Allocating Funds for Health Care to Manitoba Regional Health Authorities

BY

GREGORY FINLAYSON
B.A., University of Manitoba, 1987

THESIS

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Dissertation Examining Committee:
Ross Mullner, PhD, Chair
Evelyn Forget, PhD
Philip Jacobs, DPhil, CMA
Seijeoung Kim, PhD
Edward Mensah, PhD
Noralou Roos, C.M., PhD

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LIST OF ABBREVIATIONS

APP   Alternative Payment Plan

CCOHTA Canadian Coordinating Office for Health Technology Assessment

CIHI   Canadian Institute for Health Information

CMG   Case Mix Group

DPG   Day Procedure Group

IBD   Inflammatory Bowel Disease

MCHP   Manitoba Centre for Health Policy

MeSH   Medical Subject Headings

NHS   National Health Service

OECD   Organisation for Economic Co-operation and Development

RHA   Regional Health Authority

RIW   Resource Intensity Weight

SUMMARY

This dissertation makes three important contributions to our knowledge about funding allocation for healthcare. First, it describes a process of developing a method of allocating funds for healthcare that takes into account relevant characteristics of individuals and could be generalized to other jurisdictions. Second, it provides a summary of the approaches that are used around the world to allocate funds from a central government to smaller jurisdictions that have responsibility for providing healthcare. Third, explicit direction for assigning healthcare costs to individuals and study populations is described to assist clinicians and economists in conducting studies using administrative data.

The work presented here was initiated as a result of a research project that was designed to develop a funding allocation methodology for healthcare in Manitoba, Canada (Finlayson, Forget, Ekuma, Derksen, Bond, Martens, & De Coster, 2007). Two of the papers presented here address two of the issues that were raised most frequently during and subsequent to the completion of this report, but were outside of its scope. The "Manitoba approach" (described in the first paper) was developed specifically to address issues within the province, but as is demonstrated in the second paper, there are many ways that others have looked at it. This review responds to multiple requests that were received from several jurisdictions. The third paper addresses a need to publish in the academic literature (as opposed to gray literature that may not be accessed by clinicians) an approach to assigning healthcare costs to administrative data. Although these data are not always collected, or centralized as they are in the

SUMMARY (continued)

Repository at the Manitoba Centre for Health Policy (MCHP), the methods described

here may be generalized to other jurisdictions where similar data are routinely

collected.

Individually, each of these papers make a contribution to the academic literature

by synthesizing knowledge and issues related to allocating funds for healthcare.

Collectively, they address the issues of most importance and interest to those who are

embarking upon the process of considering options for allocating these funds.

I.   INTRODUCTION

A.   **Background**

Making decisions about how to allocate funds for health care is a common responsibility for governments in publicly funded health care systems. Resources are scarce so decisions need to be made as to how best to distribute them. Petrou and Wolstenhholm (2000) identified four possible alternatives—allocating resources by need or capacity to benefit, allocating resources using economic approaches, allocating resources by age, and allocating resources through pluralistic bargaining.

In this dissertation I deal with the first approach, allocating resources by need. The work reported here is a follow-up to a report requested by the Government of Manitoba, Canada to consider "How would (healthcare) funding be allocated if it were based upon the needs of the population?" This expresses a clear interest in exploring an explicit approach to funding rather than the current implicit approach. An explicit approach allows government and the population to express the specific objectives of a healthcare system, and to determine if and how these objectives are being met. In the following papers I explore three important issues. First, I describe a method that may be used to equitably distribute healthcare funds, taking into account those characteristics that are expected to affect the need for, or use of, these services. For the remaining two papers I respond to two questions that came up during the course of answering the government's question: how is funding allocated in other jurisdictions

throughout the world?, and what are the methods used to estimate costs for healthcare using administrative data?

B.   **Setting**

1.   **About Manitoba**

Manitoba is a Canadian province with a population of 1.17 million people (Manitoba Health, 2006) living in an area of 250,946 square miles / 649,950 square kilometres (Travel Manitoba, 2007). Large areas of the province are uninhabited. The age/sex population pyramids for different areas of the province show great variability with some areas having large proportions of young people, and some having larger proportions of older people (Fransoo, Martens, Burland, The Need to Know Team, Prior, & Burchill, 2009). Two major urban areas exist (Winnipeg and Brandon), although Brandon is relatively small (49,000 people) in comparison to Winnipeg (665,000 people). There are eight larger communities (Dauphin, Flin Flon, Portage la Prairie, Selkirk, Steinbach, The Pas, Thompson, and Winkler/Morden) where many services are available for residents of the surrounding areas.

2.   **About the Manitoba health care system**

Under the Canada Health Act (Department of Justice—Canada, 1985), provinces are responsible for providing medically necessary insured health services to residents, without direct charges, in order to be eligible for a cash transfer through the Canada Health and Social Transfer. The primary objective of Canadian health care policy is to "protect, promote and restore the physical and mental well-being of

residents of Canada and to facilitate reasonable access to health services without financial or other barriers" (Department of Justice—Canada, 1985, p. 4). The criteria upon which provinces are evaluated are: public administration, comprehensiveness, universality, portability, and accessibility. This legislation replaced two earlier acts (the Hospital Insurance and Diagnostic Services Act (1957) and the Medical Care Act (1968)). The Canada Health Act entrenched the basic principles that were established in these earlier laws, and added provisions prohibiting direct billing of patients for insured services (Health Canada, 2002).

Manitoba is one of 10 provinces and three territories that make up Canada. In Manitoba, the Regional Health Authorities Act (Government of Manitoba, 1996) created regional authorities with responsibility for providing for the delivery of and administering health services in specified geographic areas. The province is currently divided into 11 Regional Health Authorities (RHAs). The number of people living in the regions ranges from 665,028 (Winnipeg) to 965 (Churchill) (Manitoba Health, 2006). The RHAs are responsible for delivering selected health services to all residents of their region, and for providing these services to residents of other regions when they are not available in the home RHA. The services currently provided by RHAs include: hospital-based acute care services (including hospital-based diagnostic imaging and laboratory services), institutional long-term care (nursing homes), home care, community and mental health services, and emergency response and transportation. The government, through Manitoba Health, directly manages and funds additional health services (e.g., physician services, Pharmacare).

3. **How funding is currently allocated to regional health authorities**

Under the Regional Health Authorities Act, the Lieutenant Governor in Council may establish regulations:

respecting the funding of regional health authorities, including

but not limited to

- o the manner of determining funding to regional health authorities,
- o the allocation of funds (Government of Manitoba, 1996).

The Lieutenant Governor has not enacted regulations dealing with these matters. Funding allocation decisions are therefore made through the provincial budgeting process which involves the health minister providing advice to finance minister, treasury board, and cabinet. The budget is ultimately reviewed and approved by the Legislature.

The Act requires that RHAs submit plans as prescribed by the Minister. Among other things, these plans must include "a comprehensive financial plan which shall include a statement of how resources, including but not limited to financial resources, will be allocated to meet the objectives and priorities developed by the regional health authority and provincial objectives and priorities" (Government of Manitoba, 1996, p. 10). Up to this point, these plans and budgets have been the basis of funding allocation decisions, along with other political and policy decisions that are typically made by governments.

C.   **<u>Key Questions</u>**

Funding allocation is one of the fundamental healthcare policy functions within single-payer health systems where responsibility for health service delivery is decentralized. Manitoba Health has indicated an interest in considering an alternative to the current funding allocation mechanism described above, and specifically to recognize that the characteristics of the populations of Manitoba regions should influence the distribution of funding health services among the 11 geographically defined areas. Prior research has shown that the use of hospital services by the populations in some regions in Manitoba is less than would be expected, while in others it is greater than would be expected (Stewart, Black, Martens, Peterson, & Friesen, 2000). We also know that there are differences in the health status of the population of regions—some populations are healthier than others (Fransoo et al., 2005; Brownell et al., 2003; Martens, Fransoo, Burland et al., 2003; Roos et al., 2001; Fransoo et al., 2009). Implementation of a "population-based" methodology would contribute to more equitable health services utilization, and potentially contribute to a reduction in disparities in health status. The goal of the original research was not to establish the absolute funding level for regions (i.e., the "right" level of funding to maximize health status), but rather to describe the best relative allocation of funding among regions. Therefore, the key question the original research addressed was "How would funds for delivery of health services by Manitoba Regional Health Authorities be allocated to regions if the characteristics of the populations being served were considered?"

D.   **Structure of this Dissertation**

The following chapters are composed of three papers resulting from earlier work by Finlayson et al. (2007). These papers expand upon this work and are intended to ultimately be published in scholarly journals. The first paper describes an approach to allocating funds to RHAs to recognize the different characteristics of the people living in each region. The second reviews the methods of funding allocation that have been adopted in various jurisdictions around the world. The collection of this information will make an important contribution to the literature enabling decision makers and researchers to have easy access to the various methods that are in use. Finally, in developing the funding allocation methodology for Manitoba it was necessary to create estimates of costs for healthcare. This approach is widely generalizable and a detailed description is provided for others to use in future research.

E.   **Approvals**

The proposal for this work was reviewed by the Institutional Review Board of the University of Illinois at Chicago and it was determined that it does not meet the definition of human research subject research as defined by 35 CFR 46.102(f) (Protocol 20080754-41830-1). The Health Information Privacy Committee of the Government of Manitoba reviewed the research proposal and determined that the research did not require their approval (File no. 2008/2009 – 26). The Health Research Ethics Board of the University of Manitoba Bannatyne Campus reviewed the research proposal and

approved it (Reference number H2008:253). A student researcher agreement was executed between the University of Manitoba and the author.

II.   ALLOCATING FUNDS FOR HEALTHCARE

A.   Abstract

Single-payer healthcare systems often allocate some or all funds available for healthcare from a centralized organization (e.g., a province) to organizations that have responsibility for administering the services. This paper reviews alternative approaches allocating these funds and provides detailed information in a process that resulted in a population-based funding allocation for the province of Manitoba, Canada.

B.   Introduction

Allocating funds among various services and programs is a fundamental responsibility of governments. Within a single payer healthcare system, governments may choose to distribute funding for health services to smaller jurisdictions, whether it is from a national level to provinces, states or other geographically defined areas, or from a province/state-level to regions. This paper will describe a process that was used to develop a funding allocation methodology for the single payer healthcare system Manitoba, Canada.

There are a variety of ways funds are allocated for healthcare, which can be generically described as historical, per-capita or formula-based. The historical approach simply uses past expenditures as the basis for establishing the allocation. Typically an incremental increase of X% is added to the previous year's expenditures. A per capita

approach assigns a certain dollar value to each individual and the allocation is based upon the number of people living in the area, regardless of any other factors. A formula-based approach can use a variety of characteristics of the population, or the accessibility of healthcare, to determine the allocation.

In Canada, healthcare is a responsibility of the provincial government but provincial governments often distribute some funding to jurisdictions within the province to allow them to meet specific healthcare responsibilities. In Manitoba, for example, there are eleven regional health authorities that are tasked with providing hospital services, nursing home care, home care, emergency response and transportation, mental health care and community services (including region-specific public health programs). Approximately 69% of all healthcare funds are distributed to the regions with 89% of this funding being allocated to hospital care, nursing home residence, and home care. The provincial government must, therefore, come up with a method to decide how to distribute a fixed budget among RHAs. Currently, an historical-based approach is used in Manitoba and is informed by Community Health Assessments that are completed every five years by each RHA. The RHAs submit a plan and budget for those activities that will be managed by them on an annual basis, and Manitoba Health uses this as a basis for adjusting funding among the regions. The total budget allocated for healthcare is established through the provincial budget which is one of the functions of the legislative assembly. A budget for capital costs is established separately from operational costs. The problem with this approach is that

inequities become entrenched and exaggerated over time, as demographics and other population characteristics shift. Two other approaches are possible. The simplest would simply allocate funding on a per capita basis. A somewhat more complex method would take into account relevant population characteristics.

The purpose of this research was to develop a formula by which a fixed provincial budget could be allocated to the different RHAs that would take into account relevant population characteristics. The RHAs, then, could allocate the funding received among their responsibilities as they see fit.

Deciding how to allocate funds is a complex process. History and politics can play an important role. Hence the interest in establishing an empirical approach to distributing these funds to remove or diminish the role of history and politics from the process, and develop a transparent and defensible method. A formula-based approach identifies the specific parameters that are considered in the allocation.

Equity and transparency are two important considerations when developing a formula for allocating funds. Equity is distinguished from equality in that equality assumes that the need for health services is equally distributed throughout the jurisdiction so funds are allocated on a per capita basis without regard for the underlying characteristics of individuals and populations. On the other hand, "Equity in health care requires that patients who are alike in relevant respects be treated in like fashion and that patients who are unlike in relevant respects be treated in appropriately unlike fashion" (Culyer, 2001, p. 276). Transparency in government has become

increasingly important in recent years in response to public interest, scarcity of funds, and many competing programs and services.

C.   Methods

The data used in this study were drawn from the Population Health Research Data Repository housed at the MCHP (Roos, 1999). These data are anonymized yet linkable across databases—no identifiers are present in order to protect the privacy of individuals. The repository includes nearly 100 databases. In this study the following were used: population registry, hospital discharge abstracts, home care use, nursing home residence, and Statistics Canada data. The Statistics Canada data are not linked to an individual but are used to determine the socioeconomic status of a person according to the neighbourhood in which they live. This research was reviewed by the Health Research Ethics Board of the University of Manitoba (H2004:087 and H2008:253), the Health Information Privacy Committee of Manitoba Health (2004/2005/-07) and the Institutional Review Board of the University of Illinois at Chicago (20080754-41830-1).

In this analysis inpatient hospital care, hospital day procedures, home care, and nursing home residence were included. These are services for which RHAs receive funding, and are responsible for managing them. There are other services administered by RHAs (e.g., community programs, emergency transportation), but data are not available to conduct a population-based analysis. Other services are managed directly by the provincial government (physician services and prescription drug benefits) for

which RHAs have no responsibility and receive no funding. This analysis uses different approaches to measure utilization for the three services. For hospital care, standard (or "average") costs are used. Home care is measured according to the number of days an individual has an open case file. For nursing home residence, a value representing the number of days, weighted by the level of care required, is used. A brief description of the method of determining health service use for each of these types of care is provided. Similar approaches to costing health services have been used by Finlayson et al. (2010), Bernstein et al. (2011), and Leslie et al. (2011).

1. **<u>Hospital care</u>**

At discharge, all inpatient and day surgery cases are reviewed by trained abstracters who create a computerized record of the diagnoses assigned to the person, as well, in some cases, the procedures that occurred. This information is used by the Canadian Institute for Health Information (CIHI) to assign a resource intensity weight (RIW) to each case.[a] The RIW is a measure of the relative resource requirements based on the diagnoses, procedures, complexity, age of the person, and the discharge status. For example, the resource requirements for a hip replacement in an otherwise healthy adult are expected to be approximately 2.8 times more than a similar person who is treated for chronic bronchitis. The RIW is multiplied by a Manitoba-specific average cost per weighted case (i.e., the average cost for a case with a RIW of 1) to provide an average cost for individuals within a homogeneous group.

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[a] The RIW is calculated using micro-costs obtained from Canadian jurisdictions where individual cost data are collected.

2.   **Home care**

Home care use is measured by a simple count of the number of days a person has an open home care file. While this is not a precise measure, it assists in identifying those individuals receiving this service and over what period of time they receive it. The total number of days Manitobans had an open file for these services within a year is calculated. The limitation of the home care approach is that it does not recognize the various types of care that individuals receive: an individual receiving weekly home support services would be assigned the same number of days as a person who was receiving daily nursing or rehabilitation services.

3.   **Nursing home residence**

Similarly, for nursing home residence, the number of days an individual was a resident of a nursing home was determined. The days of residence are weighted by the level of nursing care they received. In Manitoba, during the period of study, when a person is admitted to a nursing home they are assigned to a level-of-care (1 to 4). These levels-of-care reflect the number of nursing hours that are expected to be needed for the individual. A person in level 1 receives a weight of 0.5, a person in level 2 receives a weight of 2.0, and for levels 3 and 4 the weight is 3.5. The weighting provides some indication of the level of service they receive.

This study includes only those services that are administered by the RHAs. Services that are administered by Manitoba health are not included as the RHAs are not responsible for their provision. In particular, physician services and prescription drugs

dispensed through community pharmacies are excluded from this funding allocation methodology. The goal of this research was to determine how funds would be allocated to RHAs to enable them to operate the services for which they are responsible—these provincially administered services are not part of RHA operations. There are other services that are administered by the RHAs but are not included: community-based health services (including mental health), public health activities, other centralized services (e.g., laboratory services), outpatient clinics, and emergency response and transportation. Funding for these services are outside of the scope of this research and in most cases funding is established through the regional plan that is submitted to Manitoba Health by the RHAs (e.g., community-based services, public health activities), or policy decisions designed to promote efficiency in the system (e.g., location of laboratories and substance abuse treatment centres). In other cases, data are not currently available to estimate population-based health care costs (e.g., outpatient clinics and emergency response).

When this research was initiated, key stakeholders were involved in the development of the "theory" that would predict utilization of health services by the populations of different regions of the province. The Regional Health Authorities of Manitoba (an umbrella organization representing all RHAs in the province) was asked to identify representatives to the advisory group. In addition, individuals from Manitoba Health, the Centre for Aboriginal Health Research, Manitoba Education, and Manitoba Family Services and Housing were appointed to the group by their agency.

At the first meeting, we reviewed funding allocation methodologies that were in place elsewhere, and after discussion, it was determined that it would be more desirable to develop an approach that fit with the population of Manitoba and the administrative data that are available for our use. Through a brainstorming approach we identified those factors that could be expected to influence the need for or use of healthcare services. These thirty factors were then grouped into four categories: demographics, behavioural characteristics, morbidity and mortality and "other" (see Table I).

TABLE I
FACTORS EXPECTED TO INFLUENCE THE NEED FOR OR USE OF HEALTH
SERVICES, AS IDENTIFIED BY THE PROJECT ADVISORY GROUP

Behavioural Characteristics	Morbidity and Mortality	Demographics	Other
Smoking Physical activity Seat belt use Diet	Premature mortality rate Injury Life expectancy Infant mortality At-risk birth weight Mental health Chronic conditions Cancer Diabetes Hypertension Sexually transmitted diseases	Age Gender Education Birth rate Employment Socio-economic status Aboriginal status Social allowance status Genetic predisposition Geography/remoteness Living on-reserve	Self-rated health Disability Environment (e.g., air and water quality) Housing

Given that some of the variables are measured at the individual-level (e.g., age and sex) and some are measured at the community-level (e.g., socioeconomic status and premature mortality rate), hierarchical linear modelling was used to model those variables for which data were available. The unit of analysis used in this study is individuals nested within 25 Winnipeg neighbourhood resource networks and 51 non-Winnipeg districts.

Although our brainstorming process helped identify factors that are expected to influence need for or use of health services, data were not available for some of the variables. The original list of thirty was refined to twenty-eight. Specific indicators were developed for each factor, and these were identified as whether they would be measured at the individual level or the community level (see Table II).

TABLE II
INDEPENDENT VARIABLES AVAILABLE FOR MODELLING

Individual	Community
Demographic - Age - Gender - Marital status - Born in the year - Died in the year Morbidity and Mortality - Presence of a diagnosed chronic condition - Number of diagnosed poor health conditions - Low birth weight - High birth weight - Adjusted Clinical Grouper (ACG) weight Other - Received home care during the year - Resident of a personal care home during the year - Panelled for personal care home during the year - Admitted to hospital during the year - Discharged from hospital during the year - Number of days in hospital during the year - Proximity to a major hospital	Demographic - Socioeconomic Factor Index (SEFI)[a] - Population density - Proportion of total provincial population - Proportion of population of aboriginal origin - Proportion of population identifying as aboriginal - % of population age 65+ - % of population age 75+ Morbidity and Mortality - Premature mortality rate (PMR)[b] - Potential years of life lost (PYLL) - Injury hospitalization rate - Infant mortality rate

[a] This is a composite index of district level social factors drawn from Statistics Canada census data. It has been shown to be highly correlated with the premature mortality rate of a district, and includes several of the factors identified by the working group (e.g., education level) as important for predicting the need for or use of health services.
[b] The premature mortality rate of a district is the rate of death before the age of 75.

After reviewing the list it was determined that not all variables were relevant to each of the health services under investigation (hospital care, home care and nursing home residence), and/or that some variables were particularly important for some

services. As a result, separate models were created for each of the outcomes. Variables

were selected that were most likely to be associated with the particular health service

and placed in the model. As this was an exploratory analysis, variables that were found

not to be significant after controlling for all other variables were dropped from the

models. Table III shows the three services that were modelled and all of the variables

that were placed in the model. Data regarding how the models were assessed for

goodness of fit may be found in the report "Allocating Funds for Healthcare in

Manitoba Regional Health Authorities: A first step—population-based funding"

(Finlayson et al., 2007).

TABLE III
PREDICTOR VARIABLES CONSIDERED FOR EACH MODEL

	Hospital Inpatient Care		Personal Care Home		Home Care	
	Individual	Community	Individual	Community	Individual	Community
Demographic Characteristics						
Aboriginal – percent of the population of aboriginal origin		T[a]				
Aboriginal – percent of the population self-identified as aboriginal		T				
Age	●[b]		●		●	
Age – proportion of the population age 65+		T				T
Age – proportion of the population age 75+		T				T
Distance to a major hospital	●					
Marital status			●		●	
Newborn	●					
Population density		T				
Population size		T				
Socio-Economic Status (SEFI)		●		●		●
Sex	●		●		●	
Morbidity/Mortality Characteristics						
At risk newborn	●	T				
Chronic disease	●				●	
Comorbidities	●		●		●	
Death	●		●		●	
Home care recipient in fiscal year	T					

TABLE III (continued)

	Hospital Inpatient Care		Personal Care Home		Home Care	
	Individual	Community	Individual	Community	Individual	Community
Demographic Characteristics						
Admitted to hospital in fiscal year					T	
Discharged from hospital in fiscal year					T	T
Hospital days in fiscal year					●	
Infant mortality rate		T				
Injury hospitalization	●	T				
Personal Care Home resident in fiscal year	T					
Panelled for Personal Care Home in fiscal year	T					
Potential years of life lost (PYLL)		T				
Premature mortality rate (PMR)		T[c]				

[a] "T" indicates that the variable was tested but was found not to be a predictor of the health service use.

[b] "●" indicates variables that were tested and retained in the models.

[c] Using premature mortality rate rather than the indicator of socio-economic status (SEFI) produces similar results.

For the final models, the above independent variables were entered in the models as:

- Age (continuous variable)
- Sex (binary variable – male/female)
- Chronic disease (binary variable – yes/no)
- Death record (binary variable – yes/no)
- Newborn separation abstract (binary variable – yes/no)
- Comorbidity (continuous variable)
- Injury hospitalization (binary variable – yes/no)
- At risk newborn (binary variable – yes/no)
- Socioeconomic status (continuous variable)
- Distance to hospital (categorical variable)
- Marital status (binary variable – married/not married)
- Death in the fiscal year (binary variable – yes/no)
- Hospital days (continuous variable)

Once satisfactory models were produced, the parameter estimates were applied to the population in each of the RHAs. The actual average use of health services, after controlling for all covariates in the model was applied to all individuals in the region, regardless of whether or not they used the service. This was done to account for regional variation in health service use which could be due to a variety of factors, including under-use (possibly due to lack of access) and over-use (possibly due to excess availability or established practices in a region). This approach answers the question of "what would be the expected use of services if everyone who had the same characteristics used health services in the same way?" This enabled us to determine the expected costs for hospital care, the expected number of weighted days for nursing home residence, and the expected days of home care. Only the characteristics of the individual and the community in which they lived were considered. These values were

summed for each individual in an RHA to produce the total for the region. The regions

were summed to produce a provincial total. Dividing the provincial total by each of the

11 regional totals produced the proportion of dollars, weighted days or days that would

be attributed to each region, if the characteristics of the population in that region were

considered. Proportions were used because this research was not designed to predict

absolute values but rather how funds would be equitably distributed, based only on the

characteristics of people living in each of the 11 regions.

Once the proportions were calculated it was necessary to make two adjustments.

There are many situations where an individual receives hospital services in a region

other than their home region. For example, for one region, 54% of the resident's

hospital care was incurred in their home region, with the remaining 46% being received

in other regions. This 46% of total hospital costs was transferred to the regions where

the care was provided. This adjustment resulted in the reduction of the proportion of

provincial costs assigned to the home region, and an increase in the proportion assigned

to other regions. As there is no inter-regional billing between regions in Manitoba,

using the raw proportions would over-fund some regions and under-fund others.

Using three years of data, patterns of inter-regional movement were identified and the

raw proportions (reflecting where people live) were adjusted to reflect where people

received their care. A second adjustment was required for hospital care to recognize

that services may be provided to non-residents of Manitoba. For some regions, services

to residents from outside of the province account for a significant proportion of the

region's hospital expenditures. In 2003–2004 this amounted to a total of $28 million. As data are not available on the characteristics of these out-of-province individuals, data from Manitoba Health that reports reciprocal billing amounts were used to increase the allocation for regions providing these services.

In summary, the process of developing the methodology is as follows:

1.   Review, with a project advisory group, funding allocation methodologies currently being used within other jurisdictions in Canada and internationally.

2.   In collaboration with the advisory group, develop a "laundry list" of factors that would be expected to affect the need for or use of health services.

3.   Establish priorities within the list based upon availability of data, and precise measures that could be applied to each factor. For example, air and water quality may be associated with health service use, but province-wide measures of these factors are not available.

4.   Develop statistical models for each of the health services with a goal to maximize the ability of the model to describe health service expenditure/utilization of individuals, while minimizing data requirements.

5.   Using these models, specify the expected proportional use of provincial health services resources by each of the 11 regional health authorities. The expected proportional use will be a function of the characteristics of the individuals and communities in each region.

D.   Results

The results presented here represent our findings based upon the application of the methods described above to the population living in the 11 regions in Manitoba. An analogy to the presentation of the results is "this is how one would slice the pie (i.e., divide the dollars available for health care) if the characteristics of the population were taken into account." No attempt has been made to establish an absolute value for funding to each region, but rather the proportion of the total budget available for healthcare that would be allocated to each region is reported. There are two reasons for not specifying absolute values for funding. First, there is no established definition for determining the "right" level of funding that is required to meet the needs of a population. Second, and a corollary of the first, is that funds that are available for any government program are established through a governance process that is political in nature.

Table IV shows the proportional distribution for all healthcare funds available for hospital care, home care, and nursing home residence, if the characteristics of the population living in the region were taken into account. The distribution is presented in two ways—under the assumption that all services will be provided to residents within their home region (i.e., individuals never travel outside of their home region for healthcare), and under the assumption that some residents of the region will receive some of their healthcare services in another region (which is the current practice).

TABLE IV
PER CENT OF FUNDING ALLOCATED TO EACH REGION, POPULATION-BASED,
FOR HOSPITAL INPATIENT CARE AND DAY SURGERY, HOME CARE, AND
PERSONAL CARE HOMES. ADJUSTMENTS MADE FOR HOSPITAL RECIPROCAL
BILLINGS

	All services will be received in home RHA %	Some services will be received outside of home RHA %
Assiniboine	6.46	4.88
Brandon	3.51	4.36
Burntwood	2.65	1.35
Central	7.49	5.78
Churchill	0.21	0.20
Interlake	5.69	3.23
Nor-Man	1.69	1.14
North Eastman	3.23	1.78
Parkland	3.91	3.35
South Eastman	3.85	2.54
Winnipeg	61.31	71.39

Table IV shows that, for example, Assiniboine would receive 6.46% of the total

provincial budget for operating hospitals, providing home care and nursing home

residence, while Winnipeg would receive 61.31%, if it assumed that all services are

received within their home region. The only tertiary care hospitals in Manitoba are in

Winnipeg and it is unreasonable to expect that such facilities would be constructed in

every region. Similarly, certain procedures are only provided in selected facilities. As a

result, a more realistic assumption is that there will be inter-regional movement for

healthcare services. As shown in this table, two regions (Winnipeg and Brandon) increase their proportion of funds while the other nine reduce their proportion. This reflects the fact that Winnipeg and Brandon are the centres to which people travel to receive healthcare.

Tables V and VI report the distribution of funds for each of the services considered in this study. Table V shows how funds would be allocated if all services were provided in the home region while Table VI assumes that some individuals will travel to other regions to receive some of these services.

TABLE V

PER CENT OF FUNDING BY REGION AND HEALTH SERVICE, POPULATION-BASED APPROACH, ASSUMING ALL SERVICES WILL BE RECEIVED IN AN INDIVIDUAL'S RHA OF RESIDENCE. ADJUSTMENTS MADE FOR HOSPITAL USE BY OUT-OF-PROVINCE RESIDENTS

	Hospital Inpatient and Day Surgery %	Nursing Homes %	Home Care %	Overall Proportion %
Assiniboine	5.52	9.38	6.05	6.46
Brandon	3.67	3.06	3.52	3.51
Burntwood	3.45	0.23	2.91	2.65
Central	6.97	8.64	8.23	7.49
Churchill	0.30	0.00	0.09	0.21
Interlake	5.70	5.10	6.91	5.69
Nor-Man	1.82	1.09	2.17	1.69
North Eastman	3.14	3.31	3.60	3.23
Parkland	3.31	5.59	4.02	3.91
South Eastman	3.80	3.42	5.09	3.85
Winnipeg	62.33	60.19	57.41	61.31

TABLE VI
PER CENT OF FUNDING BY REGION AND HEALTH SERVICE USING THE
POPULATION-BASED APPROACH ASSUMING SOME SERVICES WILL BE
RECEIVED OUTSIDE OF AN INDIVIDUAL'S RHA OF RESIDENCE. ADJUSTMENTS
MADE FOR HOSPITAL USE BY OUT-OF-PROVINCE RESIDENTS

	Hospital Inpatient and Day Surgery %	Nursing Homes %	Home Care %	Overall Proportion %
Assiniboine	3.30	8.86	6.05	4.88
Brandon	4.92	3.16	3.52	4.36
Burntwood	1.56	-a	2.91	1.35
Central	4.36	8.70	8.23	5.78
Churchill	0.28	0.00	0.09	0.20
Interlake	2.10	4.76	6.91	3.24
Nor-Man	1.01	1.05	2.17	1.14
North Eastman	1.09	2.91	3.60	1.78
Parkland	2.49	5.51	4.02	3.35
South Eastman	1.81	3.46	5.09	2.54
Winnipeg	77.08	61.58	57.41	71.39

[a] At the time of preparation of this report there were no provincially operated nursing homes in Burntwood

Note that the allocation for hospital care changes most between Tables V and VI, while there are small changes in the allocation for nursing home residence and no difference for home care. This shows that all home care services are being provided within the region, some people need to leave their home region to live in a nursing home (this could be due to availability of beds or to be closer to informal supports such as family and friends), and that it is relatively common for people to leave their home region to receive hospital care.

E.   **Discussion**

This paper has described a methodology for allocating funds for selected healthcare services to 11 regional health authorities in Manitoba. The results for other jurisdictions (e.g., other provinces) will vary depending upon the factors such as the number of regions, the population characteristics, and availability of data; but the approach described here could be applied to any situation where funds need to be allocated based upon the characteristics of a population living in a geographically defined area. The investigators on this project worked collaboratively with senior policy-makers from the regions and from government to develop an approach to allocating funds that is equitable (i.e., it considers the characteristics of the individuals living in each region), and it is transparent (i.e., the factors that are considered in making a proportional allocation are explicit).

This research has not attempted to describe the absolute level of funding that should be allocated to each population to meet their needs, rather it describes the proportion of the total healthcare funding budget that would be allocated to each region if the characteristics of the individuals living in that region were considered, as well as the patterns of movement for accessing healthcare.

There are healthcare services that are not provided by the RHAs (e.g., physician services and prescription drugs), and there are services regions provided for which administrative data are not available (e.g., community services, emergency response, and transportation). In some cases, one region will provide services to several regions

(e.g., laboratory services, addiction treatment) and the expense will be incurred by that region yet the individuals receiving these services reside in another—these expenses could be considered "geographic or policy-based" expenses for a region.

The implementation of a methodology for which data are not available for all services or a pure population-based allocation is not appropriate because the distribution would be based on factors that are not associated with the characteristics of the population in the region. One potential approach to this to consider the total funds available for healthcare as being a pie that is sliced up to take into account both population-based funding for selected services and the realities of how a healthcare system operates. Policies and/or geographic considerations will dictate the priority for non-RHA operated services, or services provided by an RHA on behalf of other RHAs. The cost of providing services for which data are not collected can be calculated by program administrators. Figure 1 provides a hypothetical representation of how the total funding "pie" could be sliced—70% for the population-based services described here, and 30% of funds for other services. The 70% is then distributed according to the population characteristics using the method reported here. Deciding whether it is a 70/30 split or an 80/20 split (or something else) is an important process that is not considered in this research, and is likely to be resolved only through consideration by the government and the regional health authorities.
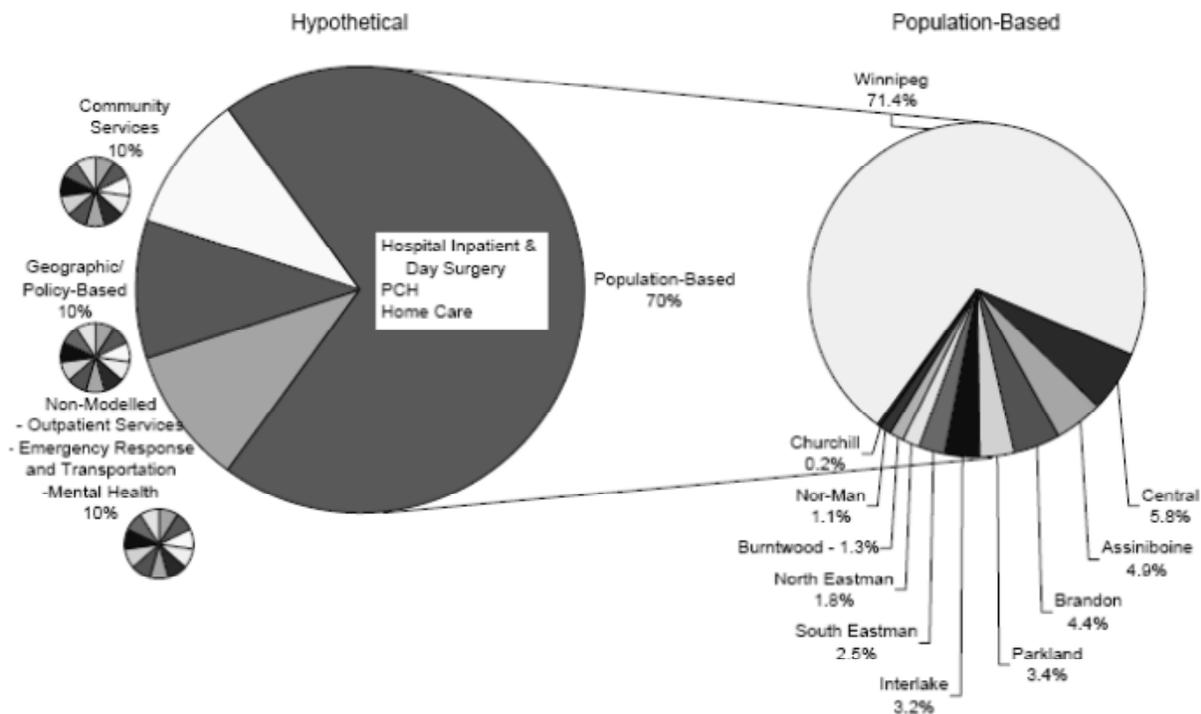
Figure 1. Allocation of funding to regional health authorities.

In their paper, "When health services researchers and policy makers interact:
tales from the tectonic plates," Martens and Roos (2005) describe the importance of
directly involving decision-makers in the research process. This was the approach that
was taken here—decision-makers were involved in discussion at every step of the
development of the methodology, not only by the advisory group but also other
interested parties (e.g., the Health Senior Executives which is comprised by the CEOs of
all RHAs as well as senior members of Manitoba Health, the CFOs of all RHAs). While
the methodology has not yet been implemented, Martens and Roos refer to a "'back-
pocket' mindset [for researchers], as they cannot count on immediate uptake of results;

because the issues never go away, evidence, if known and easily retrievable, is likely to have an eventual impact (p. 73)."

There are some limitations to this study. First of all, funding for healthcare is complex, and our methodology was limited by the data that were available. Certain services are administered centrally so are not allocated to regions, yet the services are provided in the region; while others are administered by the regions yet are independent of the characteristics of the population living in the region. As well, there is potential for measurement bias for the services provided by the RHAs. Hospital care is measured using an average weight for all individuals with similar characteristics and treatment needs. Given that this is a population-based study (i.e., it includes all individuals living in the province) it is unlikely that the use of an average weight will bias the results unless substantially different patterns of practice are used in different regions. For nursing home care, a weight representing the level of nursing care required is included. There is some risk that the weighting is inaccurate for some individuals, but there is no reason to expect that there will be differences in this inaccuracy among regions. Finally, home care is measured by the number of days that a file is open but there is no measurement of the intensity or frequency of care provided. In some studies this could be a significant limitation, but again, given this is a population-based study it is unlikely that substantial bias towards any region occurs.

There are also some methodological issues that should be considered. The specification of the models was based upon a review of characteristics that have been

used elsewhere and with input from experts in the management of health services. There is however a risk of under-specification (i.e., not including variables that should be included) when developing the models. It was also necessary to make the assumption that the average use was the right use (after controlling for the factors included in the models). Previous studies at MCHP have shown that there is over-utilization of services in some regions and under-utilization in others.

This methodology is important because, for the first time, this research quantifies the how funds for selected healthcare services would be allocated according to the characteristics of individuals living in different geographic areas. Research done at MCHP has shown that health status varies among RHAs on multiple indicators (Fransoo et al., 2009; Martens, Fransoo, & et al, 2003). Equitable funding allocation is not possible if the size of the population is the only consideration—as shown here, other factors are important too.

III.   ALLOCATING FUNDS FOR HEALTH CARE IN PUBLICLY FUNDED SYSTEMS: CONTEMPORARY APPROACHES

A.   <u>Abstract</u>

Making decisions about how to allocate funds for health care is a common responsibility for governments in publicly funded health care systems. In this paper we provide information on fifteen jurisdictions around the world that use a formula approach to allocate funds on a geographic basis. The most common policy goal in distributing funds is equity with a secondary goal of transparency. We observe that while more complex approaches attempt to respond to equity concerns with more scientific rigour, they may be more susceptible to political influences and ultimately are susceptible to frequent change. Further, while the goal of formula-based funding allocation is to promote equity, when implementing these formulae no specific evaluation of their effect has been put in place.

Key words: funding healthcare, resource allocation, equity, transparency, international comparisons.

B.   <u>Introduction</u>

In publicly funded health care systems, it is common for central governments to distribute funds to smaller jurisdictions, be it provinces, states, health boards or other such entities.

Over the last several decades, the funding allocation mechanism for operations in many health care systems has evolved from one of a simple annual increase over the previous year to an approach that attempts to take some characteristics of the population into account, to sophisticated formulae that are designed to address different needs for health care in populations. Mays (1995) describes this evolution in the United Kingdom's National Health Service (NHS) between 1948 and 1994. Prior to 1971, an incremental approach was used. The first normative approach was introduced in 1971, and used arbitrary but measurable characteristics and weights. Criticisms of this approach were answered by establishing the Resource Allocation Working Group which developed a formula that was designed to be objective, equitable, and recognize relative need. Since 1977, various empirical formulae have been used in the United Kingdom.

Eleven publicly funded health care systems that have adopted an explicit formula-based funding allocation methodology have been identified. These systems are located in: New South Wales (Australia) (NSW Department of Health, 2005; Rice & Smith, 1999; Victorian Government Department of Human Services, 2003); Alberta (Bay, Saunders, & Wilson, 1999; Plain, 1999; Alberta Health and Wellness, 2005; Alberta Health and Wellness, 2007), British Columbia (British Columbia Medical Association Council on Health Economics and Policy, 2002; British Columbia Ministry of Health Services, 2002; British Columbia Ministry of Health Services, 2005), and Ontario hospitals (Ontario Joint Policy and Planning Committee, 2004) (Canada); New Zealand

(Ashton, 2005; McHugh, 2008; New Zealand Ministry of Health, 2000); Stockholm

county (Sweden) (Andersson, Varde, & Diderichsen, 2000); England (FID Resource

Allocation, 2003; Mays, 1989; Carr-Hill, 1989; Carr-Hill, Hardman, Martin, Peacock,

Sheldon, & Smith, 1997; Judge & Mays, 1994), Wales (Rice & Smith, 2001), Northern

Ireland (Jordan, McCall, Moore, Reid, & Stewart, 2006; Rice & Smith, 2001), and

Scotland (Steering Group on the National Review of Resource Allocation, 2000;

Buchanan & Boyce, 2006; Christie, 1999) (United Kingdom), and the Veterans

Administration (Wasserman, Ringel, Wynn et al., 2001; Wasserman, Ringel, Ricci et al.,

2003; Wasserman, Ringel, Ricci, Malkin et al., 2004 & 2005) (United States). Many others

are contemplating this approach including many other countries such as Chile (Bossert,

Larranaga, & Ruiz, 2000; Bossert, Larranaga, Giedion, Arbelaez, & Bowser, 2003),

Columbia (Bossert et al., 2000; Bossert et al., 2003), Ghana (Asante, Zwi, & Ho, 2006),

Balochistan (Green, Ali, Naeem, & Ross, 2000) (Pakistan).

In early work, Rice and Smith (1999) argue that the prime purpose in

development of funding allocation where population characteristics are considered is to

control costs. They indicate that if the level of health care expenditure was not a

concern then there would not be a need to implement such systems, yet also

acknowledge that the global amount of money available is a political decision. In

subsequent work (Rice & Smith, 2001) they do not make this argument. Others argue

the two key policies goals that funding formulae are designed to address are: equity of

distribution of health services, and transparency of allocation of funds, i.e.,

governments want to be able to say that they are distributing funds fairly, and that they are doing so in a manner that is open and has good face validity. Another policy that is desired but has not been addressed to a great extent in any of the methods is that of efficiency (Häkkinen & Järvelin, 2004).

This paper will discuss the policy goals of the various allocation methodologies and the approaches that have been taken to address these goals.

One of the primary goals of funding allocation is to promote equity. Take for example the policy goals from three jurisdictions:

"Guide the allocation of funds … in order to achieve equity in funding across populations" (New South Wales Resource Distribution Formula)

"… to divide up funding equitably between the four … regions." (New Zealand Population Based Funding Formula)

" … to secure equal opportunity of access to those at equal risk." (English resource allocation formula)

Much is written about equity, and from a variety of disciplinary perspectives. The definition offered by Culyer (2001, p. 276) is straightforward and fits well in the funding allocation context: "Equity in health care requires that patients who are alike in relevant respects be treated in like fashion and that patients who are unlike in relevant respects be treated in appropriately unlike fashion." This can be contrasted with "equality" where everyone receives the same treatment (or funding), regardless of their characteristics. Culyer describes two types of equity—horizontal equity and vertical

equity. Providing similar funding to like people is horizontal equity. Vertical equity involves providing different funding to people with different characteristics, in proportion to the size of the differences. According to Culyer (p. 276), "supposing that 'need' is selected as the only relevant factor, then the two principles would imply that like needs should receive like attention and resources (horizontal equity) and that greater needs should receive greater attention and resources (vertical equity)." Almost all funding allocation methods in developed countries explicitly refer to equity as a fundamental principle.

Transparency, on the other hand is not as commonly described, but it is implied by the amount of documentation that is provided on the methods. In most of the developed world (and perhaps the developing world) there is increased interest by the public (and the media) in transparency in government (Heald, 2003). The publicly available information about the funding allocation mechanism for Alberta was 32 pages in length, for New Zealand it is 62 pages, for British Columbia it is 92, and for England, 95 pages. The rationale and mechanism of few other government policies is so well documented.

Häkkinen and Järvelin (2004) suggest that a good funding allocation formula should include efficiency. For example, the formula should not include incentives to provide excess care, or to discourage initiatives that would reduce need for health services (e.g., health promotion/illness prevention). While some formulae do include

supply-side variables it is unclear whether they are included to promote efficiency or merely to explain utilization. This is an area for considerable work in the future.

In a 1999 report, Rice and Smith (1999) provide an international survey of approaches used in 20 jurisdictions in developed nations at that time. The issue of funding allocation evolves constantly.

This paper summarizes the current approaches being taken in 12 Organisation for Economic Co-operation and Development (OECD) member locations and three developing countries. Table VII includes (when available) the underlying principles of the formula, and in some cases the minimum criteria for it; the services that are included in the formula; the underlying basis for the allocation; the individual characteristics that are included in the model; the area or community characteristics that are included in the model; and any adjustments that are made after the modelling is complete.

C.   **Methods**

Initially, the academic literature was reviewed to identify methods that are used in different jurisdictions to allocate funding. Perhaps not surprisingly, this resulted in few findings as most of the information is only available in the "gray literature," (i.e., information that is included in government reports or other documents). As a result, Google was used to search for English language publications that describe the approach

used to allocate funds to healthcare throughout the world, as well as an ongoing monitoring of news stories through Google Alerts which often leads to finding new or modified methods in various jurisdictions.

Initial search terms that were used to identify both academic and gray literature included: "healthcare funding," "health care funding," "hospital funding," "health funding allocation," and "funding allocation." There is no MeSH (medical subject headings) term that is precise enough to be used in the search. References reported in the academic literature were used to find some of these documents. Unlike a traditional review of the literature, this process was often indirect—these searches often lead down a path of links to the ultimate source of the information reported here.

Once the documents were identified, they were reviewed for six specific characteristics: their principles, the services covered, the basis of allocation, the characteristics of individuals that were considered, the characteristics of the community or area in which the individual live, and any adjustments that were made to take into account other factors. Not all jurisdictions considered all of these characteristics, but these were the most common themes among the documents that were identified.

This approach of primarily using gray literature that is readily available online was adopted to enable readers to access this information as there are frequent changes (sometimes annually). The links that are provided permit readers to review the most current approaches (albeit there may be times when links are broken—in this case a search from the jurisdiction's home page should identify the current document).

The information is presented in two categories: jurisdictions within OECD, and those that are not. The three non-OECD countries are included to show that some developing countries recognize the importance of considering healthcare funding allocation.

D.   Results

In Table VII, the results of this review are presented, according to the various characteristics of the funding allocation system. Blank cells indicate that no information is presented in the document that was reviewed regarding that characteristic.

TABLE VII
APPROACHES TO FUNDING ALLOCATION

Jurisdictions within OECD

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/Community Characteristics	Adjustments
Alberta (Prior to 2009)†	Equity Simplicity Flexibility Transparency	Acute hospital Long term care Home care Community Lab	Expected use by individual characteristics	Age (20 groups) Sex (2 groups) SES (aboriginal, welfare, subsidy, other)	None	Cross-border. Geographic differences in need not associated with individual characteristics. Input costs. Targeted programs. Minimum total.
British Columbia	Fairness and equity Understandable. Practical Comprehensive, applied to as large a proportion of the funding pool as Possible	Acute hospital Home care Community care	Expected use by individual characteristics	Age (19 groups) Sex (2 groups) SES (aboriginal, welfare and disability, subsidy, other)	None	Cross-border. Population growth. Input costs. Remoteness. Acute care complexity.

† Alberta discontinued using a regional system of healthcare management in 2009

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/Community Characteristics	Adjustments
Chile	Citizens should enjoy universal and equitable access to good quality health care.				Rurality and municipal poverty level.	
New Zealand	Fairly distribute available funding between DHBs according to the relative needs of their populations and the cost of providing health and disability support services to meet those needs.	Hospital Community services Primary health care Disability support Mental Health	Population characteristics Need	Age Sex Welfare status Ethnicity	Index of deprivation	Rurality Unmet need Overseas visitors
United States Veterans Administration	That resources be allocated equitably to the regional networks; and that the allocation system be simple and predictable.	Medical services	Historical case-mix	Illness category (10)		Input costs

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/Community Characteristics	Adjustments
England	Similar levels of healthcare for populations with similar healthcare need.	Hospital Community health Prescription drugs GP infrastructure HIV/AIDS	Need	Multiple measures and indices (and sometimes indices of indices) for each different health service. For example, the acute and maternity need index which is added to the value predicted by age is -0.152 + 0.008 education + 0.013 low birthweight + 0.070 SMR<75 + 0.026 elderly alone + 0.108 birth ratio + 0.103 income + 0.225 nervous + 0.548 circulatory + 0.375 musculoskeletal Where: ▪ education = ID2000 education domain ▪ low birthweight = Proportion of low birthweight babies born ▪ SMR<75 = Standardised mortality ratio under 75 years ▪ elderly alone = Proportion aged 75+ living alone ▪ birth ratio = Standardised birth ratio ▪ income = ID2000 income domain ▪ nervous = Nervous system morbidity index ▪ circulatory = Circulatory		All adjustments are made in the model

TABLE VII (continued)

				morbidity index ▪ musculoskeletal = Musculoskeletal morbidity index	
England					
Scotland	To establish a fair method of sharing resources between Health Boards; and to base this method as far as possible on evidence about the relative need for resources.	Hospital Community health General practitioner prescriptions	Population characteristics Factors that influence need	Population Age and sex cost weights Morbidity & Life Circumstances ▪ Standardized Unemployment Ratios ▪ % aged 65 and over claiming income support ▪ % Households with two or more deprivation indicators using 1991 census ▪ Arbuthnott coefficients ▪ Diagnostic group expenditure weights Remoteness Care Program Weights	Remoteness
Sweden	Adjust payments for differential levels of need in their populations.	All? including dental care for children	Individual characteristics	Age Marital status Housing tenure Educational level Employment Urbanization	

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/ Community Characteristics	Adjustments
New South Wales	Guide the allocation of funds from the NSW Department of Health to the geographically based Area Health Services in NSW Health in order to achieve equity in funding across populations. ▪ Technical robustness ▪ Minimizing unintended incentives ▪ Comprehensibility ▪ Transparency and objectivity ▪ Materiality ▪ Use of reliable and current data ▪ Stability and durability	Population Health Oral health Primary & Community Based Hospital Emergency Mental Health Rehabilitation and Extended Care Teaching and Research	Need	Multiple measures and indices. For example, the health need index which is one component of several of the services is 2000 HNI = 95.31 + 0.3 (SMR < 70) – 0.3 (EDOCC) + 4.0 ARIA + 1.0 %ATSI where: ▪ SMR<70 is the standardised mortality ratio for ages less than 70 ▪ EDOCC is the Australian Bureau of Statistics' SEIFA index of education and occupation ▪ ARIA is a measure of remoteness ▪ %ATSI is the proportion of the population which is Aboriginal or Torres Strait Islander.		All adjustments are made in the model

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/ Community Characteristics	Adjustments
Northern Ireland		Acute hospital Maternity and child health Family and child care Care of the elderly Mental health Learning disability Physical and sensory disability Health promotion and disease prevention Primary health and adult community			Age Sex Mortality Elderly living alone Welfare status Low birth weight	Rurality Economies of scale of facilities

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/ Community Characteristics	Adjustments
Ontario	Decrease the inequities in the volume of services hospitals provide and in the rate they are paid for that service. The goal of the Funding Formula is to ensure that each hospital is able to provide an equal share of appropriate services to their population, given the total hospital budget in Ontario.	Hospital			Medical and Surgical Volumes • Age/Sex Makeup of the Population • Excess mortality by age group • Socio-economic status (as measured by percentage of population in lowest income quintile) • Percentage of Aboriginals living in the geographic area • Percentage of the area which is deemed rural Pregnancy and Childbirth	

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/ Community Characteristics	Adjustments
Ontario (continued)					Volumes • Age/Sex Makeup of the population • Fertility Rate Newborn and Neonatal Volumes • Age/Sex makeup of the population • % of Low Birth Weight Infants	
Wales					Age Sex Mortality	Sparsity

TABLE VII (continued)

Countries Not Part of OECD

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/Community Characteristics	Adjustments
Columbia					Population adjusted for poverty level Unmet basic needs Own-source fiscal contribution Administrative efficiency Quality-of-life	
Ghana			Evenly across the board, without regard for need differential			Decentralisation assumes RHAs will "automatically" promote equity by re-distributing funds to areas where health needs are greatest.

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/Community Characteristics	Adjustments
Pakistan	Be consistent with decentralization policies and the pursuit of equity – impact on equity; – impact on efficiency ; – transparency; – feasibility including data availability, technical capacity to operate, ability to reduce over-capacity where appropriate, and capacity to absorb growth where appropriate; – consistency with other government systems;	Hospitals Primary care	Historical budget			

TABLE VII (continued)

Jurisdiction	Principles	Services	Allocation basis	Individual Characteristics	Area/Community Characteristics	Adjustments
Pakistan (continued)	– flexibility to allow medium- to long-term refinement.					

E.   <u>Discussion</u>

Governments take the allocation of funds for health services seriously. These

funds are often a large proportion of a government's budget. As shown above there are

many approaches to allocating healthcare funding, ranging from very straightforward

(i.e., a simple per capita allocation) to highly sophisticated modelling. There are several

themes that emerge from this list of approaches. Of all the allocation methods that

describe principles, "equity" or "fairness" is always reported. Less frequently

enunciated is objectivity and transparency, but that does appear for several

jurisdictions. Services that are included vary considerably—from only hospital services

to virtually all health services. For those documents that indicate the types of services

covered, hospital services are most consistently included. Many jurisdictions also

include community services, although there is inconsistency in describing what these

services include. One area in which there is substantial interest is mental health care,

and this is underrepresented in the list of services covered. The general theme for the

allocation basis is expected use of health services by the population, or similarly, the

characteristics of the population. This is often expressed using the term "need," which

is discussed below. In some jurisdictions, a simple per capita distribution or historical

allocation is used. When the characteristics of the population are taken into account,

age, sex and a measure of socioeconomic status are the most frequent factors

considered. Area or community characteristics vary widely—some models integrate

individual and community characteristics while others use community-level indicators

exclusively. Many approaches make adjustments to recognize those factors that cannot

be included in the model, while others build these factors into the model. For example, two Canadian and the New Zealand approaches make adjustments for people receiving services in the jurisdiction, but who do not live in that area. Rurality and the costs associated with providing services in a given area are also considered by several approaches.

The concept of need is frequently reported as a reason for using any kind of allocation approach, yet none of the methods reported here measure need directly. For example, the number of people living in an area is considered in all of these examples, and age and sex of the population is often a consideration. More complex methods incorporate measures of socio-economic status, racial make-up of the population, and other population-based measures. All of these can be considered proxies for need, given the evidence that health status disparities are associated with these various characteristics. But the question remains how best to measure need, and how to use these measures to ensure funds are allocated in proportion to need—how can equity be achieved?

A goal of all methods is to allocate the funds most effectively so the maximum benefit to society is derived. Without exception, jurisdictions that enunciated allocation principles refer to equity and/or fairness. Given the importance of this as a policy goal, it becomes problematic—How do you know when you've got it right? Aday (1998) provides examples of indicators that may be used to assess equity including: type and extent of affected groups' participation in formulating and implementing policies and

programs; distribution of providers; clinical indicators; population-based rates; lifestyle and health practices. Not a single allocation system referenced here has an evaluation component of any kind. Yet there seems to be a constant evolution of allocation methods, particularly when more complex approaches are used.

The pattern of rapidly evolving formulae may be associated with the complexity that is involved in specifying it. England, Scotland, and New South Wales have been redeveloping their formulae about every five years. British Columbia, on the other hand, which has the most straightforward approach of all, has maintained the same formula for over 10 years. The most complex approaches may be effected by two influences: the complexity leaves so much room for criticism that political influences will continually impact upon them, and, these approaches attempt to use modelling to explain all of the variation in service use while ignoring the context in which the health care system operates—health service utilization is not simply about population characteristics. The British Columbia formula allocates 85% of the funds through the population-based approach (British Columbia Ministry of Health Services, 2002)—the other 15% is allocated through other means. This seems to be an appropriate policy alternative, and one which has not been adopted in several jurisdictions.

F.   **Summary**

This paper has reported on 15 funding allocation approaches used in publicly funded health care systems around the world. The greatest similarity among them is

the policy goal of equity of distribution of resources. Different approaches are used to determine the need for health services ranging from simple population counts to complex models. The gap that this review has identified is that no jurisdiction has put in place an evaluation component to assess the success of the policy—this presents an opportunity for future research.

IV. CALCULATING COSTS FOR HEALTH SERVICES USING ADMINISTRATIVE DATA

A. **Abstract**

This paper describes for clinicians, economists, and health services researchers a specific process for assigning costs for healthcare to defined populations using administrative data. While the method may be used for assigning costs to individuals, care must be taken because this approach uses a hybrid of micro-costs and standard (or average) costs. Applying standard costs at the individual level does not account for individual differences in care received. Methods of assigning costs for physician services, prescription drugs, hospital care, home care, and nursing home residence are described, and their use is dependent upon availability of administrative data.

B. **Introduction**

This paper provides specific techniques for applying costs of healthcare in research and analyses using administrative data. These methods can be used to assign costs to individuals within a defined population (e.g., older adults, people with diabetes) for hospital care, physician services, prescription drugs, nursing home residence, and home care services. The goal is to provide the reader with a general understanding of the costs, and specific instructions for estimating costs for a defined population.

While these methods are specific to the data held in the repository at the MCHP, in many cases they can be generalized to those data available in other jurisdictions. For example, hospital discharge data are available in every Canadian province. However, prescription drug data are not. The methods described here can be readily applied to the data available in Manitoba, and they can be used elsewhere based upon the data that are available.

Administrative data are those data that are routinely collected as part of the process of operating a healthcare system. For example, when a person is discharged from a hospital a discharge abstract is typically prepared that describes their diagnoses and some services that were provided. Similarly, a visit to a physician produces a claim that results in the physician receiving payment for his/her services, and includes a diagnosis code and a tariff code. In some situations, alternative payment plans (APP) are in place (e.g., salaried or per diem payments), and shadow bills may be created. Researchers need to be aware that not all physicians who provide services under APPs will submit claims and should consider alternative methods for calculating the cost of care in these situations.

Consolidated records may be maintained for all people who receive home care services, or who are resident in a nursing home. If so, costs for providing these services may be determined.

Although administrative data are not specifically intended for research they may be used for that purpose. Administrative data may provide micro-costs (i.e., the

specific cost for healthcare provided to an individual) as is the case for physician services and prescription drugs, or can result in a standard cost (or average cost) that is calculated for hospital care, home care, and nursing home residence.

The Canadian Coordinating Office for Health Technology Assessment (CCOHTA) (now called the Canadian Agency for Drugs and Technologies in Health) provided an introduction to estimating costs of health care in its 1996 publication "A guidance document for the costing process" (Canadian Coordinating Office for Health Technology Assessment, 1996). The paper identifies issues relevant to assigning costs to health care, and provides an assessment of various methods of measuring and assigning value to resources consumed when providing health care. The methods described in this paper are consistent with the CCOHTA guidelines.

In this paper, the standard or average cost approach has been used to assign hospital costs, home care, and nursing home residence. Standard costs are used because in most jurisdictions micro-costs are not available for these services. Micro-costs are available for physician services and prescription drugs. For physician services, the fee that is paid to a physician is used to determine the cost of care provided to a patient. This fee is the cost to the government insurance plan of having a service provided. For prescription drugs, the actual cost of the drug that is dispensed is used, along with a provincial average dispensing fee.

This paper parallels the standard cost lists that have been developed in Canada. A standard cost list approach is the most widely used measure for costing healthcare

(Jacobs & Roos, 1999). Five Canadian cost lists for health services have been developed: one for the province of Alberta (Jacobs & Bachynsky, 1997) one for Manitoba (Jacobs, Shanahan, Roos, & Farnworth, 1999), a national cost list for provinces (Jacobs, Assiff, Bachynsky, & et al, 2000) (and an update) and a cost list of hospital services in Manitoba (Finlayson, Reimer, Dahl, Stargardter, & McGowan, 2009). This paper provides concise information on how to approach costing healthcare using administrative data. In the following section of this document a detailed description of methods that are used for determining costs is presented. This is followed by a description of the method of assigning these costs to individuals, so as to allow the calculation of the total costs of healthcare for a defined population.

C.   **Determining Standard Costs**

1.   **Inpatient hospital costs**

The cost of care provided to an inpatient in an acute care hospital is estimated using two values:

- the RIW that is assigned to the case, and
- a provincial average cost per weighted case.

CMG and RIW are registered trademarks of the Canadian Institute for Health Information

a. **Resource intensity weights**

The RIWs are measures of relative cost of providing care to people who receive hospital care. They are "relative" in that a higher weight is assigned to more complex or costly care than a more simple case—for example, the resource requirements for a hip replacement in an otherwise healthy adult is expected to be approximate 2.8 times more than a similar person who is treated for chronic bronchitis. The weights are calculated using micro-cost data from selected hospitals in British Columbia, Alberta, and Ontario where systems are in place to collect these data.

When a person is discharged from hospital, their chart is reviewed, and an abstract of the diagnosis(es) and certain procedures is created. This abstract becomes a computerized record of the case. These data are sent on an annual basis by all Canadian provinces except Québec to the CIHI, which uses algorithms to assign each case in the file to a Case Mix Group (CMG), an age group, and a complexity level. The CMG is a Canadian classification system of hospital cases that is designed to assign similar cases into a single case mix group. Each CMG is assigned a value that describes the relative value of resources that cases with that CMG are expected to consume, when compared to other CMGs, that is, the RIW. For example, a CMG that is assigned a value of 2.0 is expected to consume twice as many resources as a CMG that is assigned a value of 1.0.

Most cases with the same CMG and age and complexity classification will have the same RIW—however some cases are considered atypical and will be assigned a

unique weight that is individually calculated to reflect the expected level of resources

that would be consumed by that particular case. Atypical cases include cases that result

from a transfer to or from an acute care hospital, that are statistically defined long-stay

outliers, or that end in death or with the person leaving the hospital against medical

advice.

More information about CMGs and RIWs is available from the CIHI in their

annual methodological publication. Over the years there have been multiple versions

of the algorithms used to classify cases with corresponding adjustments to the weights

that are assigned to cases.

b.   **Average cost per weighted case**

The average cost per weighted case is calculated using the

following formula:

$$\frac{\text{Costs for Inpatient Care for all hospitals}}{\text{Weighted Cases for all hospitals}}$$

It is important to note that the calculation of total cost for inpatient care excludes

the fees that are paid to physicians. Other potential exclusions include capital costs for

the hospital, and in some cases, the overhead costs (e.g., administration, information

technology, and health records). These categories of costs may be excluded, as they are

indirect costs that cannot be directly attributed to an individual patient. The cost per

weighted case developed by CIHI excludes capital costs but does include the indirect costs associated with hospital operation.

The value for total weighted cases (i.e.,   weighted cases) is determined by summing the RIWs assigned to all cases.

The CIHI publishes an average cost per weighted case for most provinces on an annual basis and this information can be found at http://www.cihi.ca/CIHI-ext-portal/xls/internet/Regional_averages_08-09_EN. Note that the average cost per weighted case includes indirect costs of hospital operation but does not include building capital costs.

2.   **Hospital day procedure costs**

Day procedures that are performed in a hospital (e.g., hernia repair, tendon and muscle procedures, electroshock therapy) are abstracted in a manner similar to that of inpatient cases. Cases that have been abstracted are assigned by CIHI to a Day Procedure Group (DPG) (the outpatient equivalent to CMG). Every DPG has an RIW assigned to it. The same average cost per weighted case that is used for inpatients is used to determine the cost for hospital day procedures (Canadian Institute for Health Information, 1995). Note that activities within hospital outpatient clinics (including such areas as the emergency department and rehabilitation clinics) are typically not abstracted and as a result are not assigned an RIW. Information on these costs are not typically available, although Alberta has implemented a system for

calculating them. This is an area for future research as it is unknown what proportion of total healthcare costs these services represent.

3. **Nursing home and home care costs**

Typically, when data are available, the standard cost for nursing home residency and home care services are somewhat limited in that they do not provide a cost that reflects the intensity of services provided to an individual. In the absence of additional cost or utilization information the best alternative is a simple per diem cost. The per diem can be calculated by obtaining the total annual cost for the service (home care or nursing homes), and dividing this by the number of days of care that were provided. The annual cost can be obtained from the annual report of the provincial health ministry, and the number of days of care can be calculated from administrative data typically held by the ministry.

D. **Determining Micro-Costs**

1. **Physician costs**

The cost of physician services is considered to be the professional fee that is paid to a physician for his or her services. The fees (commonly known as tariffs) that are paid to physicians are established through a negotiation process between the provincial government and the physicians' negotiating bodies. The tariffs with corresponding codes and descriptions are normally available from the provincial ministry of health.

One issue that investigators should consider is that there may be two fees associated with a particular claim in the administrative data: the original fee that was paid, and a net fee for the claim. It may be necessary to calculate net fees because there are situations in which a physician has been over- or under-paid for a particular service. When adjustments to payments are required, a subsequent entry is made to correct the original entry. To ensure that there is only one claim for every physician encounter, duplicate claims are combined, with the net fee being the fee that is calculated by adding together the original fee and the adjustment to this original fee.

Physicians may also be compensated through APP. Typical APPs are salaries, per diems, and capitation (a payment based on the number of enrolled patients). In some cases, the physician is required to submit a "shadow bill" (i.e., one that reports the services provided and diagnosis code, but for which payment is not made). In other cases, no record of an interaction with a patient is recorded in administrative data. In the latter situation, in order to do population-based research, a researcher must develop an alternative method for estimating the cost for physician services. If there are geographical areas in which it is known that APPs are dominant, a potential approach is to calculate the cost for age/sex groups in areas where fee-for-service is prominent, and apply this cost to the population that likely receives services under an APP.

2.   **Prescription drug costs**

In some provinces (such as Manitoba), a prescription drug program is administered by the provincial ministry of health. Data on drugs dispensed through

community pharmacies are recorded in a central database. The database includes information on the person receiving the prescription, the drug, the dosage, the number of doses, and the price. A dispensing fee (the fee charged by the pharmacy for providing the prescription) is variable between pharmacies. An investigator may choose to use the actual dispensing fee or calculate an average dispensing fee that would then be added to the drug price.

E.   Assigning Costs to Individuals within a Defined Population

In the previous section of this paper, the methods that have been used to determine the costs associated with hospital care, home care, and nursing home residence, physician services, and prescription drugs are described. The first three types of costs use standard (or average) costs while the latter two use micro-costs that reflect the actual cost of providing service to an individual. In this section the method of assigning these costs to an individual will be described.

1.   Hospital care

As was mentioned earlier, every case that is discharged from hospital is assigned an RIW. The process for estimating the cost for any individual case involves multiplying the RIW for that case by the average cost per weighted case for the year in which the case was discharged. When doing longitudinal analysis of cost data, investigators will need to consider whether to use constant dollars or the current cost per weighted case.

It is important to note that because standard costs are being used, the cost that is calculated will not necessarily reflect the actual cost of any one particular case. The cost that is calculated for a particular case is expected to be the average for all similar types of cases.

Once all cases in a study group have had a case cost assigned, the cost of care for each individual is summed to give the total cost of hospital care for all cases.

2.   **Physician services**

Over the course of the year, an individual may see a physician multiple times, and a fee is assessed for each visit. This payment to each physician is recorded in the administrative data. To determine the cost of physician services for a study group, it is necessary to sum the fees for all individuals. As noted earlier, alternative payment plans for physicians may need to be considered, depending upon the population of interest.

3.   **Home care and nursing homes**

A standard per diem is assigned to each individual for every day they had an open home care file, or they were resident in a nursing home. The cost for the study group involves summing all of these per diems.

4.   **Prescription drugs**

Although not all provinces have centralized records of prescription drugs dispensed in community pharmacies, as is the case in Manitoba, the process of

calculating the cost for an individual simply involves summing the costs of all drugs dispensed to that person during the year. The sum of all these individual costs represents the cost for the study group.

F.   Examples of Application of Costing Methods

These methods have been applied in a number of studies, including determining the seven-year cost of care for children who are born prematurely (Newburn-Cook et al., 2004), the cost of care for people with chronic health conditions (Finlayson, Ekuma, Yogendran, Burland, & Forget, 2010), costs associated with fractures (Hopkins et al., 2012; Leslie et al., 2011), and determining the cost of providing care to people with inflammatory bowel disease (IBD) (Bernstein, Longobardi, Finlayson, & Blanchard, 2011). In each study, the methods described here were used to estimate the healthcare costs for a group of people identified as having a particular condition, and comparing these people with a group of people who do not have the condition. The last study provides a good example of how administrative data may be used to assign costs to a group of people with IBD. The goal of this study was to determine the direct costs of managing patients with IBD.

Bernstein et al. developed an algorithm to define individuals with two types of IBD through administrative data: Crohn's disease and ulcerative colitis. This resulted in the creation of the University of Manitoba Inflammatory Bowel Disease Epidemiology Database. Each of the individuals with IBD was matched with up to 10

controls without IBD. Healthcare cost for physician services, hospital care and prescription drugs were assigned to each individual (cases and controls) using the methods described above. Cost comparisons were then made between cases and controls, and between people diagnosed with Crohn's disease and those with ulcerative colitis. Further cost comparisons were made between people with IBD who received biologics and those who did not.

This research resulted in important insights into the difference in healthcare costs between people with and without IBD, the two different types of IBD, and different types of drugs. The study reported that how new biologic agents now account for half the pharmacologic costs of all drugs administered to this group of patients even though they are administered to less than 10%. So while the direct costs of these agents may make it difficult to prove their cost effectiveness, issues of quality of life and impact on indirect costs may warrant the high costs of these agents.

G. Limitations

There are limitations to these approaches. For hospital care, standard costs do not reflect the actual cost of treating an individual patient—they are the cost of treating an average patient with similar characteristics. Also, we are usually not able to determine hospital costs for people who receive treatment on an outpatient basis, including the emergency department and rehabilitation clinics. The measures described here do not take into account the intensity of care provided in nursing homes or

through home care, rather they assign a per diem to all individuals receiving the service. Information on the dispensing of prescription drugs is not available in all provinces. However, this paper has described practical approaches to using administrative data to estimate costs for providing healthcare to defined populations.

H.   <u>Summary</u>

This paper has provided background information that will be useful to clinicians who are interested in conducting economic evaluations of healthcare. The methods that are reported in this document allow the estimation of healthcare costs for hospital, physician services, home care, nursing home residence and prescription drugs for any study group, when applied to administrative data commonly collected by provincial ministries of health. Table VIII summarizes key features of determining costs for healthcare using administrative data.

TABLE VIII
SUMMARY OF METHODS OF COSTING HEALTHCARE USING ADMINISTRATIVE
DATA

Health Service	Type of Cost	Measure	Individual Cost for time period	Study/Control Group Cost
Inpatient hospital care and day surgery	Standard	Cost per weighted case	CWC x RIW	Sum of all cases
Home care	Standard	Per diem	Days x per diem	Sum of all cases
Nursing home residence	Standard	Per diem	Days x per diem	Sum of all cases
Physician services	Micro	Payment to physician	Sum for all services	Sum of all individuals' cost
Prescription drugs	Micro	Payment to pharmacy including dispensing fee	Sum for all prescriptions dispensed	Sum of all individuals' cost

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NAME: Gregory Scott Finlayson

EDUCATION: B.A, Psychology/Sociology, University of Manitoba, 1987
Ph.D., Public Health Sciences, University of Illinois at Chicago, 2012

TEACHING: University of Chicago, Fall 2008

HONORS: Illinois Public Health Research Fellowship Program—Pre-Doctoral Fellow (2005 to 2008)
UIC Health Professions Student Council, Student Travel Award (2003)
UIC Graduate College Student Travel Award (2003)

PROFESSIONAL MEMBERSHIPS: Canadian Association for Health Services and Policy Research

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Allocating Funds for Health Care to Manitoba Regional Health Authorities

Gregory S Finlayson, Ph.D.
Department of Public Health Sciences
University of Illinois at Chicago
Chicago, Illinois (2012)

Dissertation Chairperson: Ross H. Mullner

Making decisions about how to allocate funds for health care is a common

responsibility for governments in publicly funded health care systems. Resources are

scarce so decisions need to be made as to how best to distribute them.

The work presented here was initiated as a result of a research project that was

designed to develop a funding allocation methodology for healthcare in Manitoba,

Canada. The primary focus was to how to best meet the healthcare needs of

populations living in different regions, based on their health status. The principle of

equity suggests that those with more need will require more healthcare services and

funding for those services. A method of allocating healthcare funds most equitably is

proposed for hospital care, home care, and nursing homes using administrative

healthcare data and other data on the health status of populations. The proposed

"Manitoba approach to funding allocation" (described in the first paper) was developed

specifically to address issues within the province, and may be generalized to other

jurisdictions, but as is demonstrated in the second paper, there are many ways that

others have looked at it. The third paper addresses a need to publish in the academic

literature an approach to assigning healthcare costs to administrative data.

Taken together, these papers provide readers with insights into, and tools for,

making decisions regarding funding allocation for healthcare.