	0.97632	0.97632	0.97632	0.97632
		T: 80+ Years	ELOS Effect	1.26159	1.67941	2.08026	2.92768
			RIW Effect	1.42653	2.01348	2.61789	3.96885
			PD Effect	1.01684	1.09321	1.09319	1.10736
			LSPD Effect	0.97632	0.97632	0.97632	0.97632

Table 12: Provincial average cost per weighted case (CWC), 2006-7

Province	CWC $ per weighted case
Newfoundland	$5,092
PEI	4,878
Nova Scotia	5,040
New Brunswick	4,921
Quebec	Not available
Ontario	$5,078
Manitoba	$4.649
Saskatchewan	$4,955
Alberta	$4,955
British Columbia	$4,718

Source: Canadian Institute for Health Information[62]

Table 13: Example of cost calculation for LABA observational arm

Service type	Services per person	Cost per service	Cost per person	Data source
Family doctor visits	3.2	$24.29	$78	Visits from provincial FFS records. Cost from provincial Schedule of Medical Benefits, Code 0303A
Specialist visits	0.7	$45.61	$32	Same as above, using billing code 0303A, Code RSMB
ED visits				
--Facility cost	0.8	$225	$180	ED visits obtained from AACCS data base. Per visit costs from Table 2.
--ED doctor fee	0.8	$80	$64	ED visits obtained from AACCS data base. Per visit costs from Table 2.
Hospitalizations			$0	
-- Facility costs	1.2	$6,757	$8,108	Hospital COPD visits obtained from DAD provincial data base. Costs per Table 1.
--Physician visits	1.2	$45.61	$55	Hospital COPD visits obtained from DAD provincial data base. Costs per Table 1.
Drugs			$0	
-- LABA	365	$1.61	$588	Drug utilization and costs obtained from drug plan.
-- Combination		NA		
-- Other				
Total cost			**$9,104**	

Please note some of the data in this table is fictional and cannot be directly referenced.

Table 14: Example of cost calculation for combination drug observational arm

Service type	Services per person	Cost per service	Cost per person	Data source
Family doctor visits	3.4	$24.29	$83	Same as above
Specialist visits	0.8	$45.61	$36	Same as above
ED visits				Same as above
--Facility cost	0.6	$225	$135	Same as above
--ED doctor fee	0.6	$80	$48	Same as above
Hospitalizations			$0	Same as above
-- Facility costs	0.9	$6,757	$6,081	Same as above
--Physician visits	0.9	$45.61	$41	Same as above
Drugs			$0	Same as above
-- LABA		$1.61	$0	Same as above
-- Combination	365	$2.77	$1,011	Same as above
-- Other				
Total cost			**$7,435**	

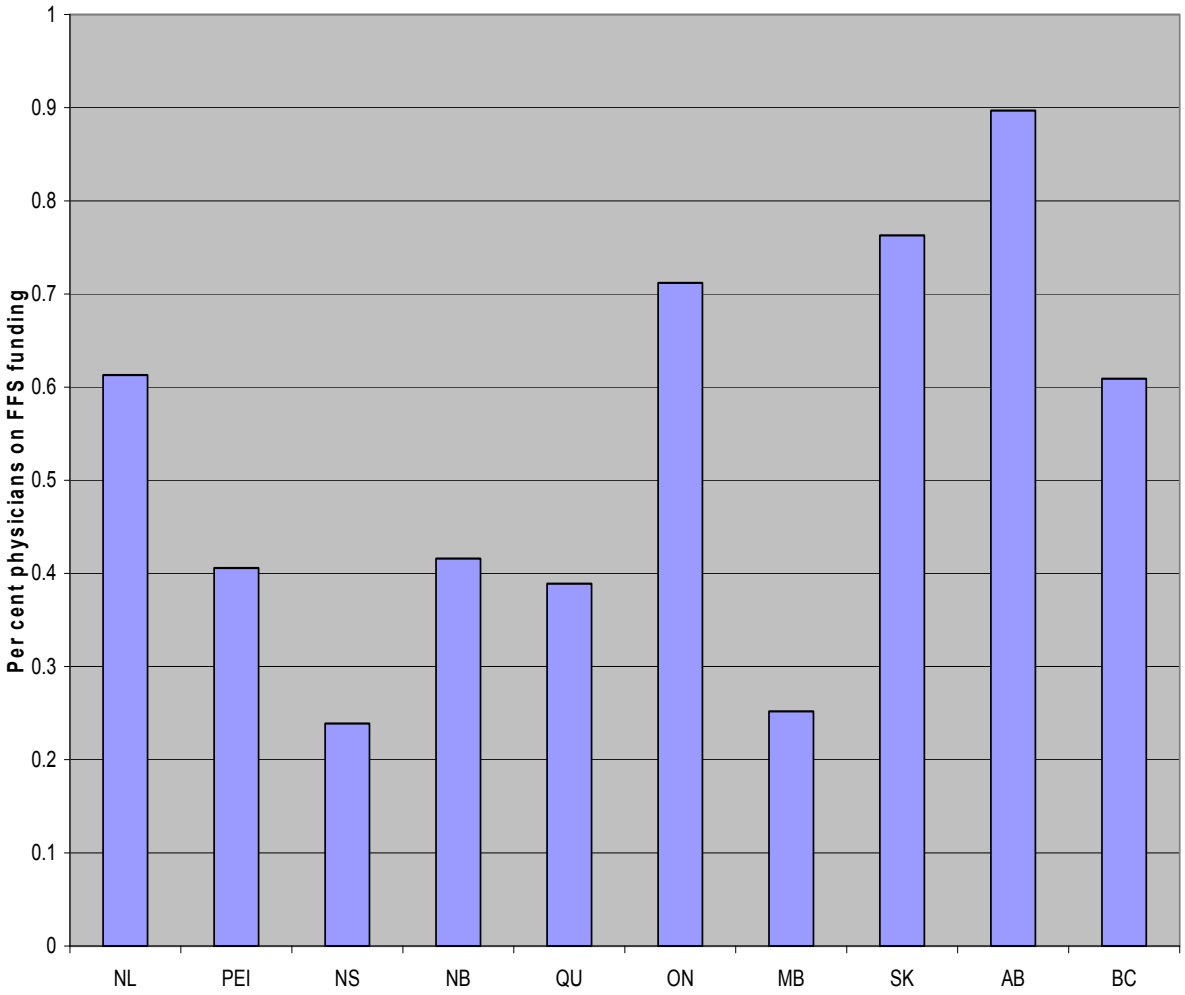
Please note some of the data in this table is fictional and cannot be directly referenced.

Table 15: Example of budget impact analysis for replacing LABA with combination therapy

		Current	Proposed
Population over 65		360,000	360,000
Number with COPD		18,000	18,000
Number using LABA		8,000	0
Number using combined		6,000	18,000
Number using no drugs		4,000	
Annual drug costs			
LABA	$588		
Combined therapy	$1,011		
Annual other costs			
LABA	$8,517		
Copmbination therapy	$6,424		
No drug therapy	$7,900		
Total drug budget		**$10,767,500**	**$18,198,900**
Total other budget		**$138,280,000**	**$115,632,000**
Total budget, all services		**$149,047,500**	**$133,830,900**

Please note some of the data in this table is fictional and cannot be directly referenced.

Figure 1: Per cent of physicians billing on a fee for service basis, by province



Source: Canadian Institute for Health Information. Physicians in Canada: The Status of Alternative Payment Programs, 2005-2006[63]