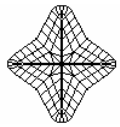

The Centre for Spatial Economics

Assessing past, present and future economic and demographic change in Canada

The economic cost of wait times in Canada

UNDER EMBARGO

until January 15, 2008 at 12 :00pm (EST)

Prepared for:

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Abstract

This study presents the economic costs of excessive wait times in Canada's medical system. It updates and extends analysis conducted in 2006 for the Canadian Medical Association and the British Columbia Medical Association. Unlike other studies that have examined the overall cost of wait lists and that therefore have had limited value in targeting health care spending, the costs presented in this study are those incurred by waiting longer than medically recommended for treatment. This "excess wait" is what current policy initiatives are attempting to reduce. The study, therefore, estimates the potential economic benefits that can be achieved through successful health care policy initiatives to eliminate these wait times.

Of the 4 priority areas reviewed in this study, the highest economic costs are generated for total joint replacement surgery (an average of around $26 400 per patient), followed by MRIs ($20 000) and CABG surgery ($19 400) with cataract surgery yielding the lowest costs ($2900). Although significant differences in costs exist among the provinces, no one province has either the highest or the lowest costs in all priority areas.

About this study

This study was commissioned by the Canadian Medical Association (CMA) to analyze the economic costs of wait times in Canada's medical system. The CMA's membership includes more than 67 000 physicians, medical residents and medical students. It plays a key role by representing the interests of these members and their patients on the national stage. Located in Ottawa, the CMA has roots across the country through its close ties to its 12 provincial and territorial divisions.

The study was conducted by Ernie Stokes, managing director, and Robin Somerville, director of corporate research services, of the Centre for Spatial Economics (C_4SE). The C_4SE monitors, analyzes and forecasts economic and demographic change throughout Canada at virtually all levels of geography. It also prepares customized studies on the economic, industrial and community impacts of various fiscal and other policy changes, and develops customized impact and projection models for in-house client use. Our clients include government departments, industry and professional associations, crown corporations, manufacturers, retailers and real estate developers.

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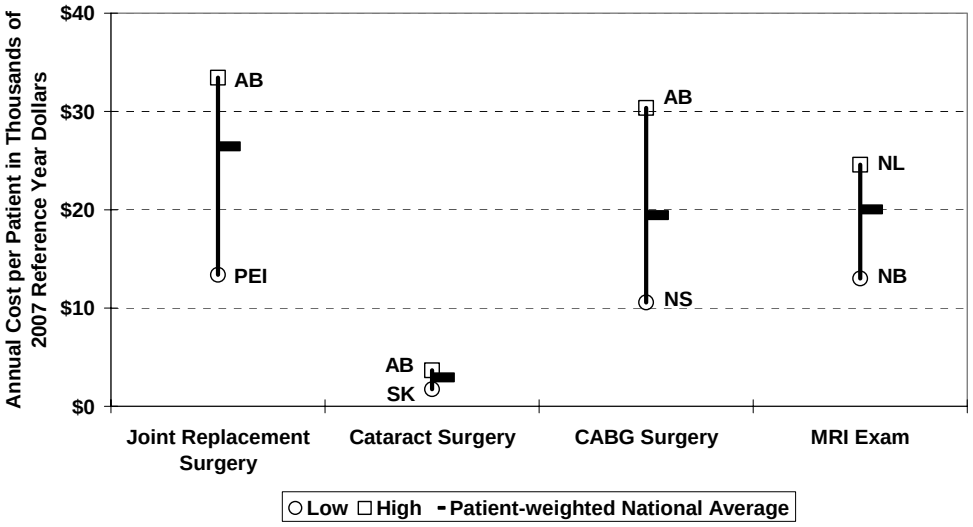
Executive Summary

The wait times experienced by patients who have to wait longer than medically reasonable for treatment impose costs not only on the patients themselves, but also on the economy as a whole. Previous economic studies of wait times, which have examined the overall cost of wait lists, have had limited value in determining the best way to target public spending to reduce wait times. In response, the Canadian Medical Association and the British Columbia Medical Association commissioned a 2006 study, which has been updated and expanded in this report, to examine the cost of waiting longer than medically recommended for treatment. The costs of these "excess waits" are relevant to policy-makers because they measure costs that could be avoided if wait times were reduced or eliminated.

Four of the 5 priority areas identified following the 2003 First Ministers' Accord on Health Care Renewal were analyzed: total joint replacement surgery, cataract surgery, coronary artery bypass graft (CABG) and MRI scans. Costs of the excess waits for these procedures were calculated for each province. Figure 1 shows that the highest economic costs are generated for total joint replacement surgery (an average of about $26 400 per patient), followed by MRIs ($20 000) and CABG surgery ($19 400), with cataract surgery yielding the lowest costs ($2900). Although significant differences in costs exist among the provinces, no one province has either the highest or the lowest costs in all priority areas. The cumulative economic cost of waiting for treatment across these 4 priority areas in 2007 was an estimated $14.8 billion. This reduction in economic activity lowered federal and provincial government revenues in 2007 by a combined $4.4 billion.

Figure 1

Impact on Gross Domestic Product per Patient Waiting in Excess of the Recommended Maximum Wait Time
Patient-weighted National Average



Source: The Centre for Spatial Economics

Our analysis is a conservative one. It only addresses the wait time from when a specialist requests a course of treatment to the time that treatment occurs. This ignores the wait times endured by patients in getting to see the specialist or even in getting to see their family doctor. Moreover, it examines only the costs associated with waiting for treatment — it does not assess the costs of reducing wait times. This latter analysis is required for a comprehensive review of the costs and benefits of achieving shorter wait times for treatment.

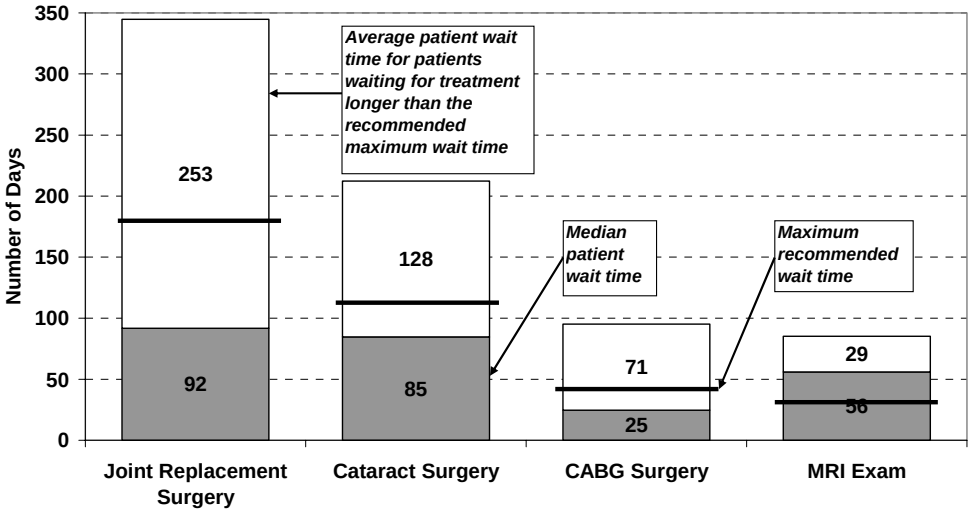
Calculating excess waits

Provincial governments and other organizations provide some information on wait times for treatment for a number of different medical conditions experienced by the median patient in their province or region, that is, the patient in the middle of the scale of those waiting the shortest amount of time and those waiting the longest. We used this information to report and calculate the following for each of the 4 procedures:

1) The median patient wait time (shown as the shaded bars in Figure 2)
2) The average wait time for treatment by the average patient who has to wait for longer than the maximum recommended period for treatment (shown as the shaded and clear bars together in Figure 2)

Figure 2

Average Patient Wait Times for Patients Waiting Longer than the Recommended Maximum Period for Treatment
Province-weighted National Average



Source: Wait Time Alliance for Timely Access to Health Care, The Centre for Spatial Economics based on information from federal and provincial government ministries, departments, and agencies and the Fraser Institute

We then compared this information to the wait time benchmarks developed by the Wait Time Alliance for Timely Access to Health Care. These benchmarks represent the maximum medically reasonable wait time for treatment (shown as the bold lines in Figure 2). This comparison reveals that the median patient now generally receives treatment at or before the maximum recommended

wait time limit. However, because the median patient is, by definition, the patient in the middle of the distribution, this means that many patients are *not* receiving care in a timely fashion. In addition, among those patients who must wait longer than medically necessary, average waits are long, approaching a year for hip and knee replacement surgery and 7 months for cataract surgery. For cardiac patients not treated within the maximum recommended period, the average wait for coronary artery bypass graft (CABG) surgery is over 3 months, or more than double the maximum recommended wait. The situation for patients requiring an MRI is grave. The maximum recommended wait is 30 days, but the median patient still waits 56 days, while patients who do not get their scan within that maximum recommended period wait an average of 85 days.

Calculating the economic cost of waiting

This study considers 3 types of costs: patient costs, caregiver costs and medical system costs. These costs are estimated for each province and priority area.

1. **Patient costs** measure the impact from reduced economic activity as a result of patients being unable to participate in the labour force. These costs involve the direct loss in production from these people no longer producing goods and services as well as the broader reduction in economic activity resulting from reduced incomes and lower spending.
2. **Caregiver costs** measure the impact from reduced economic activity as a result of caregivers giving up work to care for family members or relatives. As with patient costs, these costs involve the direct loss in production from these people no longer producing goods and services as well as the broader reduction in economic activity resulting from reduced incomes and lower spending.
3. **Health care system costs** include the additional costs to the health care system from patients attending medical appointments, submitting to tests and procedures, and taking medications that would not have been required had their wait time not exceeded the maximum recommended.

Total costs — the sum of the patient, caregiver and health care system costs — are influenced by 2 main factors: the length of time spent waiting for patients with wait times that exceed the maximum recommended (see Figure 2) and whether patients are able to continue their regular activities while waiting for care. The low proportion of patients who need to stop their regular activities while waiting for cataract surgery leads to relatively low per-patient wait time costs for this priority area despite lengthy waits for treatment. The reverse is true for CABG surgery. In this case, the high proportion of patients who must stop their regular activities while waiting for treatment raises the per-patient wait time cost despite the relatively short duration of that wait.

Findings and recommendations

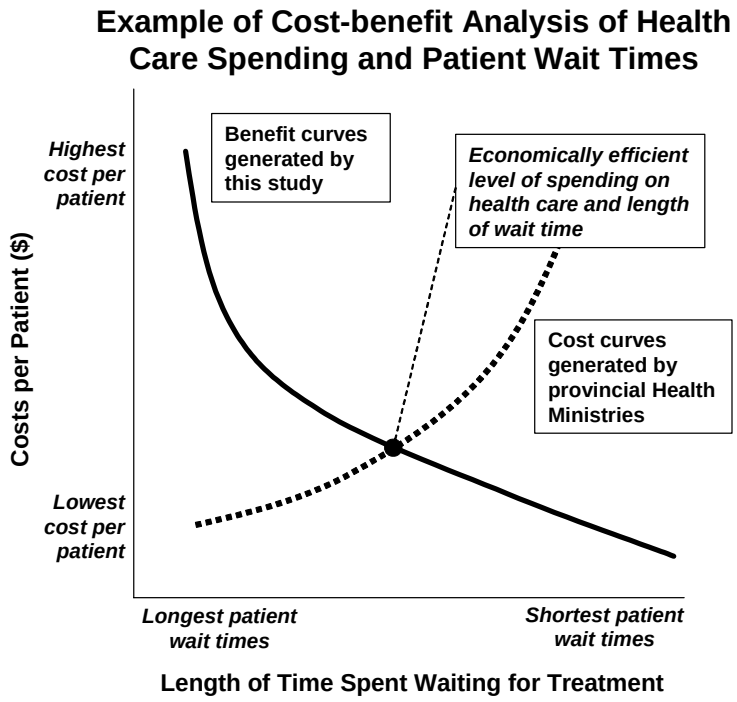
Although information on median wait times is useful, the true cost of waiting is borne by patients waiting for treatment longer than the maximum recommended period. The economic costs developed using the approach in this study take this into account. From a health care policy perspective, these are the relevant costs for use in cost-benefit analysis.

Cost-benefit analysis is a tool used by policy-makers to help determine an economically efficient use of public resources. This study provides policy-makers with a set of benefit curves for each province and priority area in terms of GDP per patient by length of wait for treatment. (See the example of the downward sloping curve in Figure 3.) This information can be combined with

information available to provincial health ministries and other public health officials on the incremental cost of providing service to patients. The cost of providing additional service is expected to rise, on a per patient basis, as the number of patients treated rises. (See the upward sloping curve in Figure 3.) The costs of providing timely care are likely to rise on a per-patient basis as available resources become fully utilized and new — more expensive — capacity has to be added to the health care system.

The economically efficient level of public spending on health care is therefore determined by the intersection of the downward sloping benefit curves provided in this study with the provinces' own upward sloping spending curves. This intersection shows a practical way to target spending to reduce wait times. While cost-benefit analysis should not be the only the criteria used to determine public policy, it can be a powerful tool to help guide decisions on public spending.

Figure 3



Source: The Centre for Spatial Economics

There are several natural extensions to this analysis that health care policy-makers and advocates may want to consider:

- The cost of reducing wait times for these priority areas could be studied. Combined with the information about the cost of wait times from this study, understanding how much it would cost to reduce those wait times would permit valid cost-benefit analysis to support the case for additional funding of identified priority areas.
- The analysis in this study could be expanded to cover other medical conditions.
- Similar analysis could be conducted for other aspects of the patient wait time experience such as waiting to see a specialist or waiting to see a family doctor.

- A study could be conducted — preferably in conjunction with a cost-benefit analysis — to review the impact on patient demand for medical services if wait times are reduced or eliminated.

In conclusion, our study found that no one province has either the highest or the lowest costs in all priority areas. Average per-patient costs range from a high of $33 400 for total joint replacement surgery in Alberta to a low of $1700 for cataract surgery in Saskatchewan. The cost of waiting remains significant for patients, government treasuries and the economy.

The physician-members of the CMA are concerned about lengthy wait times. The 2005 Supreme Court decision in favour of Dr. Chaoulli and Mr. Zeliotis suggests that physicians' concerns — voiced repeatedly over many years — are well founded and that patients' legitimate medical needs have not been met. While physicians have drawn attention to the *health* impact of excessive waits for care, this study attempts to determine the *economic* impact of these waits. By making government policy-makers aware of the costs that these excessive waits entail, we hope this analysis will stimulate discussion on this issue and encourage action to address wait times throughout the health care system.

1. Introduction

Most Canadians have had either direct or indirect experience waiting for health care. In a large number of cases, perhaps the majority, the wait does not have a material impact on their lives. For too many people, however, the wait can be excessive, leading to mounting frustration and inflicting pain and suffering. While national and provincial politicians have talked of solving the problem, recent stories in the media are still alerting us to lengthy wait times for medical treatment:

> *"Slow progress made on wait times: report"*
> *CBC News (www.cbc.ca), April 19, 2007*
>
> *"Wait times for surgery, medical treatments at all-time high: report"*
> *CBC News (www.cbc.ca), October 15, 2007*
>
> *"Canada rates worst on health-care waiting times among 7 countries"*
> *The Canadian Press (www.cp.org), November 1, 2007*

This study presents the economic costs associated with excessive wait times in Canada's medical system. It updates and extends analysis conducted in 2006 for the Canadian Medical Association and the British Columbia Medical Association. Unlike other studies that have examined the overall cost of wait lists and that therefore have had limited value in targeting health care spending, the costs presented in this study are those incurred by waiting longer than medically recommended for treatment. This "excess wait" is what current policy initiatives are attempting to reduce. The study, therefore, estimates the potential economic benefits that can be achieved through successful health care policy initiatives to eliminate these wait times.

The collection of data on wait times by province and procedure was an important part of the work for the study. These data were used to determine the number of patients waiting for treatment for a period longer than medically recommended. Along with information on caregiver support and other health care spending related to "excess wait times," this information was then put into the C_4SE's dynamic multi-sector provincial economic model to analyze the overall impact of wait times. This approach captures the impact from reduced sales by business as a result of lower personal incomes and the implications for provincial government finances as a result of higher spending and lower revenues.

The research in this study focuses on 4 of the "priority" areas identified in 2004 in the 10-year plan to strengthen health care that stemmed from the 2003 First Ministers' Accord on Health Care Renewal[1]:

1. Orthopaedics: total joint replacement (hip and knee)
2. Ophthalmology: sight restoration (cataract surgery)
3. Cardiology: coronary artery bypass graft (CABG) surgery
4. Diagnostic procedures: MRI exam

The costs of waiting for treatment in each of these areas are provided for each province and nationally as a patient-weighted national average. The scope of the study is limited in 2 main

[1] Available at *http://www.hc-sc.gc.ca/hcs-sss/delivery-prestation/fptcollab/2003accord/index_e.html.*

respects. First, it only addresses wait lists for hip and knee replacements, cataract surgery, cardiac artery bypass graft (CABG) surgery and MRI exams. The fifth priority area, oncology radiation therapy, was excluded from the study because of a lack of comparable data. Second, it only examines the costs associated with waiting for treatment — it does not assess the costs involved in actually reducing wait times. This latter analysis is required for a comprehensive review of the costs and benefits associated with achieving shorter wait times for treatment.

Section 2 of this report discusses the reasons — from an economist's perspective — why wait lists for medical treatment are so prevalent. Section 3 reviews statistics on wait times across Canada for the priority areas covered by the study. Section 4 describes the methodology used to estimate the cost of waiting. Section 5 discusses the results of that analysis and shows how cost-benefit analysis can be used as a tool to help policy-makers target public spending to reduce wait times. The report concludes with a brief summary of the findings and suggestions for further research.

2. The economics of wait lists

This chapter defines wait times and wait lists, briefly reviews the economic reasons for wait lists, examines what an optimal wait time might be, gives the costs and benefits of waiting for treatment, and reviews some of the other research on the cost of wait times. Together, this information helps explain why this study focuses on the cost of waiting longer than medically necessary for treatment: to help policy-makers target public spending to cut wait times.

The wait times clock

Before continuing, it is worth reviewing some of the definitions of wait lists and wait times[2].

What is a wait list?

A wait list is how doctors and hospitals keep track of people who need specialized medical care, such as heart surgery, MRIs, and hip and knee replacements. A wait list allows doctors to prioritize their patients by the urgency of the treatment they need.

What is a wait time?

A wait time is how long patients must wait for a specific procedure. Patients experience several separate wait times from when a health problem is first noticed until treatment is completed. Wait times are, in general, measured from the time when the procedure is formally booked in the hospital until it is actually carried out. The wait time clock in Figure 4 summarizes the various wait times stages experienced by patients.

Why do we have wait times?

From the government's perspective, wait times are a symptom of problems in managing how patients get access to health care. Wait times grow when there are more patients needing health services than the system can treat. Increased demand may come from a variety of sources, such as an aging population that relies more on health care or advancements that allow doctors to diagnose more illnesses.

Who will go on a wait list?

A patient needing emergency surgery is treated as quickly as possible and does not go on a wait list[3]. Anyone needing surgery or treatment that is not an emergency will be placed on a wait list.

What influences wait times?

In general, wait times are influenced by factors such as:

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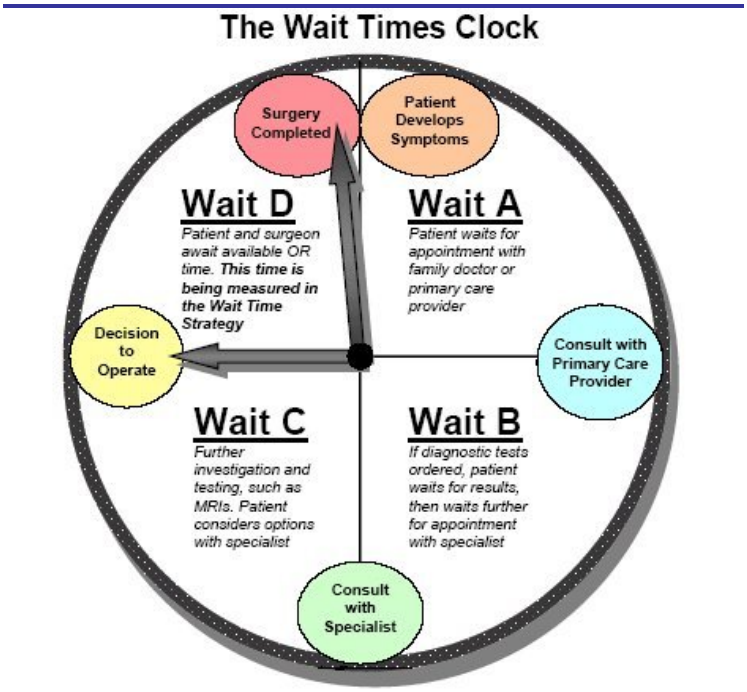
[2] The information in this section was drawn from the Ontario Ministry of Health and Long-Term Care Web site at http://www.health.gov.on.ca.

[3] The time spent waiting for emergency treatment is, however, of grave concern. Delays in treatment can lead to serious medical complications, even death. Although most provincial governments have made substantial efforts to improve emergency services in the last decade, there are still significant problems in this area. No attempt has yet been made to evaluate the economic implications of delays in emergency treatment.

- The urgency of the condition — patients with illnesses that are not considered life-threatening may wait longer because a hospital's operating room time is prioritized for more serious cases
- The surgeon's caseload — some specialists have shorter wait times than others
- The resources available to the hospital — changes in the capacity of particular hospitals or regions to carry out the procedure
- Increasing demand for health services in the community and region

Figure 4



Source: Ontario Ministry of Health and Long-Term Care

Determining optimal wait times

The preceding information explains what a wait time is and why they exist, but it does not shed much light on how long patients should wait for service. In part, the answer to this question requires an analysis that looks at the impacts on economic efficiency and equity of allocating the economy's resources to achieve different wait times. A concept of optimality must, however, be adopted to allow comparisons across these different resource allocations. Costs and benefits must be estimated in the analysis not only for the health sector, but also for the economy as a whole. One must be able to answer the question: If waiting times are reduced, are Canadians as a whole better off or worse off? Shorter wait times require more resources diverted to the health care system. These resources must be paid for through higher taxes, service charges or deficit financing. Deficit financing is, however, only a temporary solution, as what is borrowed today must be paid back tomorrow.

What is optimal?

An analysis of optimal wait times is complicated by a lack of agreement on what is optimal. Governments, clinicians, patients and economists all have different notions of what is optimal.

For governments, optimality is determined by making decisions that they perceive to be the best ones from society's point of view. Cynics would argue that this simply means finding a solution that yields the most votes. From the perspective of clinicians and consumers, what is optimal is frequently based on the notion that the marginal cost of providing additional services is zero (or almost zero). Services should be available for all those that need them: costs are not a factor. Economists argue that health care services should be provided to the point where the marginal value to the consumer of providing the service is equal to the marginal cost of their provision, where marginal cost reflects the value of those resources in their next best use.

There is no clear answer to which notion of optimum is most appropriate. Any study on this issue must necessarily choose one, which naturally affects the outcome of the study and its conclusions.

Costs of waiting

The costs of waiting can be determined in terms of the impacts on individual economic agents — (individuals, businesses and governments), the resulting impacts on the resources available to the economy as a whole and the efficiency of this resource allocation.

The cost to individuals of waiting depends on the nature of the illness and the circumstances of the individual. It is determined by the impact on the person's ability to work or play. For those in the labour force, illness can lead to a temporary loss of employment, including the postponement of skills development and the possibility of advancement, and the associated income. It can also lead to a permanent loss of employment and income from death or disability. Individuals must also contend with out-of-pocket costs for purchases related to waiting, a reduction in the quality of their leisure time and the impact on their extended family.

Businesses face increased human resource costs to replace lost or affected employees. Productivity is reduced when employees take time off work to visit health care providers. The productivity of some employees who are still working may be reduced, as they may not able to perform at required levels. From a broader perspective, businesses face reduced sales as a result of the lost employment income of affected individuals throughout the economy and a reduction in the ability of individuals to engage in leisure activities.

The costs to governments of waiting come from higher spending and lower revenues. Government expenditures, excluding health, go up as unemployment rises and increased transfer payments to people are required. Government revenues fall as reduced individual income and business sales lead to lower taxes. Finally, additional health care resources must be supplied while people are waiting for treatment, something that increases demands on and costs for the health sector. These include additional visits to medical practitioners, additional drugs and other additional costs associated with care required before and after treatment.

Benefits of waiting

Although the costs of waiting usually receive considerable attention, there are also potential societal benefits that accrue from wait lists. The primary benefit is that wait lists may alleviate the problem of over-consumption of health care. This benefit is achieved by imposing a non-monetary price — the time cost of waiting — on health care that reduces its consumption. A

reduction in wait times reduces this non-monetary price, which may lead to an increase in demand for service.

Wait lists can also lead to the substitution of foreign resources for domestic resources. Consumers who do not wish to wait to obtain health care services and can afford to go elsewhere, do so. There are also businesses that benefit from the added costs of waiting such as higher drug sales, higher sales of medical devices and the increased provision of certain medical services. Finally, wait lists allow resources to be allocated to the rest of the economy, resources that might otherwise be used to increase health care services.

Empirical research

To date, most statistics and research on wait times have focused on the experience of the median patient[4]. Provincial government health ministries now provide information — in varying formats — on wait times and wait lists for some or all of the priority areas. Statistics Canada's 2003 and 2005 reports, *Access to Health Care Services*, provide information based on a large survey of patients across Canada. This information now joins a survey from the Fraser Institute, which has, for the last 17 years, published its *Waiting Your Turn* report on the length and size of queues for visits to specialists and for diagnostic and surgical procedures.

The Fraser Institute's information, which is based on the survey responses of medical practitioners, constitutes the most comprehensive set of information available on wait times across the country. Its most recent survey found that wait times for surgical and other therapeutic treatments lengthened slightly in 2007, but remain below the historical highs experienced earlier in the decade. As always, this picture becomes more complicated when examining the details. While wait times fell in British Columbia, Saskatchewan, Ontario, New Brunswick and Prince Edward Island, they rose in the other provinces. The Fraser Institute compares the median wait time to a physician-determined "reasonable" wait time to draw conclusions about the provision of health care services by province and area of care.

Economists have used information on median wait times to estimate the cost of waiting for treatment. Several similar approaches have been adopted. Steven Globerman (1991) viewed wait times as periods during which productive activity (either for pay or in the household) was potentially precluded. He used the Canadian average wage to estimate of the cost of a day of waiting. Only those patients reporting "significant difficulties in carrying out their daily activities" — about 41% of those waiting — were counted as bearing the cost of lost wages, which led to an estimated cost per patient of about $2900 in Canada in 1989.

Nadeem Esmail (2007) used a similar approach to Globerman, except that 11% of patients were assumed to experience "significant difficulties in carrying out their daily activities." (See box "Making sense of differences in cost estimates.") This rate is drawn from a Statistics Canada survey that found that 11% of people were adversely affected by their wait for non-emergency surgery in 2005. Using this approach, Esmail estimated the cost of waiting per patient to be $959 in 2007 if only hours during the normal working week were considered "lost," and as much as $2900 if all hours of the week (minus 8 hours per night sleeping) were considered "lost."

[4] The median patient is the middle patient in a list of patients put in order of the length of their wait time. The median patient waits for a shorter time than 50% of the patients and for a longer time than the other 50% of patients.

Making sense of differences in cost estimates

This study, carried out by The Centre for Spatial Economics, estimates the cost of waiting for 4 priority areas to be $14.8 billion. But Nadeem Email's study for the Fraser Institute (2007) recently estimated the cost of waiting for medical treatment in 2007 to be "at least $793 million, if not substantially more." At first glance, these 2 estimates appear to be wildly inconsistent with each other. There are, however, a number of significant differences in what these two estimates are measuring and how they should be interpreted and used.

Indeed, far from being inconsistent, these two estimates of the cost of waiting for treatment simply deal with different issues. This study estimates the cost to the economy as a result of public policy failing to treat patients within the recommended maximum wait time; this measures the loss to society of wait times. Esmail's analysis, on the other hand, estimates only the private cost of waiting for treatment from the patient's perspective.

The first difference in measurement stems from the fact that Esmail's estimates do not include the cost of waiting for diagnostic imaging, unlike this study. This study estimates the cost of waiting for MRI exams to be $13.8 billion and the cost for the other 3 priority areas to be a combined $1.0 billion.

A more precise comparison can be made by looking at the estimated cost of waiting for each treatment area individually.

Treatment	Esmail	C_4SE
Ophthalmology	$111.1 million	$317 million
Orthopaedic surgery	$202.2 million	$479 million
Cardiovascular surgery	$0.1 million	$204 million

Source: Esmail, 2007 (Table 4) and Figure 14

It should be noted that Esmail's estimates include more categories of treatment in each of these priority areas than this study does. Specifically, this study estimates the costs of waiting for cataract surgery, hip and knee replacement surgery and CABG surgery.

The second important difference is that Esmail estimates the narrowly defined direct impact of waiting for treatment. His costs only include patient costs — but they do include all patients for the entire length of their wait. This study, in contrast, includes the direct impact from patients, caregivers and the health care system. The direct costs from these sources are then fed into an economic model to generate total economic costs. Including indirect costs raises the level of estimated impacts in this study relative to Esmail's.

This study's analysis is, however, narrower than Esmail's in that it only considers the costs associated with patients waiting for care longer than the maximum recommended wait time. This measure is used because it is relevant for policy-makers seeking to take practical steps to reduce wait times. This analysis does not consider the costs of waiting less than the recommended maximum wait time.

The final difference between the two studies is Esmail's assumption that 11% of all patients waiting for treatment are unable to carry on their normal activities. The same 11% rate is applied to all priority areas. In contrast, this study uses estimates from the Western Canada Waiting List Project on the percentage of patients unable to carry on their normal activities: 32% of patients waiting for hip and knee replacement surgery, 7% of cataract surgery patients, 95% of CABG surgery patients and 22% of patients waiting for an MRI exam. A single rate is a useful simplifying assumption when determining the impact on the overall patient population, as was the case with Esmail's analysis. However, this study was concerned with the cost of waiting by priority area and province. There can be little argument that each disease has a different impact on a patient's quality of life. What's more, it seems likely that the impact of the disease is greatest for patients waiting longest for treatment, which is the class of patients for which the cost of waiting is estimated in this study.

Several other approaches have also been used to estimate the cost of waiting for medical treatment. John Cullis and Philip Jones (1986) reasoned that paying for private care is the alternative to waiting for publicly provided care in the UK. This implied that the cost of waiting for treatment in terms of reduced morbidity and mortality is, at a maximum, the cost of private care. Taking the actual costs of private care for a variety of important and common treatments, they estimated the cost of waiting in the UK in 1981 was about $5600 per patient. In an interesting experiment, Carol Propper (1990) estimated the cost of waiting by asking subjects to choose between immediate treatment at a varying range of out-of-pocket costs and delayed treatment at a varying range of time intervals but at no out-of-pocket cost. This approach resulted in wait time costs of about $1100 per patient in the UK in 1987.

Like Globerman and Esmail, the current study also uses the average wage to estimate the cost of waiting. This approach is adopted because the average wage represents — on a theoretical level — the marginal cost of a person's time. It is the amount of money a person would have to be paid for another hour's work or to forgo for another hour's leisure.

The theoretical basis and ease of calculation make some of these approaches popular among researchers. But although the cost estimates generated using these approaches are interesting, they are of limited value from a policy perspective. The true cost of waiting is borne by those patients waiting for treatment longer than the maximum recommended period. In particular, estimates of median patient costs cannot be used to determine the benefits of reducing wait times because they contain no information on the costs that would be reduced if excess wait times were eliminated. This study focuses on the cost of waiting longer than medically recommended for treatment, something that is more relevant for policy-makers seeking to take practical steps to reduce wait times.

3. Calculating excess wait times

This section reviews the data and assumptions about wait times by province and priority area. This information is used to determine the patient and caregiver impact on the labour force and health care costs associated with waiting.

This study examines the economic cost associated with the wait after a specialist has decided on and booked a treatment, up to the time that treatment is provided. As noted in the previous section, this time period is just one of several wait times experienced by patients. Other parts of the waiting process are also important — such as the wait to see a specialist or the wait to see a family doctor — but analysis of these wait time costs fell outside the scope of this research.

Maximum recommended wait times

Section 2 of this report discussed the difficulty of deciding what an optimal wait time is. Various groups have proposed maximum wait times for each of the priority areas. Each group has used its own criteria to determine a maximum acceptable time. Differences in these criteria can lead to large differences in what is considered acceptable.

The costs of waiting for treatment in this study are based on the maximum recommended wait times published by the Wait Time Alliance for Timely Access to Health Care, a group of national medical specialty societies whose members are directly involved in providing care to patients. The wait times represent the maximum recommended wait time for treatment from the time the procedure is booked to the time it is performed. Of all the assumptions used in this study, these have the largest impact on the results. Choosing different wait times standards would have a direct impact on the results of this analysis.

Table 1[5]

Maximum Recommended Treatment Wait Time *maximum recommended wait for treatment after appointment with specialist (in days)*	
Orthopaedics: total joint replacement surgery	182
Ophthalmology: cataract surgery	112
Cardiology: CABG surgery	42
Diagnostic Procedures: MRI	30

Source: Wait Time Alliance for Timely Access to Health Care

Median patient wait times for treatment

Median patient wait times for treatment represent the amount of time the patient at the 50th percentile spent waiting for treatment after his or her specialist had booked it. The median is considered a more reliable measure than the average because average wait times can vary widely over time based on the presence of outliers (a few people waiting an extraordinary length of time

[5] Wait Time Alliance for Timely Access to Health Care, *Time's Up! Achieving meaningful reductions in wait times*, (Ottawa: Canadian Medical Association, April 2007), p. 8.

for treatment). Median wait times for treatment are reported in Table 2 for each priority area and province.

Table 2[6]

Treatment Wait Time *median wait for treatment after appointment with specialist (in days)*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	98	91	129	161	81	84	151	84	110	70
Ophthalmology: cataract surgery	63	81	76	96	49	168	82	77	77	109
Cardiology: CABG surgery	64	6	8	26	18	23	15	42		56
Diagnostic Procedures: MRI	84	57	84	42	32	84	56	70	84	140

Source: Provincial government ministries, departments and agencies and the Fraser Institute

[6] Median wait time information for this update was obtained from the following sources:

- British Columbia Ministry of Health: www.healthservices.gov.bc.ca, data for July-September 2007
- Alberta Ministry of Health and Wellness: www.ahw.gov.ab.ca/waitlist, data for August-October 2007
- Saskatchewan Surgical Care Network: www.sasksurgery.com, data for January-June 2007
- Manitoba Health: www.gov.mb.ca/health/waitlist/index.html, data for October 2007
- Ontario Ministry of Health and Long-Term Care: www.ontariowaittimes.com, data for July-September 2007
- New Brunswick Surgical Care Network: www.gnb.ca/0217/NBSCN-RSCNB/index-e.asp, data for April 2005 – March 2006
- Nova Scotia Department of Health: www.gov.ns.ca/health/waittimes, data for April-June 2007
- Government of Prince Edward Island: www.gov.pe.ca/photos/original/WaitTimes.pdf, data for January-December 2006

Median patient wait time information is not, however, available for all provinces or for all 4 priority areas. When this data was not available it was drawn from the following sources:

- Median wait times for total joint replacement surgery for Quebec and Newfoundland and Labrador in 2007 were drawn from: Nadeem Esmail, Michael A. Walker, Margaret Bank, *Waiting Your Turn 17th Edition: Hospital Waiting Lists in Canada* (Vancouver: The Fraser Institute, 2007), Table 5g, p. 50.
- Median wait times for cataract surgery Quebec and Newfoundland and Labrador in 2007 were drawn from: Ibid., Table 5c, p. 48.
- Median wait times for CABG surgery for Quebec, Nova Scotia and Newfoundland and Labrador in 2007 were drawn from: Ibid., Table 5h, p. 51. Cardiac patients from Prince Edward Island are treated outside the province.
- Median wait times for MRI exams for British Columbia, Saskatchewan, Quebec, New Brunswick, Nova Scotia, and Newfoundland and Labrador in 2007 were drawn from: Ibid., Table A7, p. 80.

A valuable summary of wait time data sources in Canada can be found in: Canadian Institute for Health Information, *Wait Times Tables – A Comparison by Province, 2007*, (Ottawa: Canadian Institute for Health Information, February 2007).

Wait times for the median patient are, in general, longest for hip and knee replacement, next longest for cataract surgery and MRIs, and shortest for CABG surgery. Provincial variation in wait times is high. The patient-weighted national mean for joint replacement surgery median wait times is 92 days but varies from a high of 161 days to a low of 70 days. The disparity in wait times for an MRI is also high, with a patient-weighted national mean of 56 days and provincial medians ranging from a high of 140 days to a low of 32 days. The median wait time used in this study for cardiac care in British Columbia is significantly higher than for most other provinces. It should be noted, however, that British Columbia's median wait time is for all cardiac procedures rather than just CABG surgeries and, therefore, likely overstates the wait time for treatment in that province.

Excess wait times

The next natural calculation, and one that is frequently seen in the research on wait times, is the degree to which median wait times exceed the recommended maximum wait time for treatment. In some studies, this is presented as a ratio; for example, median wait times might be 110% of recommended wait times. Table 3 simply subtracts the 2 to show the number of days that the median patient is waiting in excess of the recommended period.

Table 3

Excess Wait Time *excess of median wait time over maximum recommended for treatment (in days)*	**BC**	**AB**	**SK**	**MB**	**ON**	**QC**	**NB**	**NS**	**PE**	**NL**
Orthopaedics: total joint replacement surgery	-84	-91	-53	-21	-101	-98	-31	-98	-72	-112
Ophthalmology: cataract surgery	-49	-31	-36	-16	-63	56	-30	-35	-35	-4
Cardiology: CABG surgery	22	-36	-34	-16	-24	-19	-27	0	-42	14
Diagnostic Procedures: MRI	54	27	54	12	2	54	26	40	54	110

Source: The Centre for Spatial Economics

Median wait times for nearly all surgical procedures are now below the maximum recommended across Canada — only cardiac surgery in British Columbia and Newfoundland and Labrador and cataract surgery in Quebec exceed the maximum recommended wait time. Median wait times for MRIs, however, still exceed the maximum recommended in all provinces.

Although these results are encouraging, it is important to recognize the limitations of this analysis. If, for example, the median patient experiences a wait time equal to the maximum recommended wait time, then the remaining 50% of patients have to wait longer than recommended for treatment. The analysis in this report requires a more complete understanding of the number of patients waiting longer than recommended for treatment.

An estimate of the distribution of patients by province, priority area and length of wait is needed to develop a better understanding of the impact of wait times. In Table 4 through Table 7, each column represents the distribution of patients in terms of the number of days they had to wait for treatment. (Each column, therefore, adds up to 100%.) The figures between the 2 lines in each table indicate when the maximum recommended wait time occurs for each priority area. All patients waiting below this line of figures are waiting longer than recommended. The figures in bold show how long the median patient in each province is waiting for treatment.

Table 4[7]

Distribution of patient wait times for total joint replacement surgery *proportion of patients treated by wait time period*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Under 3 weeks	**4%**	**6%**	**8%**	**4%**	**6%**	**6%**	**4%**	**7%**	**4%**	**6%**
3 to 6 weeks	**8%**	**12%**	**4%**	**8%**	**12%**	**12%**	**7%**	**12%**	**8%**	**12%**
7 weeks to 3 months	**25%**	**37%**	11%	**25%**	**37%**	**37%**	22%	**37%**	**25%**	**37%**
4 to 6 months	**24%**	24%	**29%**	**24%**	24%	24%	**25%**	17%	**24%**	24%
7 to 12 months	**26%**	**14%**	**17%**	**26%**	**14%**	**14%**	**28%**	**12%**	**26%**	**14%**
13 to 18 months	**8%**	**4%**	**18%**	**8%**	**4%**	**4%**	**6%**	**11%**	**8%**	**4%**
Over 18 months	**3%**	**2%**	**13%**	**3%**	**2%**	**2%**	**8%**	**4%**	**3%**	**2%**

Source: The Centre for Spatial Economics based on data from provincial government ministries, departments and agencies

Table 5

Distribution of Patient Wait Times for Cataract Surgery *proportion of patients treated by wait time period*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Under 3 weeks	7%	7%	25%	4%	7%	4%	6%	6%	4%	4%
3 to 6 weeks	19%	19%	9%	11%	19%	11%	16%	17%	11%	11%
7 weeks to 3 months	**45%**	**45%**	**20%**	25%	**45%**	25%	**36%**	**39%**	25%	25%
4 to 6 months	19%	19%	32%	**19%**	19%	**19%**	19%	21%	**19%**	**19%**
7 to 12 months	7%	7%	12%	32%	7%	32%	10%	10%	32%	32%
13 to 18 months	1%	1%	1%	5%	1%	5%	7%	3%	5%	5%
Over 18 months	1%	1%	1%	4%	1%	4%	6%	3%	4%	4%

Source: The Centre for Spatial Economics based on data from provincial government ministries, departments and agencies

Table 6

Distribution of Patient Wait Times for CABG Surgery *proportion of patients treated by wait time period*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Under 3 weeks	35%	**70%**	**80%**	41%	**70%**	41%	**65%**	41%		35%
3 to 6 weeks	4%	8%	8%	**18%**	8%	**18%**	8%	**18%**		4%
7 weeks to 3 months	**21%**	16%	6%	29%	16%	29%	15%	29%		**21%**
4 to 6 months	32%	5%	5%	10%	5%	10%	8%	10%		32%
7 to 12 months	8%	1%	1%	2%	1%	2%	4%	2%		8%
13 to 18 months	0%	0%	0%	0%	0%	0%	0%	0%		0%
Over 18 months	0%	0%	0%	0%	0%	0%	0%	0%		0%

Source: The Centre for Spatial Economics based on data from provincial government ministries, departments and agencies

[7] Available information on the distribution of wait times for treatment by priority area and province varies widely. The estimates in Table 4 through Table 7 were derived based on the median patient wait times by province and priority areas and the distribution of patients wait times reported by the Alberta Waitlist Registry, the Saskatchewan Surgical Care Network, the New Brunswick Surgical Care Network and the Nova Scotia Department of Health. The distribution of patients by length of wait for the other provinces (British Columbia, Manitoba, Ontario, Quebec, Prince Edward Island, and Newfoundland and Labrador) was adjusted using a mathematical algorithm based on differences between that province's median wait time and Alberta's. The results were then compared with other available patient wait time statistics to ensure that the procedure provided reasonable estimates of the distribution of wait times. The use of actual patient wait times (in place of these estimates) would improve the quality of the results reported in this study but would likely have, at most, only a minor impact on their values, since the distribution of patients has been adjusted to reflect the median patient's experience in each province.

Table 7

Distribution of Patient Wait Times for an MRI *proportion of patients treated by wait time period*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Under 3 weeks	22%	22%	22%	39%	39%	22%	22%	22%	22%	11%
3 to 6 weeks	23%	23%	23%	**23%**	**23%**	23%	23%	23%	23%	12%
7 weeks to 3 months	**30%**	**30%**	**30%**	21%	21%	**30%**	**30%**	**30%**	**30%**	15%
4 to 6 months	24%	24%	24%	17%	17%	24%	24%	24%	24%	**24%**
7 to 12 months	2%	2%	2%	1%	1%	2%	2%	2%	2%	36%
13 to 18 months	0%	0%	0%	0%	0%	0%	0%	0%	0%	2%
Over 18 months	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Source: The Centre for Spatial Economics based on data from provincial government ministries, departments and agencies

The data in Table 4 through Table 7 are then used to estimate the proportion of patients with wait times that exceed the maximum recommended time for treatment. The results of those estimates are in Table 8. The proportions vary from a low of 14% of patients waiting for CABG surgery in Saskatchewan to a high of 84% of patients waiting for an MRI in Newfoundland and Labrador.

Table 8

Proportion of Patients with Wait Times Exceeding the Maximum Recommended Period	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	38%	21%	48%	38%	21%	21%	41%	27%	38%	21%
Ophthalmology: cataract surgery	24%	24%	38%	55%	24%	55%	38%	32%	55%	55%
Cardiology: CABG surgery	61%	24%	14%	45%	24%	45%	29%	45%		61%
Diagnostic Procedures: MRI	70%	70%	70%	53%	53%	70%	70%	70%	70%	84%

Source: The Centre for Spatial Economics

The final calculation needed to assess excess wait times is to determine the average wait time for a patient whose wait time for treatment exceeds the recommended maximum period. (See Table 9.) This measure excludes patients who were fortunate enough to have their treatment provided within the recommended maximum period. Subtracting the maximum recommended wait time (Table 1) from the wait times in Table 9 provides an estimate of the length of time spent waiting over and above the maximum recommended time by the average patient who does not receive treatment within that period.

Table 9

Average Wait for Patients with Wait Times Exceeding the Maximum Recommended Period (in Days)	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	342	342	428	342	342	342	362	396	342	342
Ophthalmology: cataract surgery	193	193	176	269	193	269	298	238	269	269
Cardiology: CABG surgery	130	92	109	91	92	91	117	91		130
Diagnostic Procedures: MRI	89	89	89	85	85	89	89	89	89	182

Source: The Centre for Spatial Economics

Morbidity rates

The excess wait time information developed above is combined with the number of patients to determine (i) the number of patients waiting longer than recommended for treatment and (ii) the length of the queue of patients waiting longer than recommended measured in years.

The number of patients by priority area and province is determined by multiplying the incidence rates (expressed as patients per 100 000 people) by the population in the province. Incidence rates for cataract surgery and MRIs far exceed those for joint replacements and CABG surgery.

Table 10[8]

Age-Standardized Incidence Rates per 100,000 People										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	252	319	291	314	296	149	247	260	277	187
Ophthalmology: cataract surgery	1,032	986	1,229	927	999	882	1,103	972	648	600
Cardiology: CABG surgery	70	72	111	88	88	82	92	84	82	126
Diagnostic Procedures: MRI	2,000	4,000	2,000	2,500	3,300	3,000	3,500	3,000	1,900	1,200

Source: Canadian Institute for Health Information

The next step is to determine the age and sex of the patient. Information on the distribution of patients by age and sex is only available at the national level, so the same age and sex distribution is applied to all provinces. Cataract surgeries and joint replacement surgeries are predominantly performed on people over the age of 65 (80% and 83% respectively). More joint replacement surgeries are performed on women (57%) than men (43%), while more cataract surgeries are performed on men (62%) than women (38%). Looking at the incidence of CABG surgeries shows 67% are performed on people over age 65 and 77% of all CABG surgeries are performed on men. While surgery for the priority areas is primarily performed on the elderly, MRI exams are performed on younger Canadians, with 85% of patients being under 65.

Table 11 provides the share by age and sex of patients for each priority area. These are the same as those used in the 2006 study.

Cataract surgeries and joint replacement surgeries are predominantly performed on people over the age of 65 (80% and 83% respectively). More joint replacement surgeries are performed on women (57%) than men (43%), while more cataract surgeries are performed on men (62%) than women (38%). Looking at the incidence of CABG surgeries shows 67% are performed on people over age 65 and 77% of all CABG surgeries are performed on men. While surgery for the priority areas is primarily performed on the elderly, MRI exams are performed on younger Canadians, with 85% of patients being under 65.

[8] The incidence rate data for each priority area was drawn from the following sources:

- The age standardized incidence rates for joint replacement surgery in 2005 for patients aged 20 and over were drawn from the Canadian Institute for Health Information's web site *(http://qstat.cihi.ca)*.
- The age standardized incidence rates for cataract surgery in 2002–2003 were drawn from: Canadian Institute for Health Information, *Waiting for Health Care in Canada: What We Know and What We Don't Know* (Ottawa: Canadian Institute for Health Information, 2006), Figure 2.2, p. 53.
- The age standardized incidence rates for CABG surgery in 2005 were drawn from the Canadian Institute for Health Information's web site *(http://qstat.cihi.ca)*.
- The age standardized incidence rates for MRI exams in 2005–2006 were drawn from: Canadian Institute for Health Information, *Medical Imaging Technologies in Canada, 2006 – Supply, Utilization and Sources of Operating Funds*, (Ottawa: Canadian Institute for Health Information, 2007), Figure 3, p. 11.

Table 11[9]

Morbidity Proportions by Age and Sex				
Male: by age in years	**<45**	**45-54**	**55-64**	**>65**
Orthopaedics: total joint replacement surgery	0%	1%	5%	36%
Ophthalmology: cataract surgery	1%	2%	6%	53%
Cardiology: CABG surgery	1%	7%	19%	50%
Diagnostic Procedures: MRI	18%	14%	10%	7%
Female: by age in years	**<45**	**45-54**	**55-64**	**>65**
Orthopaedics: total joint replacement surgery	0%	2%	11%	44%
Ophthalmology: cataract surgery	1%	2%	5%	30%
Cardiology: CABG surgery	0%	1%	4%	17%
Diagnostic Procedures: MRI	19%	14%	10%	8%

Source: The Centre for Spatial Economics based on data from the Canadian Institute for Health Information

The queue

The information collected for this study was used to determine the number of patients waiting for treatment longer than the recommended maximum period by province and priority area and also the average length of that wait.

With a few notable exceptions, the median patient generally receives treatment at or before the maximum recommended wait time limit. This experience is not, however, shared by all patients. The average wait for patients not treated within the recommended maximum period is nearly a year for hip and knee replacement surgery and 7 months for cataract surgery. For cardiac patients not treated within the maximum recommended period, the average wait for coronary artery bypass (CABG) surgery is over 3 months, or more than double the maximum recommended wait. The situation for patients requiring an MRI is grave. The maximum recommended wait is 30 days, but the median patient still waits 56 days, while the patient who does not get a scan within that maximum recommended period waits an average of 85 days.

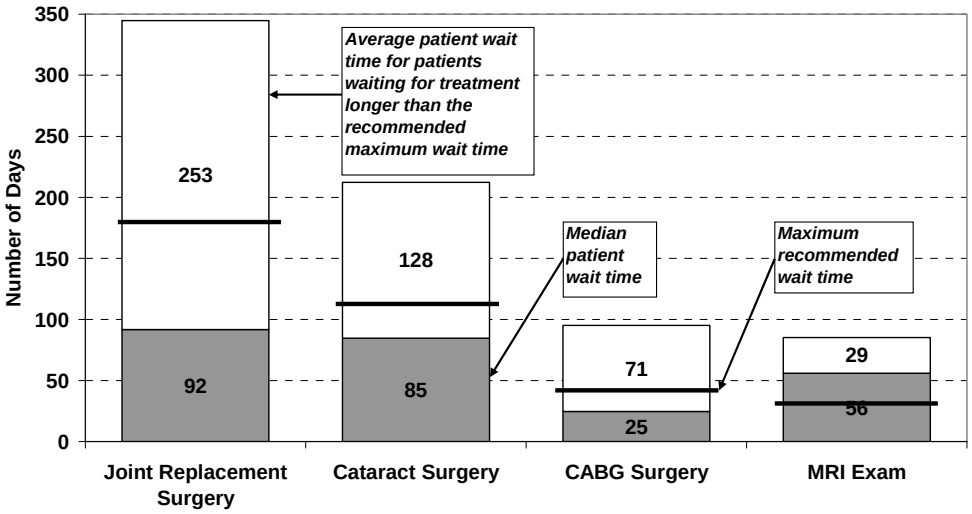
Figure 5 shows that, with the notable exception of MRIs, the median patient receives treatment within the maximum time recommended by the Wait Time Alliance. Figure 6 shows the number of patients treated within the maximum recommended period (the shaded bar) and the number of patients waiting for longer than the maximum recommended period (the clear bar). In this chart, it can be seen that well over half of all patients receive treatment within the maximum recommended time for all priority areas except MRIs. In this case, considerably more than half of all patients have to wait longer than medically recommended for their exam.

Figure 5 shows the wait time for treatment experienced by the median patient (shaded bars) in their province or region for the priority areas covered by this study, the maximum recommended wait time benchmarks developed by the Wait Time Alliance (solid line) and the time spent waiting for treatment by the average patient who has to wait for longer than the maximum recommended period for treatment (top of the stacked bar).

[9] The distribution of joint replacement, cataract and CABG patients by age and sex was drawn from the Canadian Institute for Health Information's web site *(http://qstat.cihi.ca)*. The age distribution of MRI patients was drawn from: Canadian Institute for Health Information, *Medical Imaging in Canada 2005*, (Ottawa: Canadian Institute for Health Information, 2005), Figure A.8, p. A-8. The male–female ratio for MRI exams was not available from this source, so it was assumed to be the same as for the general population.

Figure 5

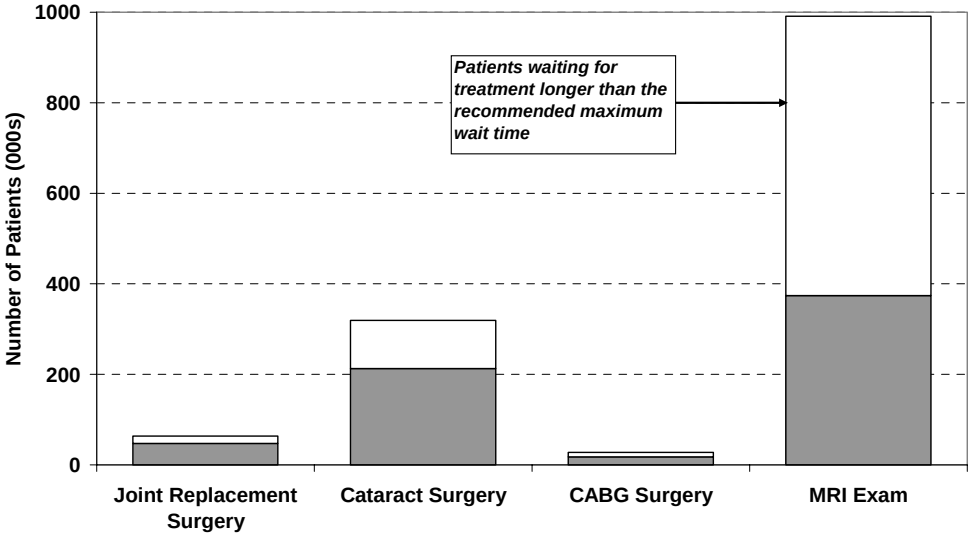
Average Patient Wait Times for Patients Waiting Longer than the Recommended Maximum Period for Treatment
Province-weighted National Average



Source: Wait Time Alliance for Timely Access to Health Care; The Centre for Spatial Economics based on information from federal and provincial government ministries, departments and agencies and from the Fraser Institute

Figure 6

Total Number of Patients and Patients with Excess Wait Times (2007)



Source: The Centre for Spatial Economics

As will be shown in Section 4, the length of time spent waiting for treatment is a key determinant of the economic costs of waiting. Patients in provinces that have lengthy wait times for treatment experience higher economic costs from wait lists. Table 12 provides estimates of the number of patients affected by lengthy waits for treatment in 2007. Total economic costs are determined by the number of patients in this table multiplied by per-patient costs.

Table 12

Annual Number of Patients Waiting in Excess of the Recommended Maximum Wait Time (thousands, 2007)										
	BC	**AB**	**SK**	**MB**	**ON**	**QC**	**NB**	**NS**	**PE**	**NL**
Orthopaedics: total joint replacement surgery	3.3	1.7	1.0	1.0	5.9	1.9	0.6	0.5	0.1	0.2
Ophthalmology: cataract surgery	10.9	8.3	4.6	6.1	30.8	37.5	3.1	2.9	0.5	1.7
Cardiology: CABG surgery	1.9	0.6	0.2	0.5	2.7	2.8	0.2	0.3		0.4
Diagnostic Procedures: MRI	60.8	96.9	13.8	15.8	224.6	160.6	18.2	19.5	1.8	5.1

Source: The Centre for Spatial Economics

4. Methodology for calculating the cost of waiting

This section reviews the approach taken to estimate the economic impact of wait times and is unchanged from the 2006 study. The costs addressed in this study are those that could be mitigated by adhering to wait time standards, so they focus exclusively on the costs incurred by patients waiting longer than the recommended maximum period for treatment. The costs of waiting are organized in 1 of 3 categories: patient costs, caregiver costs and health care system costs.

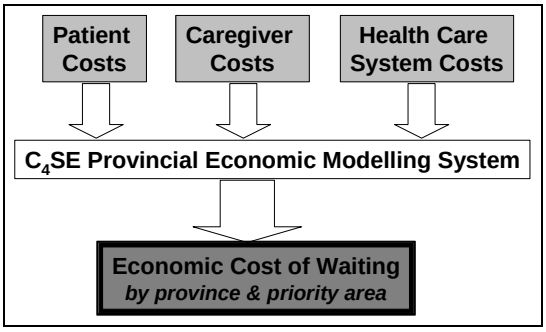
The first category is the impact from reduced economic activity as a result of patients being unable to participate in the labour force. These costs involve the direct loss in production from these people no longer producing goods and services as well as the broader reduction in economic activity resulting from reduced incomes and lower spending.

The second is the impact from reduced economic activity as a result of caregivers giving up work to care for family members or relatives. As with patient costs, these costs involve the direct loss in production from these people no longer producing goods and services as well as the broader reduction in economic activity resulting from reduced incomes and lower spending.

The third set of costs is that borne by the health care system. These include additional patient visits while waiting for treatment and the cost of medication and medical appliances that are required as a result of extended waits.

These 3 sets of costs are used in the C_4SE Provincial Economic Modeling System to determine the cost of waiting by province for each priority area. This section includes a brief discussion of the C_4SE modeling system[10] and summarizes some of the key assumptions that have a bearing on the results obtained from this analysis.

Figure 7



Patient costs

A 2005 survey by Statistics Canada indicated that between 33% and 35% of patients waiting for treatment reported that their lives were negatively affected by the wait. The impact on patients' ability to continue with their normal activities is, however, highly dependent on the nature of their condition and — to a lesser extent — on the length of time they have to wait for treatment.

[10] Please see Appendix C for more information on the C_4SE's Provincial Economic Modeling System.

For this study, a series of studies conducted by the Western Canada Waiting List Project was used. As well, physicians highly experienced in each of the priority areas were were asked the following question:

> *For patients waiting longer than the recommended period for treatment, what proportion should not continue (or reduce) their regular activities (including work)?*

The Western Canada Waiting List Project studies surveyed patients to determine the impact of their condition on their "ability to work, give care to dependents, live independently." Respondents who were "immediately threatened or unable" were considered unable to continue their regular activities. To this was added a third of the respondents who indicated their activities were "threatened but not immediately," because this study focuses on patients who are waiting in excess of the recommended period; as a result, some of these patients may have progressed to being unable to function while waiting for treatment.

The answers to this question, shown in Table 13, are critical in determining the economic impact of wait times. Western Canada Waiting List Project research was available for all priority areas except cardiac surgery. For this category, the study relied on the expert opinion of a cardiologist who indicated that 95% of patients waiting for CABG surgery are unable to continue their regular activities.

Table 13[11]

Proportion of patients who need to discontinue their	
Orthopaedics: total joint replacement surgery	32%
Ophthalmology: cataract surgery	7%
Cardiology: CABG surgery	95%
Diagnostic Procedures: MRI	22%

Sources: The Western Canada Waiting List Project; The Centre for Spatial Economics

The proportion of cataract surgery patients who need to discontinue their regular activities is low, at just 7%. This is because the majority of people present for surgery when they notice difficulty with visual tasks rather than waiting until their ability to do the activities of daily living is

[11] The information in this table was derived from the following sources:

- Information on hip and knee replacement surgery patients was found in Gordon Arnett, MD; David C. Hadorn, MD. MA; and the Steering Committee of the Western Canada Waiting List Project, *Developing priority criteria for hip and knee replacement: results from the Western Canada Waiting List Project*, (Canadian Journal of Surgery, Vol. 46, no. 4, 2003), Table 1, p. 292.
- Information on cataract surgery patients was found in Kenneth G. Romanchuck, MD; Suren Sanmugasunderam, MD; David C. Hadorn, MD; and the Steering Committee of the Western Canada Waiting List Project, *Developing cataract surgery priority criteria: results from the Western Canada Waiting List Project*, (Canadian Journal of Opthalmology, Vol. 37, no. 3, April 2002), Table 1.
- Information on patients waiting for an MRI exam was found in David C. Hadorn, MD; and the Steering Committee of the Western Canada Waiting List Project, *Developing priority criteria for magnetic resonance imaging: results from the Western Canada Waiting List Project*, (Canadian Association of Radiologists Journal, Vol. 53, No. 4, 2002), Table 1, p. 213.

threatened. Current wait list research only looks at the level of disability when the patients are put on the waiting list. No published literature shows the rate of decline in function in these patients. It is possible that with cataract wait times of one year or more, an increasing proportion of patients will have to discontinue their regular activities. Any increase in this proportion would significantly increase the estimated economic cost of wait times for cataract surgery.

The approach taken to determine the impact on the labour force from patients who are both unable to continue work and are experiencing wait times longer than recommended is shown in Figure 8 through Figure 11. The information in the light grey shaded text boxes in these figures can be found in this and Section 3 of this report, the information in the clear text boxes is data from the C_4SE's provincial economic modeling system, and the information shaded in the dark grey text boxes is the result of calculations using these information sets.

The first step is to estimate the excess wait time (measured in days) for each province and priority area (see Figure 8). This is followed by determining the excess wait times experienced by sex and age cohorts for each province and priority area. The excess wait times can then be used to determine the impact on the labour force by multiplying each group by its participation rate in the labour force and adjusting for the proportion of patients who need to discontinue their regular activities. The sum of these labour force impacts is then distributed across the 14 industry sectors in the model, based on their shares of total employment. These are the values used in the model to determine the impact of excess wait times on each province's economy for each of the priority health care areas (see Figure 9).

Figure 8

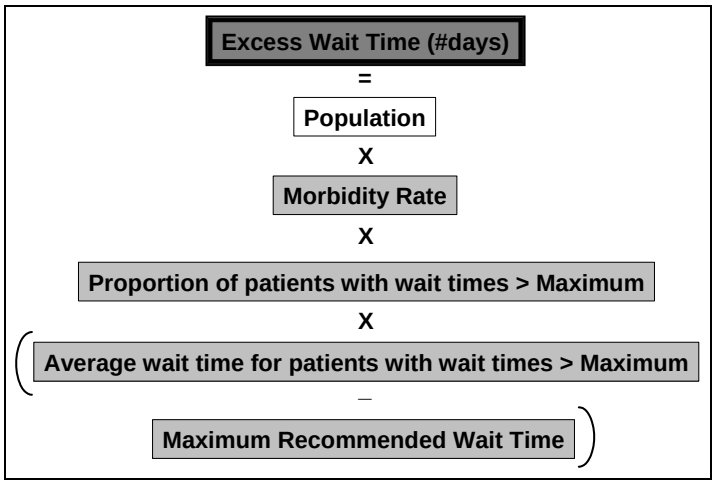
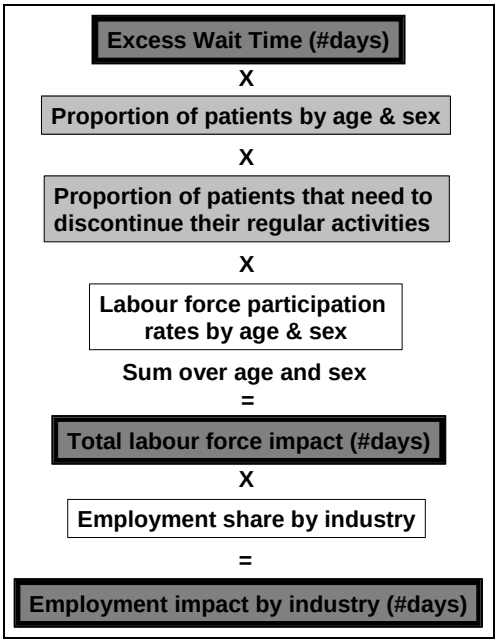


Figure 9



Caregiver costs

An important factor in the overall cost of waiting for treatment is the impact from caregivers being forced to suspend their regular activities to care for a sick family member or other relative. Although this phenomenon is well recognized anecdotally, quantitative information on its prevalence is scarce.

Again, for this study, the opinion of physicians highly experienced in each of the priority areas was solicited to answer the following questions:

> *For patients waiting longer than the recommended period for treatment, what proportion requires the assistance of a family member as a caregiver?*
>
> *When a caregiver is available, could you estimate whether it is likely to be a (i) spouse, (ii) parent, (iii) adult child, (iv) other relative.*

The physicians' responses to the first of these questions are summarized in Table 14. Approximately 20% of patients waiting for joint replacement surgery require the assistance of a caregiver. Frequently these patients are quite elderly and require considerable assistance. For patients waiting for cataract surgery, it was estimated that less than 10% (a value of 5% was used in the analysis) require the assistance of a family member as a caregiver. But for patients waiting for CABG surgery, this ratio rises to 25%.

Table 14

Proportion of Patients that Require a Caregiver	
Orthopaedics: total joint replacement surgery	20%
Ophthalmology: cataract surgery	5%
Cardiology: CABG surgery	25%
Diagnostic Procedures: MRI	

Source: The Centre for Spatial Economics

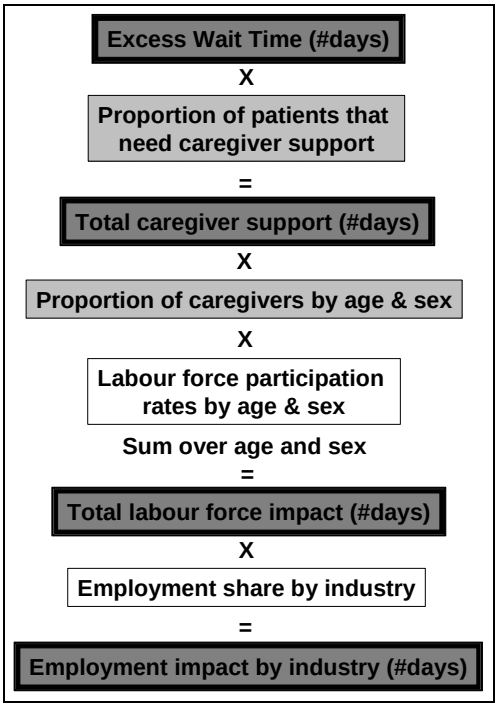
The answers to the second question are combined with the general and patient population statistics to create an estimated distribution of caregivers by age and sex. The male and female proportions for each age group add up to 100% for each of the priority areas in Table 15.

Table 15

Caregiver Proportions by Age and Sex				
Male: by age in years	**<45**	**45-54**	**55-64**	**>65**
Orthopaedics: total joint replacement surgery	16%	6%	10%	22%
Ophthalmology: cataract surgery	7%	4%	5%	24%
Cardiology: CABG surgery	10%	4%	5%	12%
Diagnostic Procedures: MRI				
Female: by age in years	**<45**	**45-54**	**55-64**	**>65**
Orthopaedics: total joint replacement surgery	15%	6%	7%	18%
Ophthalmology: cataract surgery	7%	4%	6%	42%
Cardiology: CABG surgery	10%	8%	15%	35%
Diagnostic Procedures: MRI				

Source: The Centre for Spatial Economics

Figure 10



The steps required to determine the impact of caregiver support on the labour market are similar to those taken to determine the impact from patients. The process begins with the excess wait time measure developed previously. This excess wait time is multiplied by the proportion of patients that require caregiver support to determine total caregiver support (measured in days) for each province and priority area. This step is followed by determining the level of caregiver support by sex and age cohorts for each province and priority area, which can then be used to determine the impact on the labour force by multiplying each group by its participation rate in the labour force. The sum of these labour force impacts is then distributed across the 14 industry sectors in the model based on their shares of total employment. These are the values used in the

model to determine the impact of caregiver support on each province's economy for each of the priority health care areas (see Figure 10).

Health care system costs

Patients waiting for longer than the recommended maximum period for treatment frequently incur and impose costs during this period over and above those costs that would be experienced with a wait of shorter duration. This study estimates the economic impact of these costs by province and for each priority area.

A key difference between these costs and those described previously is that from the perspective of Statistics Canada's National Accounts, spending on goods and services within the medical system represents an increase in economic activity[12]. These goods and services must, however, be paid for. Therefore, this study assumes that the cost of providing additional health care services to patients waiting for a period longer than the recommended maximum is financed through an increase in provincial personal income taxes. Imposing the requirement that these goods and services be paid for through general revenues means this study attempts to measure the net cost (or benefit) of this spending.

Another assumption made for this study involves the private purchase of drugs, health care appliances and services by patients while waiting for treatment. This spending is ignored because it is assumed to displace spending on other (non-health) goods and services. From a well-being perspective, patients are worse off because they would have preferred to purchase those other goods and services. But economic activity is unaffected because the overall level of consumer purchases is unchanged. Only drug costs incurred by seniors are included because these are covered by provincial health care systems.

As with the calculation of patient and caregiver costs, the opinion of physicians highly experienced in each of the priority areas was solicited to answer the following set of questions:

> *For patients waiting longer than the recommended period for treatment, what proportion requires additional specialist appointments prior to treatment? Responses were for the proportion needing 0, 1, 2 or 3 additional visits.*
>
> *What proportion requires additional visits post-treatment (beyond those that would normally be scheduled)? Responses were for the proportion needing 0, 1, 2 or 3 additional visits.*
>
> *What is the average cost of a visit (i.e., the amount billed to the provincial health authority)?*
>
> *For patients waiting longer than the recommended period for treatment, what proportion requires additional tests/procedures and what is their average cost?*
>
> *What proportion of patients waiting for treatment requires medication and what is the average cost (per month)?*

[12] The National Accounts are a system of measures collected by Statistics Canada to determine the value of economic activity occurring within a specified period of time. The total value of goods and services produced by the economy, as measured by the National Accounts, is called gross domestic product.

For patients waiting longer than the recommended period for treatment, what proportion requires additional medications (i.e., not normally taken) and what is the average cost (per month)?

The responses from the 2006 study physician's survey were used for this update. In the last year, costs were assumed to have risen by 3.5% for medical appointments, by 4.0 % for tests and other procedures, and by 5.0% for drugs. The results are summarized in Table 16, which shows that additional medical system costs for each patient waiting longer than the maximum recommended period are $227 for hip and knee replacement surgery, $36 for cataract surgery and $328 for CABG surgery.

Table 16

Health Care System Costs by Priority Area *Dollars per Patient Waiting Longer than the Maximum Recommended Period*	Hip & Knee Replacement Surgery	Cataract Surgery	CABG Surgery
Proportion of Patients Requiring Additional Pre-op Appointments:			
0 Additional Appointments	15%	5%	10%
1 Additional Appointment	35%	85%	40%
2 Additional Appointments	45%	10%	30%
3 Additional Appointments	5%	0%	20%
Proportion of Patients Requiring Additional Post-op Appointments:			
0 Additional Appointments	100%	100%	70%
1 Additional Appointment	0%	0%	10%
2 Additional Appointments	0%	0%	10%
3 Additional Appointments	0%	0%	10%
Average Cost of an Additional Appointment:			
Average Cost	$37	$34	$42
Other Tests & Procedures:			
Prop. Requiring Additional Tests	100%	0%	Varies
Avg. Cost of Additional Tests	$47	$0	$107
Proportion of Patients Requiring Medication:			
Prop. Requiring Additional Drugs	80%	0%	100%
Avg. Monthly Cost of Additional Drugs	$161	$0	$183
Proportion of Patients Requiring Additional Medications:			
Prop. Requiring Additional Drugs	20%	0%	10%
Avg. Monthly Cost of Additional Drugs	$161	$0	$79
Summary of Costs			
Appointment Costs	$52	$36	$93
Test / Procedure Costs	$47	$0	$107
Drug Costs	$161	$0	$191
Total Additional Medical Costs:	$259	$36	$390
Drug costs for patients over 65	$128	$0	$128
Total Additional Medical System Costs:	**$227**	**$36**	**$328**

Source: The Centre for Spatial Economics

Orthopaedics

The average cost for an orthopaedic specialist's limited consult is $45, which can be billed once every six months, and $30 for an office follow-up. Patients waiting for an extended period of time for treatment also visit their general practitioner's on a monthly or bi-monthly basis for medications and analgesics and to try and speed up their treatment.

Patients waiting in excess of the recommended period also require a radiograph on average once every six months at a cost of $45.

About 80% of patients take NSAID and/or Tylenol #3, with a smaller proportion requiring a stronger narcotic, for an approximate average cost of $30 a month. And about 20% of patients need to take stronger narcotics such as MS contin or oxycodone as a result of waiting longer than the recommended period for treatment, at an estimated cost of $30 a month.

Ophthalmology

Approximately 85% of patients waiting for longer than the recommended maximum period for cataract surgery require an additional visit to their specialist, and about 10% require 2 additional visits at an average cost of $33 a visit.

No additional medications or tests are required during the wait period.

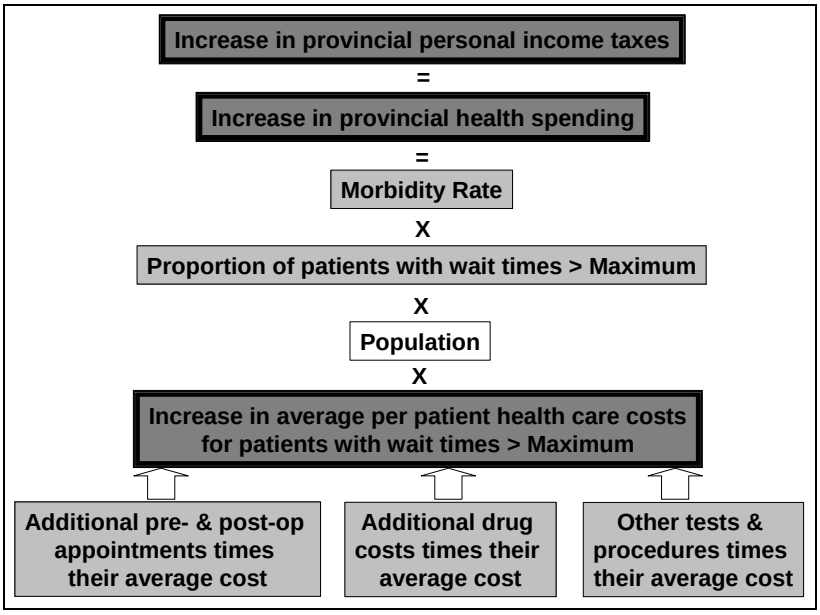
Cardiology

The average cost of visit to a general practitioner is $30 and $65 for a specialist. This analysis assumes that two-thirds of the additional visits are to a GP and one third to a specialist, for a weighted average cost of $42.

All patients waiting in excess of the recommended period for CABG surgery require an additional ECG at a cost of $30. Patients waiting longer than 3 to 6 months will need a repeat echocardiogram at a cost of $180, and those waiting longer than 6 to 12 months will need a repeat cardiac catheterization at a cost of $500.

Cardiac patients who wait longer than the maximum recommended period will need to purchase about one-and-one-half additional months' worth of medication. The regular medication includes ASA, B-Blocker ($20), Statin ($60), ACEI ($30) and NTG ($5). Additional medications required include anti-anginals ($50).

Figure 11



The process required to estimate the impact of health care spending follows a similar approach to that taken for patients and caregivers. It begins with an estimate of the increase in average per-

patient health care costs for patients with wait times that exceed the recommended maximum. This estimate is obtained by multiplying the proportion of patients experiencing these costs by their average cost. The average per-patient cost is then multiplied by the province's population, the proportion of patients with wait times exceeding the maximum recommended and the morbidity rate for the priority area. This multiplication yields the increase in provincial health spending that can be attributed to patients waiting longer than the recommended maximum period for each of the priority areas. As discussed earlier, this value is also the amount by which provincial personal income taxes are raised (see Figure 11).

C_4SE Provincial Modeling System

The C_4SE's Provincial Modeling System is a dynamic multi-sector regional economic model of the country. It includes a bottom-up set of macroeconomic models for the provinces, the territories and the rest of the world. The national model links economic activity in one region with activity in the other regions through trade. The model includes detailed income and expenditure categories and demographic and labour market information. The purpose of the model is to produce medium- to long-term projections of the provincial economies and conduct simulation studies that require industry and demographic detail. More information on the C_4SE's Provincial Modeling System can be found in Appendix B to this report.

Critical assumptions

The following assumptions made for this study have varying impacts on its outcome. Most were made either to simplify the analysis or because of the lack of readily available information to reliably quantify an alternative set of assumptions. The assumptions have been grouped based on the likelihood that, if relaxed, they raise the estimated the economic cost of waiting (i.e., these assumptions lower this study's estimated cost of waiting), lower the estimated cost of waiting or have no clear impact on the results.

Assumptions that if relaxed may raise the cost estimates

- The primary benefit of wait lists is that they ration demand. This rationing likely discourages some patients from seeking treatment. Efforts to reduce wait times and improve service could, therefore, encourage those patients to return to the medical system limiting the overall improvement in wait times. This issue is particularly difficult to measure and account for. As a result, most studies, including this one, ignore this issue. It will be assumed that the incidence of treatment is unaffected by the availability of care.
- The direct impact on economic activity of patients not in the labour force was ignored. This ignores reductions in leisure spending or volunteer activity as a result of patients and caregivers being unable to pursue these activities to the extent that they might under normal conditions. It also ignores the value of leisure time. The reason for this assumption is that leisure (or non-work related) activity is not measured by Statistics Canada's National Accounts. The reduction in these patients quality of life is clearly real, but not given a monetary value in this study.
- This study has not imposed an overall revenue or budgetary condition on federal and provincial governments that would force them to raise taxes to recover revenues lost as a result of wait time costs.

- The study assumes that the probability of patients experiencing a negative outcome from their treatment is independent of their wait time. This assumption ignores the possibility that a patient's outcome may be affected by the length of time it takes to receive treatment[13].
- This study does not consider the costs associated with waiting to see a family doctor, a specialist or waiting for results from diagnostic tests.

Assumptions that if relaxed may lower the cost estimates

- The private purchase of drugs, health care appliances and services by patients (and by private insurance) while waiting for treatment is ignored by this study. This assumption is adopted because these goods and services are assumed to displace spending on other (non-health) goods and services. From a well-being perspective, patients are worse off because they would have preferred to purchase those other goods and services. But economic activity is unaffected because the overall level of consumer purchases is unchanged.
- The cost of providing additional health care services to patients waiting for a period longer than the recommended maximum is fully financed through an increase in provincial personal income taxes. This assumption is important because these costs are borne by the medical system. From the perspective of the National Accounts, they represent spending on goods and services and so raise economic activity. By imposing the requirement that these goods and services be paid for through general revenues, the study can determine the net cost (or benefit) of this spending.
- The study assumes that the probability of patients leaving the wait list prior to treatment is independent of their wait time. This assumption, therefore, ignores the possibility that patients dying, getting better without treatment or deciding not to pursue treatment depends on the length of time they have to wait for treatment[14].

Assumptions with no clear impact on the cost estimates

- The study assumes that the probability of patients waiting longer than recommended for treatment is independent of their age or sex. It also assumes that it is independent of the industry in which they are employed (if they are employed).
- The study assumes that the probability of patients waiting for treatment longer than recommended being unable to continue their normal activities is independent of their age or sex.

On balance, the C_4SE believes the cost estimates generated by this research are conservative. In particular, 2 assumptions significantly reduce the estimated impacts. First, this study only

[13] There is evidence that excessive waits for treatment reduce the quality of patient outcomes, contribute to mental anguish, depression and drug addiction, and reduce the likelihood that the patient can return to the workforce. This study only considers the adult population, but it should be noted that children are particularly sensitive to wait times for treatment, and this remains an area for future research.

[14] Although patients who leave the wait list reduce the overall cost of waiting, this is offset by the fact that patients who die or are unable to continue their daily activities as a result of lack of treatment increase the economic cost of wait times.

addresses the wait time from when the specialist decides upon and requests a course of treatment to the time that treatment occurs; it ignores the wait times experienced by patients in getting to see the specialist or even in getting to see their family doctor, so a large proportion of patient costs are missing. Second, the study ignores the costs imposed on the economy through the elevated tax rates required by governments to recover the revenues lost through reduced economic activity.

5. Cost of waiting

This section provides an estimate of the costs of wait lists. These costs were derived using the C_4SE's provincial modeling system and reflect all the assumptions discussed in the previous sections. The modeling system is dynamic, which means it can examine the impacts of wait times over time.

To estimate the impacts of the costs of wait lists, 2 economic projections were made with the modeling system. In the first projection, it was assumed that there were no wait lists. In the second projection, the wait lists and their associated costs were included. The results of the 2 projections were then compared for the various economic indicators to determine the impacts. The projections were conducted on an annual basis for a period of time of sufficient length to allow the model to reach its long-run equilibrium position.

The results, which are presented for each of the priority areas covered by this study, highlight the impacts in terms of output and federal and provincial government revenues for each province. A national (patient-weighted) summary figure is also produced for reference.

The economic impact is shown for each of the major contributing factors to wait time costs discussed in the previous section:

- The impact from reduced activity by patients in the labour market
- The impact from reduced activity by caregivers in the labour market
- The impact from higher health care costs associated with the excess wait
- The sum of these 3 costs

The costs are presented in 2 ways. The first measure is the average cost per patient for patients that experience a wait time longer than medically recommended. This measure provides an estimate of the average burden placed upon these patients and is an appropriate measure for considerations of fairness and equity. The second measure is the estimated total cost to each province's economy of wait times for each of the priority areas in 2007.

Economic cost measures

The tables in the following sections provide the economic impacts of patient wait times in excess of the recommended maximum period for several measures. These economic impacts are measured as the average annual difference between the projections with and without wait lists over a 10-year projection horizon.

Gross domestic product: This measure shows the impact on the value of goods and services produced per patient expressed in 2007 reference year dollars. Values greater than zero indicate that wait lists impose a cost on the economy.

Federal government revenue: The measure shows the impact on federal government revenue generated per patient in the province expressed in 2007 reference year dollars. Values greater than zero indicate a reduction in government revenues.

Provincial government revenue: This measure shows the impact on provincial government revenue generated per patient in the province expressed in 2007

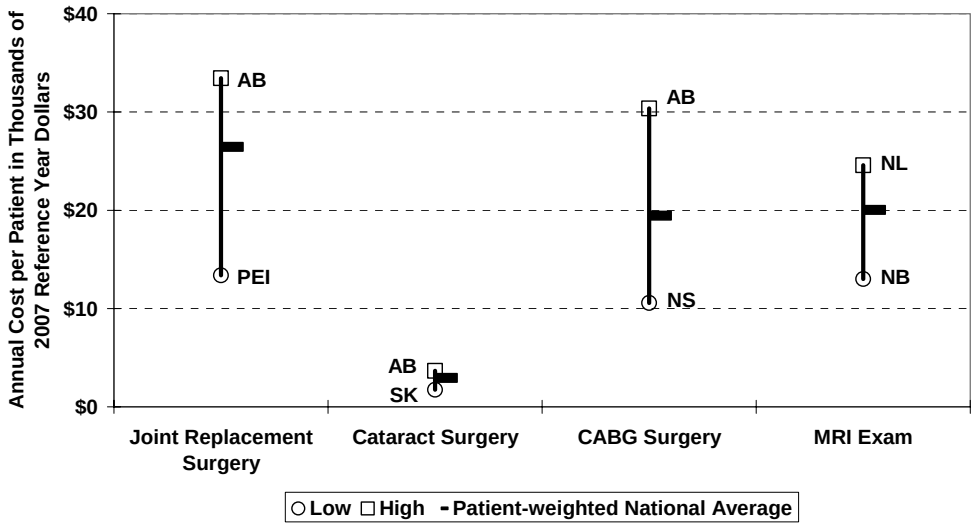
reference year dollars. Values greater than zero indicate a reduction in government revenues.

Impact on GDP

The economic costs of wait times, which vary widely by province and priority area, are summarized in Figure 12. The highest costs are generated for total joint replacement surgery, followed by CABG surgery and MRIs, with cataract surgery yielding the lowest costs.

Figure 12

Impact on Gross Domestic Product per Patient Waiting in Excess of the Recommended Maximum Wait Time
Patient-weighted National Average



Source: The Centre for Spatial Economics

Figure 12 provides the national, patient weighted, average cost for each priority area as a benchmark value for the provinces and compares them across priority areas. At $26 400 per patient, the wait time costs for total joint replacement surgery are significantly higher than for the other priority areas. Significant differences in costs exist among the provinces, with Alberta's per patient cost exceeding $33 400, while Prince Edward Island's is under $13 400.

The differences in costs among the provinces are also stark for CABG surgery, ranging from just over $10 600 in Nova Scotia to over $30 000 in Alberta. Meanwhile, the difference from top to bottom for cataract surgery and MRIs is significantly less.

It is interesting to note that no one province has either the highest or the lowest costs per patient in all priority areas. Alberta has the highest costs for all priority areas except MRIs, where Newfoundland and Labrador has the highest costs. The lowest costs are in Atlantic Canada for all priority areas except cataract surgery, where Saskatchewan has the lowest costs.

Table 17 provides the wait time costs by province and priority area for the 3 contributing factors to wait time costs.

Table 17

Impact on Gross Domestic Product *2007 Reference Year Dollars per Patient*											
	Costs per patient with excess waits										
Total Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	23,608	33,437	24,457	15,774	28,543	28,766	17,084	21,593	13,386	21,573	26,437
Ophthalmology: cataract surgery	2,813	3,671	1,728	2,921	3,107	2,958	2,574	2,125	2,541	2,473	2,926
Cardiology: CABG surgery	26,808	30,356	28,497	11,850	22,913	12,204	16,182	10,576		13,254	19,445
Diagnostic Procedures: MRI	22,092	20,307	21,737	18,960	23,165	15,546	13,004	14,072	14,359	24,575	20,037
Patient Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	9,114	13,396	9,842	6,062	11,079	10,332	6,081	7,678	5,164	6,665	10,166
Ophthalmology: cataract surgery	1,368	1,824	857	1,410	1,514	1,372	1,172	992	1,235	1,025	1,401
Cardiology: CABG surgery	20,284	23,671	21,782	9,146	17,764	9,526	12,054	8,368		9,863	14,985
Diagnostic Procedures: MRI	22,092	20,307	21,737	18,960	23,165	15,546	13,004	14,072	14,359	24,575	20,037
Caregiver Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	15,123	21,084	15,151	10,216	18,357	19,531	11,435	14,813	8,684	15,809	17,090
Ophthalmology: cataract surgery	1,581	2,043	970	1,613	1,763	1,730	1,475	1,279	1,406	1,587	1,672
Cardiology: CABG surgery	7,429	8,583	8,212	3,487	6,621	3,786	4,857	3,442		4,219	5,647
Diagnostic Procedures: MRI											
Health Care System Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	-629	-1,043	-537	-504	-894	-1,097	-432	-898	-462	-901	-819
Ophthalmology: cataract surgery	-136	-195	-98	-103	-169	-145	-73	-145	-101	-139	-147
Cardiology: CABG surgery	-904	-1,899	-1,497	-783	-1,473	-1,108	-728	-1,234		-828	-1,187
Diagnostic Procedures: MRI											

Source: The Centre for Spatial Economics

The distribution of economic costs across the 3 cost categories considered in this study is instructive (see Figure 13). The source of total economic costs varies considerably for each of the priority areas.

For total joint replacement, caregiver costs exceed those generated by the patients. This result is due to the relatively high proportion of patients who require the assistance of a caregiver (relative to the proportion of patients who need to discontinue their regular activities) and the relative youth of the caregivers increasing the likelihood that they had to withdraw from the labour force.

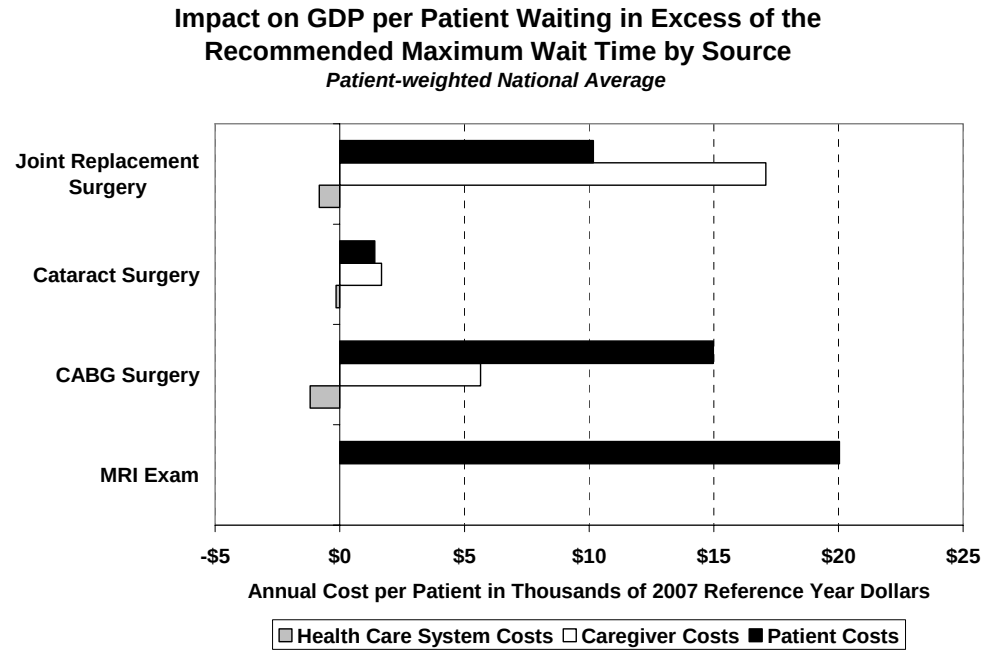
The distribution of costs between patient and caregiver is nearly equal for cataract surgery. Again, the proportion of patients requiring a caregiver is close to the proportion of patients who need to discontinue their regular activities, although 66% of these caregivers are over 65 years old.

For CABG surgery, the high proportion of patients who must discontinue their regular activities leads to patient costs exceeding caregiver costs by a margin of nearly 3 to 1. The fact that nearly half the caregivers for these patients are over 65 reduces the level of caregiver costs.

MRI costs are only reported for the patient. This reporting procedure is used because patients with such a wide variety of medical conditions require an MRI that is not possible to provide reasonable estimates of (i) the likelihood that they will require a caregiver or (ii) the impact on their medical expenses as a result of waiting for the scan.

Finally, the impact of health care system costs reflects the multiplier impact of the increased health expenditures. Despite increased taxes, the higher expenditures faced by the health care system lead to a small net positive impact on the economy, as these expenditures lead to additional jobs and associated economic activity. The increased spending on health care services partially offsets the cost of waiting. This offset should, however, be considered carefully because it represents public money that could have been used instead to reduce wait times rather than to support them.

Figure 13



Source: The Centre for Spatial Economics

The estimated overall cost of waiting in terms of foregone GDP for each priority area in 2007 is presented in Figure 14. This cost is simply the product of the per-patient costs presented above and the number of patients waiting for longer than the recommended maximum period for treatment.

The total estimated cost across the 4 priority areas in 2007 was $14.8 billion[15]. The true cost of wait lists in the health care system is clearly much higher because this analysis only accounts for a small proportion of the diseases for which patients are waiting for treatment and excludes several parts of the wait time process: waiting to see a specialist, waiting for diagnostic test results, waiting to see a family doctor, etc.

The cost of waiting for an MRI exam ($13.8 billion) dominates the total wait time costs estimated in this study. This is the result of several factors conspiring together. First, a large number of patients need an MRI each year in Canada. The incidence rates for an MRI exam (see Table 10) are significantly higher than for any of the other priority areas. The second factor can be seen in Table 3 where the median patient's wait time falls far short of the maximum recommended wait time across the country. Average wait times for patients not treated within the maximum recommended period may not be the longest for the priority areas studied (see Table 9) but are still lengthy and become formidable when combined with the large number of patients left waiting for an exam longer than the maximum recommended time (see Figure 12)[16]. Third is the

[15] The total economic cost of waiting by province is provided in Appendix B.

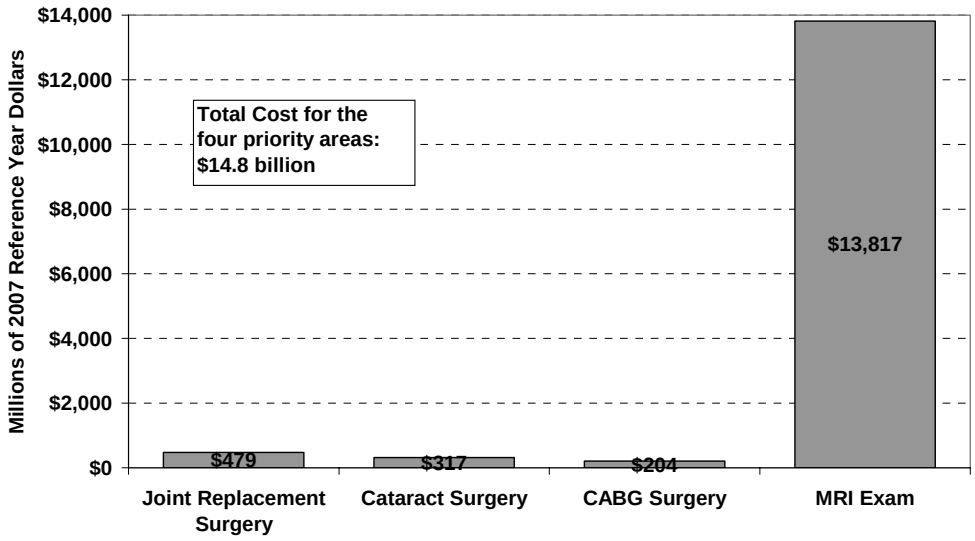
[16] Lengthy wait times for an MRI exam are due in large part to the relative scarcity of equipment available in Canada. In 2005, Canada ranked 16th among Organisation for Economic Co-operation and Development

comparatively low age for patients waiting for treatment. Cataract surgeries and joint replacement surgeries are predominantly performed on people over the age of 65 (80% and 83% respectively). More joint replacement surgeries are performed on women (57%) than men (43%), while more cataract surgeries are performed on men (62%) than women (38%). Looking at the incidence of CABG surgeries shows 67% are performed on people over age 65 and 77% of all CABG surgeries are performed on men. While surgery for the priority areas is primarily performed on the elderly, MRI exams are performed on younger Canadians, with 85% of patients being under 65.

Table 11 shows that over 80% of patients are under the age of 65, so this wait list has a major impact on the nation's labour force. The final factor is the relatively large proportion of these patients who are unable to continue with their usual activities while waiting for treatment (see Table 13). In short, a large, young group of patients who are unable to work leads to the high total cost of wait lists for MRI exams.

Figure 14

Impact on Gross Domestic Product of Wait Times in Excess of the Recommended Maximum Wait Time



Source: The Centre for Spatial Economics

Impact on government revenue

As discussed in Section 4, provincial government personal income tax revenues must be raised to offset the cost of health care spending resulting from wait times that exceed the recommended maximum period for treatment. The reduction in economic activity does, however, more than

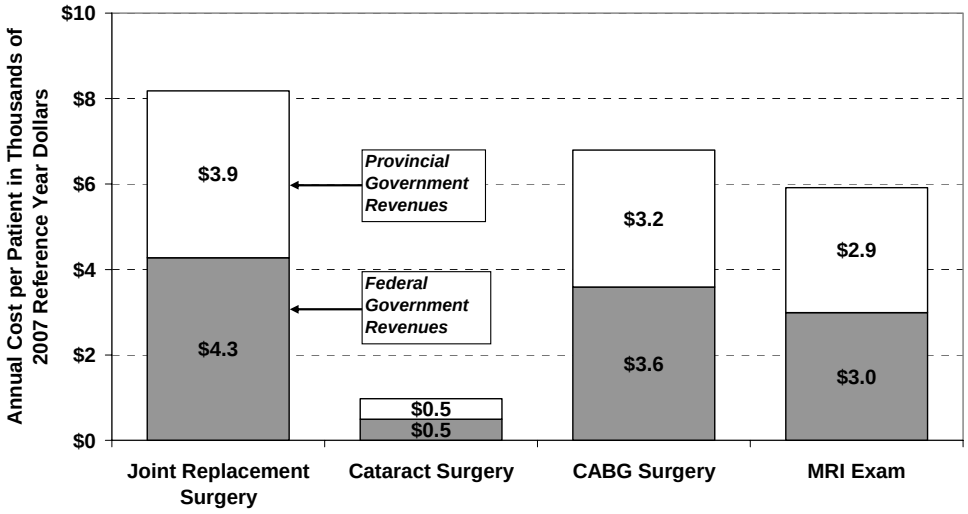
(OECD) nations with just 5.5 MRI units per million people. The OECD average is 9.8 MRI units per million people, and the U.S. has 26.6 MRI units per million people.

offset this increase. Reduced personal incomes lead to lower federal and provincial personal income taxes, and reduced personal spending leads to lower sales and excise tax revenues. Business activity is also reduced so federal and provincial corporate income tax revenues are also affected.

Figure 15 summarizes the wait time costs to federal and provincial government revenues per patient waiting longer than the recommended maximum period for treatment. Table 18 provides impacts on federal government revenues by province, priority area and source. Table 19 provides the same information for the provincial governments.

Figure 15

Impact on Government Revenues per Patient Waiting in Excess of the Recommended Maximum Wait Time
Patient-weighted National Average



Source: The Centre for Spatial Economics

The costs to the federal and provincial governments in terms of foregone revenue are significant and vary widely by province and priority area. The relative costs per patient are similar to those seen in terms of GDP per capita (see Figure 12). This is not surprising because changes in tax revenue are positively related to changes in income. The costs to governments are highest for total joint replacement — nearly $8200 per patient — and lowest for cataract surgery. It is worth noting that the costs in terms of lost revenues to provincial governments are less than those of the federal government for each priority area. Also, although the costs do vary widely across provinces, the variance in provincial and federal government revenue costs is similar within each of the 4 priority areas. The total cost in terms of foregone government revenue across the 4 priority areas in 2007 was about $2.21 billion for the federal government and $2.18 billion for the provincial governments.

The impact on government expenditures is less obvious. As discussed earlier, the added spending on health care services while patients wait for treatment raises government spending. The impact on the labour market raises social insurance spending as more people collect employment

insurance and other social assistance benefits. But reduced economic activity, in the C_4SE model, also reduces government spending, so that the overall impact on government deficits is less severe than the reduction in government revenues.

Table 18

Impact on Federal Government Revenues *2007 Reference Year Dollars per Patient*											
	Costs per patient with excess waits										
Total Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	3,533	5,529	3,398	2,466	4,853	4,372	2,792	2,945	2,364	2,791	4,276
Ophthalmology: cataract surgery	441	592	228	451	531	528	435	316	459	294	497
Cardiology: CABG surgery	4,252	5,768	4,404	2,022	4,288	2,334	3,157	1,847		1,610	3,588
Diagnostic Procedures: MRI	2,975	2,958	2,718	2,513	3,672	2,309	2,020	1,673	2,407	2,586	2,990
Patient Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	1,511	2,563	1,457	1,056	2,058	1,902	1,113	1,246	988	1,140	1,863
Ophthalmology: cataract surgery	251	354	130	237	287	262	217	180	240	146	268
Cardiology: CABG surgery	3,315	4,834	3,569	1,648	3,457	1,901	2,491	1,584		1,240	2,896
Diagnostic Procedures: MRI	2,975	2,958	2,718	2,513	3,672	2,309	2,020	1,673	2,407	2,586	2,990
Caregiver Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	2,108	3,129	2,025	1,488	2,936	2,598	1,741	1,821	1,436	1,749	2,531
Ophthalmology: cataract surgery	207	264	112	228	269	288	229	155	231	163	249
Cardiology: CABG surgery	1,061	1,176	1,003	483	1,054	606	776	447		466	863
Diagnostic Procedures: MRI											
Health Care System Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	-87	-163	-83	-78	-141	-129	-63	-122	-61	-98	-119
Ophthalmology: cataract surgery	-17	-26	-13	-14	-25	-23	-11	-20	-12	-15	-21
Cardiology: CABG surgery	-124	-242	-168	-109	-223	-173	-110	-184		-96	-171
Diagnostic Procedures: MRI											

Source: The Centre for Spatial Economics

Table 19

Impact on Provincial Government Revenues *2007 Reference Year Dollars per Patient*											
	Costs per patient with excess waits										
Total Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	3,606	3,814	3,812	2,785	3,910	5,782	3,563	3,535	2,728	3,647	3,903
Ophthalmology: cataract surgery	429	372	221	499	409	649	540	350	545	352	479
Cardiology: CABG surgery	4,092	3,573	4,943	2,112	3,311	2,728	3,936	1,964		1,889	3,206
Diagnostic Procedures: MRI	3,341	2,014	3,317	3,013	3,163	3,141	2,812	2,124	2,547	3,580	2,925
Patient Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	1,650	1,791	1,760	1,318	1,824	2,715	1,543	1,601	1,371	1,626	1,810
Ophthalmology: cataract surgery	267	233	153	291	253	356	293	222	340	204	281
Cardiology: CABG surgery	3,512	3,224	4,332	2,038	3,055	2,606	3,445	1,985		1,771	2,926
Diagnostic Procedures: MRI	3,341	2,014	3,317	3,013	3,163	3,141	2,812	2,124	2,547	3,580	2,925
Caregiver Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	2,349	2,398	2,428	1,822	2,512	3,578	2,407	2,333	1,736	2,439	2,501
Ophthalmology: cataract surgery	228	199	127	274	225	384	308	190	278	222	271
Cardiology: CABG surgery	1,140	903	1,190	579	887	810	1,076	559		661	893
Diagnostic Procedures: MRI											
Health Care System Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	-393	-375	-375	-355	-426	-511	-386	-399	-380	-418	-409
Ophthalmology: cataract surgery	-66	-60	-59	-67	-70	-91	-62	-63	-73	-74	-73
Cardiology: CABG surgery	-561	-553	-579	-504	-632	-687	-584	-580		-544	-613
Diagnostic Procedures: MRI											

Source: The Centre for Spatial Economics

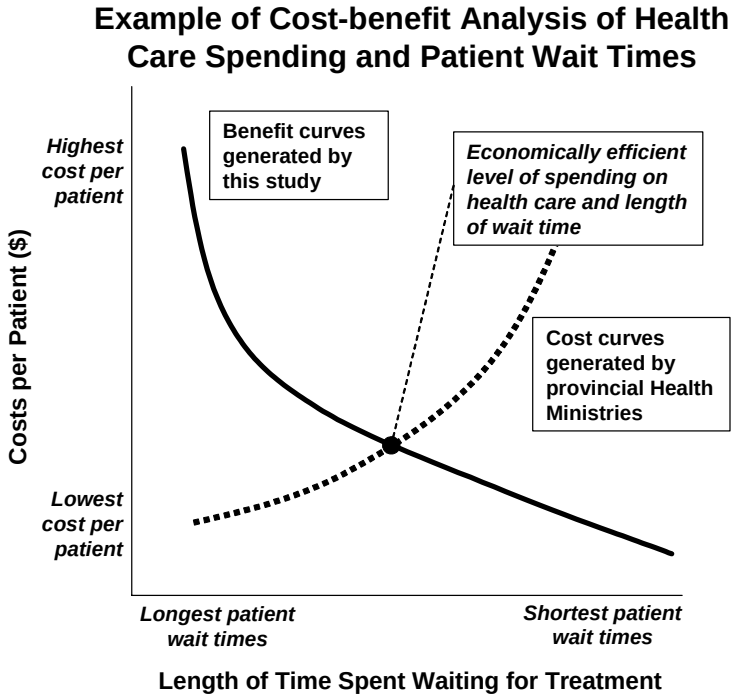
Wait time benefit curves

The economic cost of waiting for treatment depends on the length of time spent waiting — the costs are highest for those waiting longest. Since not all patients wait the same length of time for treatment, it is possible to determine the costs borne by patients depending on the length of time

spent waiting for treatment. The analysis in this section demonstrates how the wait time cost varies depending on the length of time spent on the wait list.

Reducing wait lists will reduce wait times for patients waiting longest for treatment. As previously noted, the per-patient costs of waiting are highest for those waiting longest for treatment. As a result, a set of wait time benefit curves can be developed for each priority area and province. These benefit curves represent the economic benefit of reducing the length of time spent waiting for treatment. From a health care policy perspective, these are the relevant costs for use in cost-benefit analysis.

Figure 16



Source: The Centre for Spatial Economics

Cost-benefit analysis is a tool used by policy-makers to help determine an economically efficient use of public resources. This study provides policy-makers with a set of benefit curves for each province and priority area in terms of GDP per patient by length of wait for treatment. (See the downward sloping curve in Figure 16.) This information can be combined with information available to provincial health ministries and other public health officials on the incremental cost of providing service to patients. The cost of providing service is expected to rise, on a per-patient basis, as the number of patients treated rises. (See the upward sloping curve in Figure 16.) This is because the costs of providing timely care are likely to rise on a per-patient basis as available resources become fully utilized and new — more expensive — capacity has to be added to health care system. Building new operating theatres and hiring more doctors, nurses and support staff to significantly increase capacity is, for example, considerably more expensive — in both absolute terms and per patient treated — than increasing the number of procedures completed in existing facilities with current staff. The more wait times are cut, the more it costs per patient to keep

cutting them, and so the curve showing health care costs per patient rises. The higher up this curve, the harder it becomes for policy-makers to justify spending public money on cutting wait times instead of other important public services.

The economically efficient level of public spending on health care is then be determined by the intersection of the downward sloping benefit curves provided in this study with the provinces' own upward sloping spending curves. This intersection shows a practical way to target spending to reduce wait times.

Although cost-benefit analysis should not be the only the criteria used to determine public policy, it can be a powerful tool to help guide decisions on public spending. Each province can determine how its resources can best be used to reduce the economic impact of wait times. This is admittedly an imperfect solution; it is important to note that this approach seeks to measure and reduce the economic cost of wait times. This economic cost is obviously related to but not the same as the human suffering due to wait times. This is why the CMA's ultimate goal is to eliminate wait times altogether.

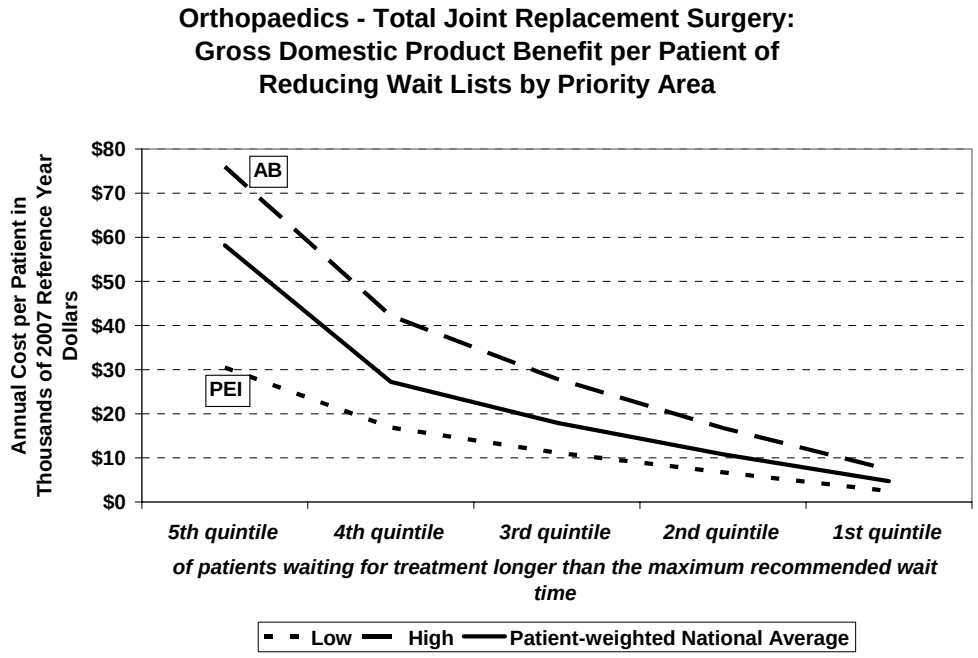
Figure 17 through Figure 20 provide a summary of the benefit curves for each priority area[17]. Each point on the curve in these charts represents the wait time costs associated with that proportion of patients (with wait times in excess of the recommended maximum) waiting the longest for treatment. For example, the 20% of patients waiting the longest for joint replacement surgery (the fifth quintile) impose costs on the economy of just over $58 200 per patient on average. These costs vary by province, from a high of $76 000 in Alberta to a low of $30 400 in Prince Edward Island. Providing treatment within the maximum recommended wait time for these patients would yield economic benefits equal to these costs. These benefits fall as patients with shorter wait times are treated. The 20% of patients waiting the shortest time beyond the maximum recommended wait time for joint replacement (the first quintile) impose costs on the economy of $4700 per patient on average.

The slopes of the curves differ by priority area. The patient-weighted national average benefit curves for cataract surgery, CABG surgery and MRI exams are all steeper than the curve for total joint replacement surgery. This relationship may not hold true for the benefit curves of all provinces. However, the priority area with the largest absolute differences in benefit curves across provinces is total joint replacement surgery.

In summary, this report provides valuable tools to help policy-makers use cost-benefit analysis to figure out the most economically efficient way to use public resources to reduce wait times. Policy-makers understand that reducing wait lists requires a real commitment in terms of resources. But this investment in health care yields dividends. For example, if an additional patient in Alberta can receive hip or knee replacement surgery at a cost of less than $76 000, cataract surgery at a cost of less than $13 200, or CABG surgery at a cost of less than $86 400, then Alberta will be better off providing treatment for that patient than leaving the patient on the wait list.

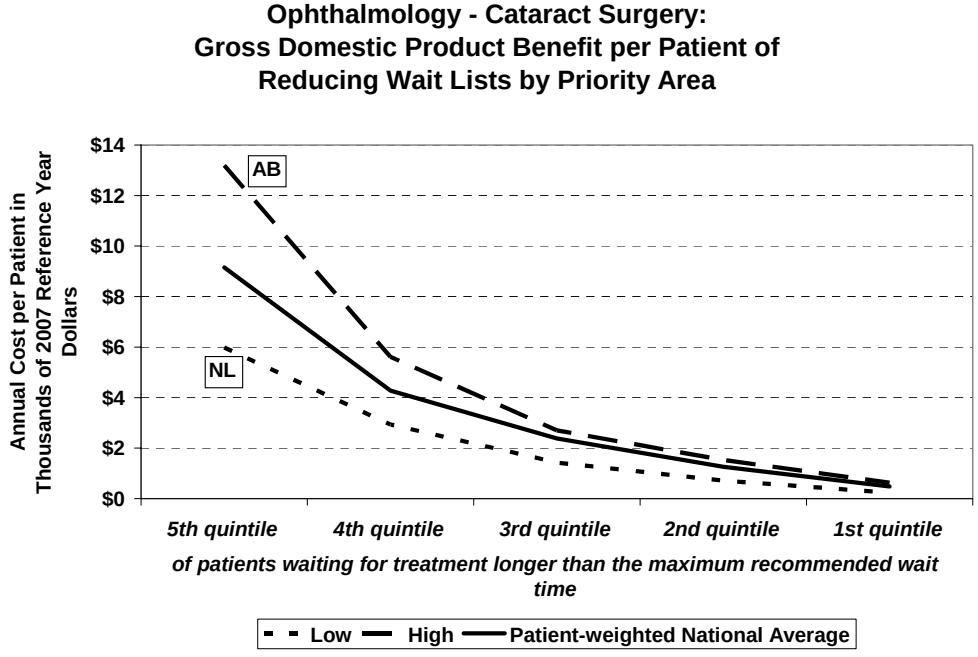
[17] Charts showing the benefit curves for each priority area by province can be found in Appendix A.

Figure 17



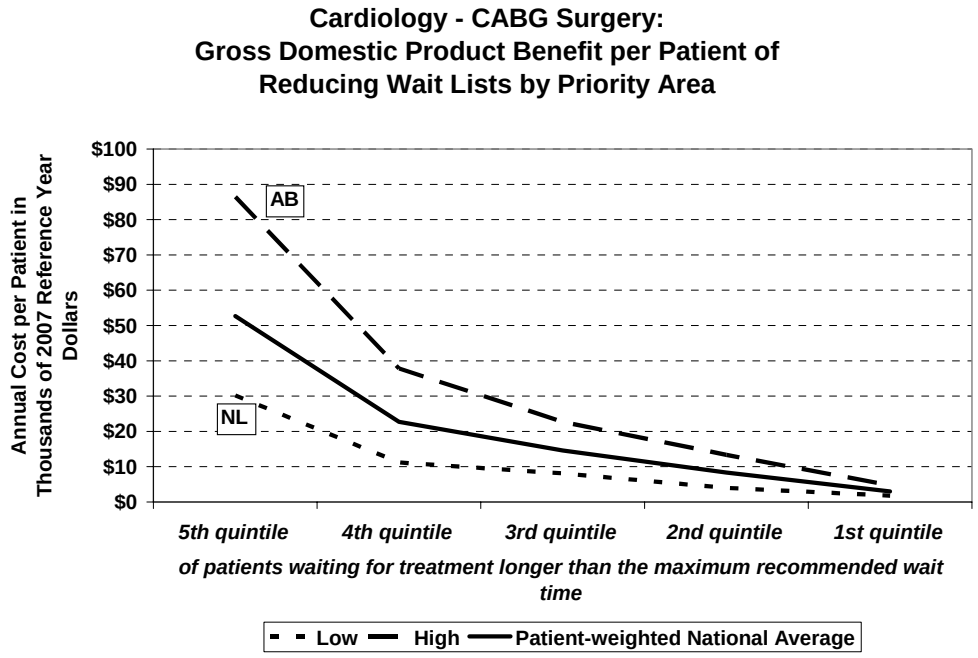
Source: The Centre for Spatial Economics

Figure 18



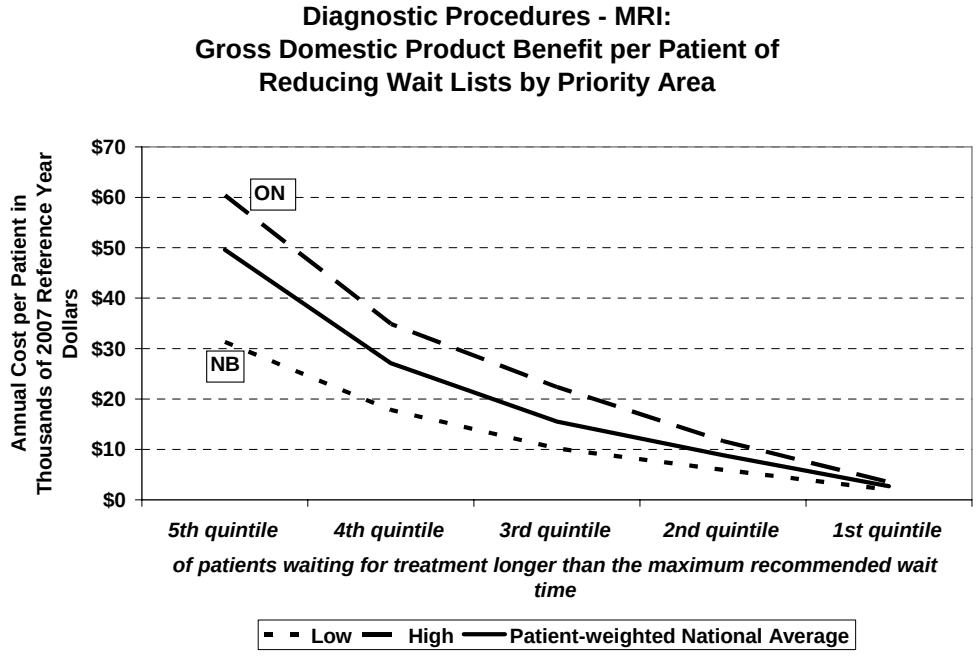
Source: The Centre for Spatial Economics

Figure 19



Source: The Centre for Spatial Economics

Figure 20



Source: The Centre for Spatial Economics

6. Conclusions and suggestions for further research

This report updates a 2006 study that was the first to attempt to determine the economic cost of waiting for treatment. It is hoped that this analysis will stimulate discussion on this issue, which will, with little doubt, yield useful information and insight into the appropriateness of the data sources and assumptions used.

The focus of most statistics and research on wait times has been on the experience of the median patient. While information on median wait times is useful, the true cost of waiting is borne by those patients waiting for treatment longer than the maximum recommended period. The economic costs developed using the approach in this study take this fact into account. From a health care policy perspective, these are the relevant costs for use in cost-benefit analysis.

Although a variety of factors contribute to the economic cost measures developed in this study, the interaction of two of these factors dominate the results. The first is the average wait times for patients waiting longer than the recommended maximum period for treatment. This factor determines which province is likely to experience the highest cost for a given priority area. It is directly affected by the recommended maximum period chosen. The second factor is the proportion of patients who need to discontinue their regular activities while waiting for treatment. This factor determines the overall economic costs of waiting for treatment. The highest economic costs are generated for total joint replacement surgery (an average of about $26 400 per patient), followed by MRI exams ($20 000) and CABG surgery ($19 400), with cataract surgery yielding the lowest costs ($2900).

Significant differences in costs exist among the provinces for joint replacement surgery, with Alberta's per patient cost exceeding $33 400, while Prince Edward Island's is just under $13 400. There are also significant differences in costs among the provinces for CABG surgery, ranging from just over $30 400 in Alberta to about $10 600 in Nova Scotia. The difference from top to bottom is less for MRI exams, where New Brunswick's average patient cost of $13 000 compares with Newfoundland and Labrador's $24 600. Wait time costs are low in all provinces for cataract surgery, ranging from a low of $1700 in Saskatchewan to a high of $3700 in Alberta. The economic costs in terms of GDP and government revenue show that no one province has either the highest or the lowest costs in all priority areas. Since the cost of waiting varies widely by province, wait time solutions will need to reflect provincial priorities.

In trying to measure the economic costs of waiting, this study also considered caregiver and health care system costs. Caregiver costs exceed patient costs for total joint replacement surgery, are about the same as patient costs for cataract surgery, and are just over a third of patient costs for CABG surgery. Health care system costs, on the other hand, provided a small offset to patient and caregiver costs because of the stimulative effect of the spending on health care goods and services. This offset should, however, be considered carefully because it represents public money that could have been used to reduce wait times rather than to support them.

Time spent waiting for treatment robs the economy of workers, both patients and caregivers. In this study, the cost of waiting — or the cost of time — is measured by the cost of labour. Labour is an increasingly scarce resource in Canada, with labour shortages evident in many occupations and regions across the country; as a result, its cost is correspondingly high. The cumulative

economic cost of waiting for treatment across these 4 priority areas in 2007 was an estimated $14.8 billion, which in turn lowered federal and provincial government revenues by $4.4 billion.

These estimates are, however, just the tip of the iceberg. There are about 6000 patient-doctor categories, with wait times for medical appointments, diagnostic testing, specialist visits and treatment. Wait times for emergency, paediatric, psychiatric and at-home care are all of concern to Canadians. The total economic cost of waiting for medical care is clearly large by any standards. The health and timely treatment of Canadians should, therefore, be considered a key component of our economic strategy and of critical importance to our future prosperity.

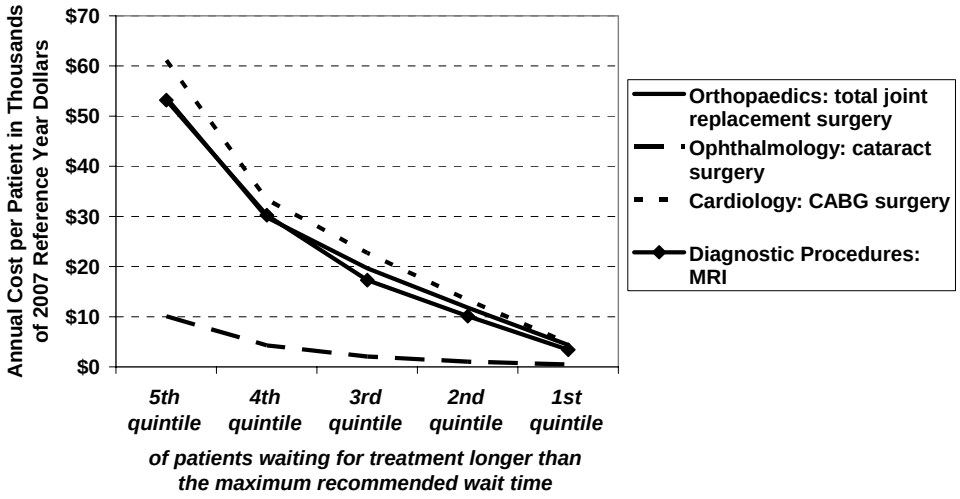
There are several natural extensions to this analysis that health care policy-makers and advocates may want to consider:

- The cost of reducing wait times for these priority areas could be studied. Combined with the information about the cost of wait times in this study, understanding how much it would cost to reduce those wait times would permit valid cost-benefit analysis to support the case for additional funding of identified priority areas.
- The analysis in this study could be expanded to cover other medical conditions.
- Similar analysis could be conducted for other aspects of the patient wait time experience such as waiting to see a specialist or waiting to see a family doctor.
- A study could be conducted — preferably in conjunction with a cost-benefit analysis — to review the impact on patient demand for medical services if wait times are reduced or eliminated.

The physician-members of the CMA are concerned about lengthy wait times. The 2005 Supreme Court decision in favour of Dr. Chaoulli and Mr. Zeliotis suggests that physicians' concerns — voiced repeatedly over many years — are well founded and that patients' legitimate medical needs have not been met. While physicians have drawn attention to the health impact of excessive waits for care, this study attempts to determine the economic impact of these waits. These costs remain significant for patients, government treasuries and the economy, but evidence from the last 18 months shows that, with concerted effort by governments and health care professionals, solutions to the wait time problem exist. By making government policy-makers aware of the costs that these excessive waits entail, we hope this analysis will stimulate discussion on this issue and encourage action to address wait times throughout the health care system.

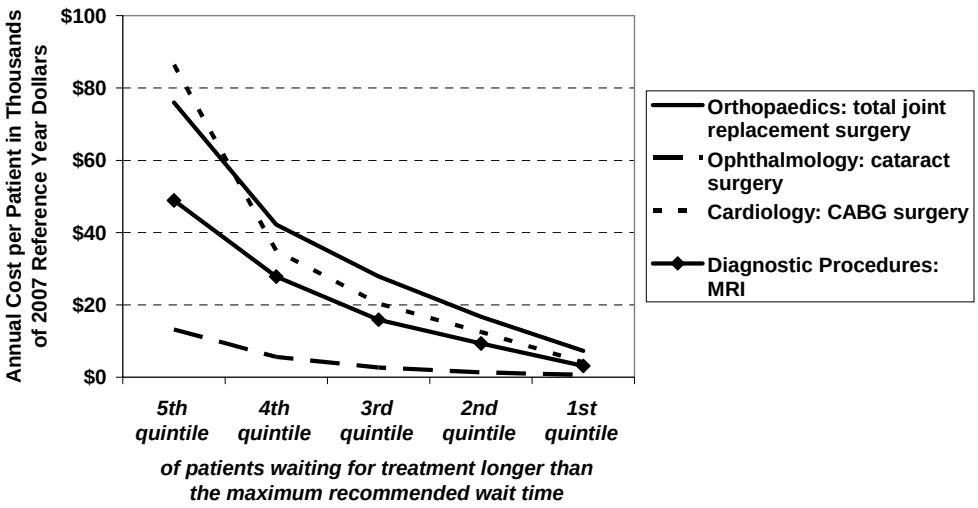
Appendix A: Provincial benefit curves

British Columbia:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



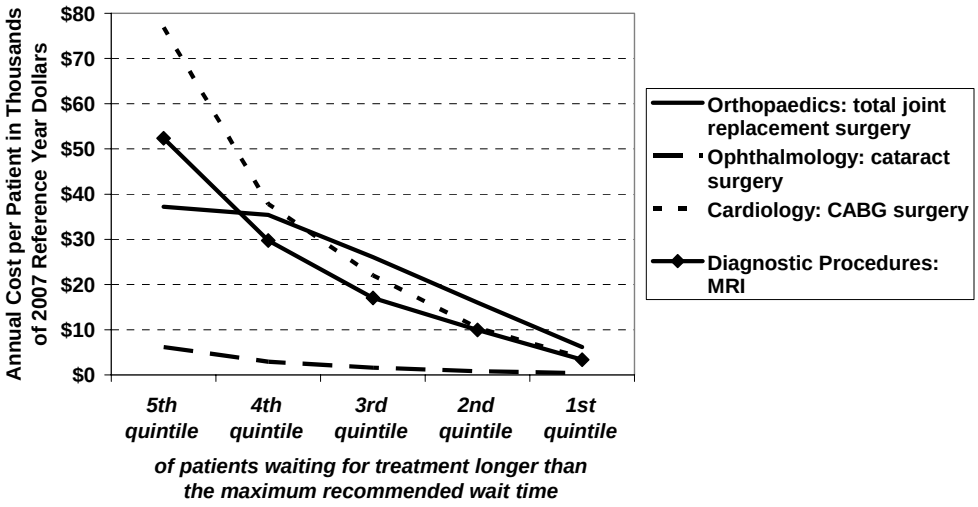
Source: The Centre for Spatial Economics

Alberta:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



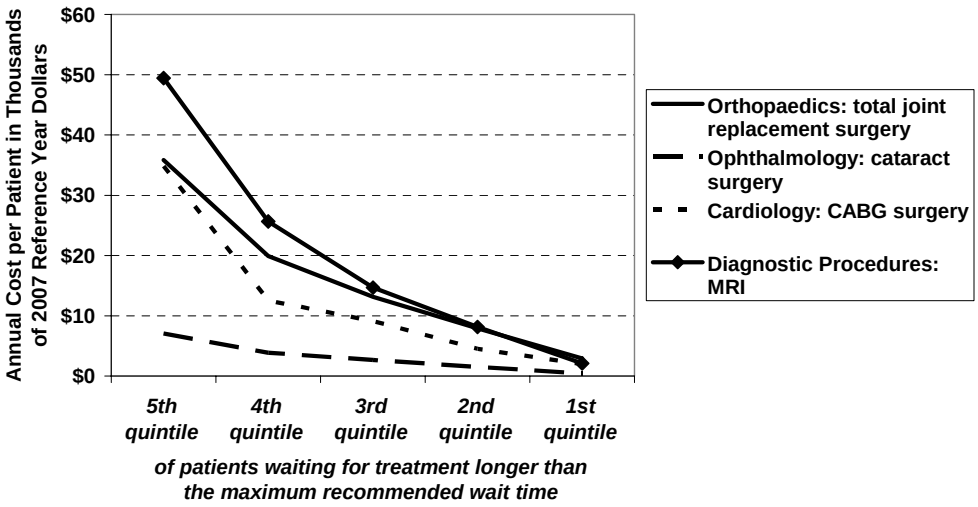
Source: The Centre for Spatial Economics

Saskatchewan:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



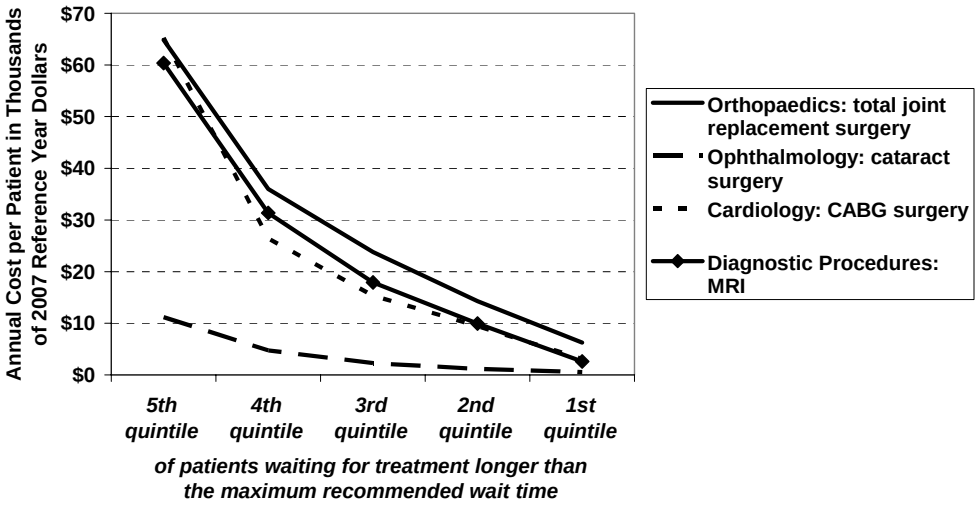
Source: The Centre for Spatial Economics

Manitoba:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



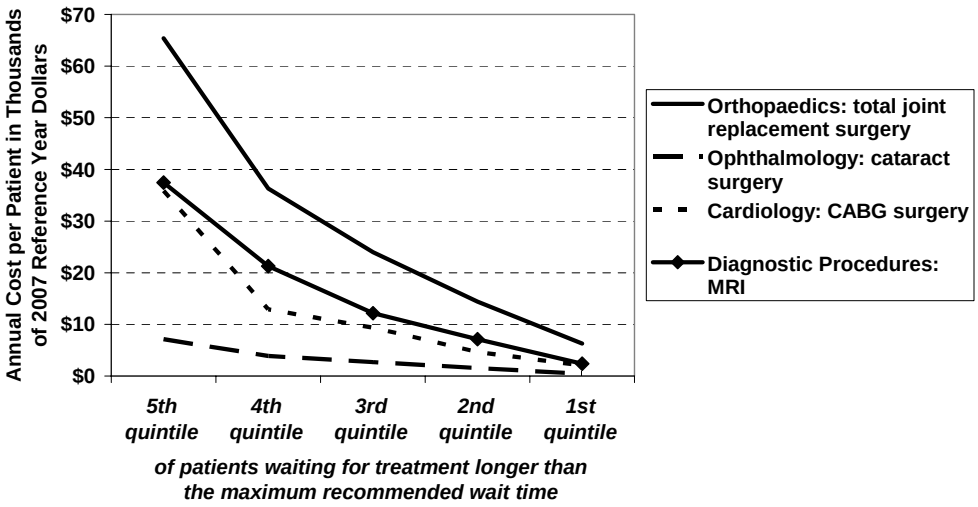
Source: The Centre for Spatial Economics

Ontario:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



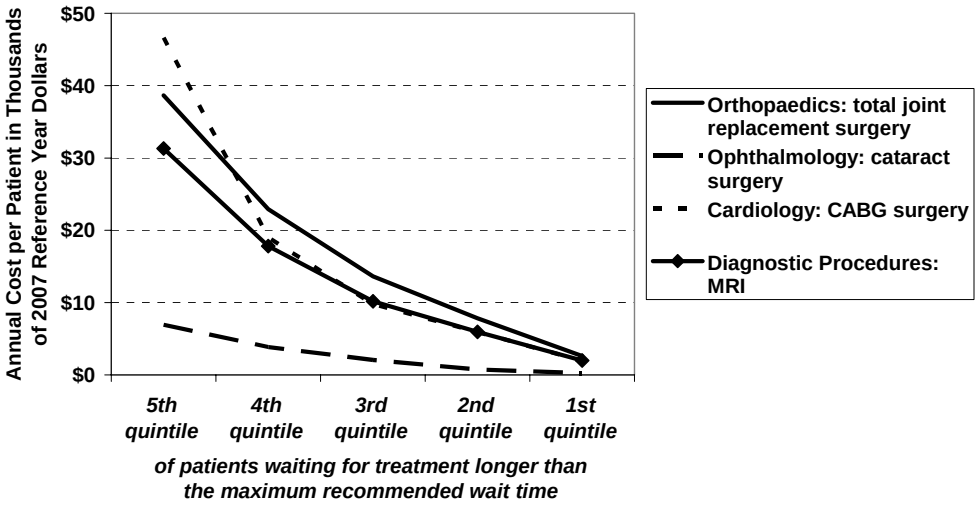
Source: The Centre for Spatial Economics

Quebec:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



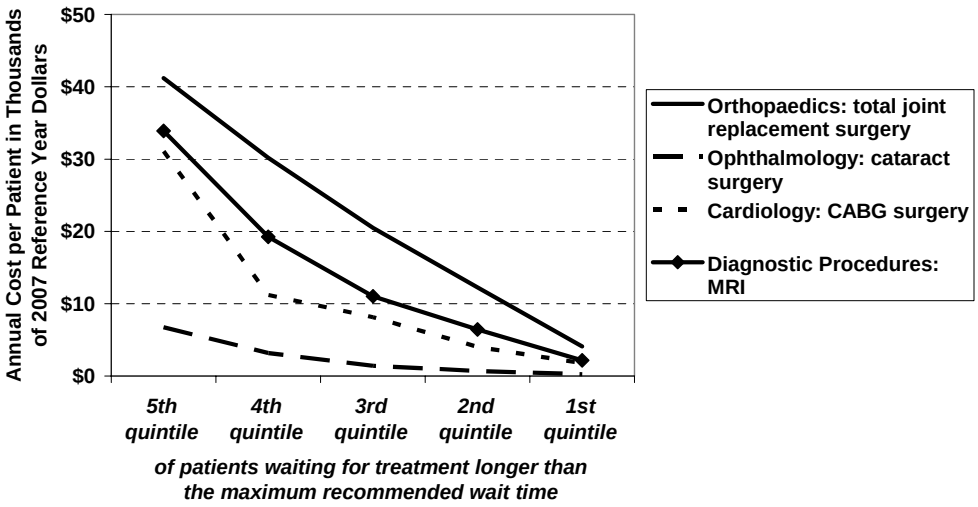
Source: The Centre for Spatial Economics

New Brunswick:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



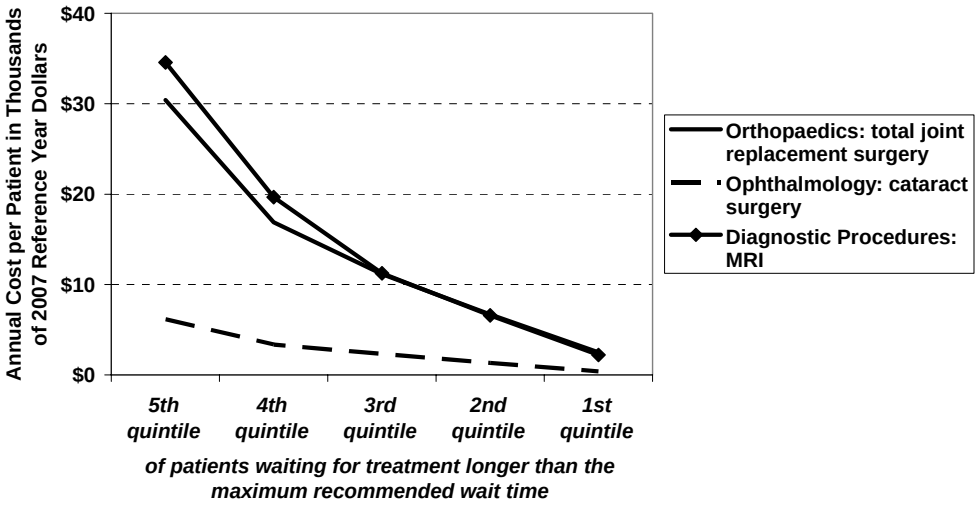
Source: The Centre for Spatial Economics

Nova Scotia:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



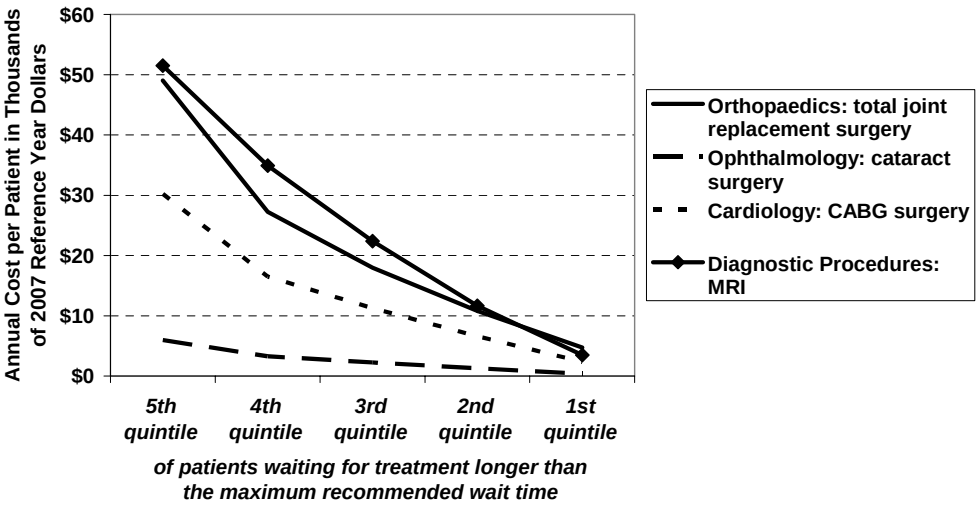
Source: The Centre for Spatial Economics

Prince Edward Island:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



Source: The Centre for Spatial Economics

Newfoundland and Labrador:
Gross Domestic Product Benefit per Patient of Reducing Wait Lists by Priority Area



Source: The Centre for Spatial Economics

Appendix B: Wait Time Costs by Province

Total Impact in Millions of 2007 Reference Year Dollars											
Gross Domestic Product	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	88	68	26	18	193	57	10	12	2	3	479
Ophthalmology: cataract surgery	35	36	8	16	109	98	8	6	1	3	317
Cardiology: CABG surgery	57	22	5	6	70	37	3	4		5	204
Diagnostic Procedures: MRI	1,539	2,345	318	325	5,903	2,673	241	285	29	119	13,817
Combined Costs Across Priority Areas	*1,719*	*2,471*	*358*	*365*	*6,275*	*2,864*	*263*	*307*	*31*	*130*	*14,817*
Federal Government Revenues	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	13	11	4	3	33	9	2	2	0	0	76
Ophthalmology: cataract surgery	5	6	1	2	18	17	1	1	0	0	54
Cardiology: CABG surgery	9	4	1	1	13	7	1	1		1	37
Diagnostic Procedures: MRI	206	341	40	43	930	396	37	34	5	13	2,045
Combined Costs Across Priority Areas	*233*	*363*	*45*	*49*	*994*	*429*	*41*	*37*	*5*	*14*	*2,211*
Provincial Government Revenues	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	13	8	4	3	26	11	2	2	0	1	71
Ophthalmology: cataract surgery	5	4	1	3	14	21	2	1	0	0	52
Cardiology: CABG surgery	9	3	1	1	10	8	1	1		1	34
Diagnostic Procedures: MRI	233	233	49	52	803	539	52	43	5	17	2,025
Combined Costs Across Priority Areas	*260*	*247*	*55*	*59*	*853*	*580*	*57*	*47*	*5*	*19*	*2,182*

Source: The Centre for Spatial Economics

Appendix C: C_4SE Provincial Modeling System

The C_4SE's Provincial Modeling System is a dynamic multi-sector regional economic model of the country. It includes a bottom-up set of macroeconomic models for the provinces, the territories and the rest of the world. The national model links economic activity in one region with activity in the other regions through trade. The model includes detailed income and expenditure categories and demographic and labour market information. The purpose of the model is to produce medium- to long-term projections of the provincial economies and conduct simulation studies that require industry and demographic detail.

This modeling system consists of a set of provincial and territorial macroeconomic models that are linked through trade, financial markets and inter-provincial migration. The impact on the supply chain — in terms of output and employment — is fully captured by the multi-sector model, which incorporates the purchasing patterns from the current input-output tables. But, in contrast to an input-output model, a dynamic macroeconomic model also considers the impact on supplier's investment decisions that occur as a result of the change in economic activity.

The model produces impacts on employment, labour income, value added output, productivity, investment and exports for at least fourteen industry sectors (see list below). It also produces the impacts on government revenue by level of government and source of revenue. The dynamic nature of the model, however, makes it more challenging to develop a single summary measure that provides a "rule-of-thumb" result. The need for such a measure is satisfied by generating an average impact over the first 15 years of the simulation.

C_4SE Model — Industry Sectors

Agriculture	Finance, insurance & real estate
Other primary (detail varies by province)	Professional, scientific & management services
Manufacturing (detail varies by province)	Accommodation & rood
Construction	Health services
Utilities	Other services
Transportation & warehousing	Education services
Trade	Government services

The following sections provide more information on the structure of the individual provincial models and the national model that unites the provincial and territorial models.

Provincial models

The provincial and territorial models are similar in structure, although the parameters in each model differ to reflect differences in the economic experience of each region.

The provincial models are similar in nature to a general equilibrium model, but full product and factor substitution is not implemented. At present, substitution is restricted to the energy products and value-added. For purposes of manageability, the model does not consider the impacts of changes in relative labour and capital costs across industry categories. There is only one wage rate and one set of cost of capital measures — construction and equipment — in the model. Changes in these measures of labour and capital costs cause labour and capital intensities to change across all sectors of the economy.

The model's economy is organized into 4 broad sectors. Firms employ capital and labour to produce a profit-maximizing output under a Cobb-Douglas constant-returns-to-scale technology. Households consume domestic and foreign products and supply labour under the assumption of

utility maximization. Governments purchase domestic and foreign products and produce output. Foreigners purchase the domestic product and supply foreign products.

There are 2 main markets in the model. These markets correspond to the domestic and foreign products and the labour market. Each of these markets is concerned with the determination of demands, supplies and prices. Like most sub-national models, the Ontario model assumes that most prices are set in national markets. The presence of the national model in the system means that interest rates, exchange rates and the prices of some goods and services are affected by changes in economic activity in Ontario and the rest of the country.

In sub-national economies, the movement of labour is a key factor in the adjustment of the local economy to changes in economic conditions. The C_4SE's model allows net migration — and therefore the total population — to adjust over time to reflect changes in economic conditions. If the economy and employment are growing, then the demand for labour rises and net migration rises. This feature is an important consideration when examining economic impacts over one or more decades.

National Model

The presence of the national model is what makes the C_4SE's system unique. The national block adds up the economic activity across the country and uses this information to help determine prices, interest rates, exchange rates and the rest-of-country external demand for goods and services — all factors that are exogenous to other provincial modeling systems.

To see why this is important, consider an increase in one province's economy. This raises that province's demand for imports. In this system, each of the other provinces sees an increase in demand for their exports to that province, which, in turn, raises their own economies. The increase in economic activity will put upward pressure prices, interest rates and the exchange rate. The entire national economy, therefore, adjusts over time to the initial shock.

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Government and government-agency-maintained Web sites on wait lists and related information

Canadian Institute for Health Information
http://qstat.cihi.ca

British Columbia Ministry of Health
http://www.healthservices.gov.bc.ca/cpa/mediasite/access_waittimes.html

Alberta Ministry of Health and Wellness
http://www.ahw.gov.ab.ca/waitlist/WaitListPublicHome.jsp

Saskatchewan Surgical Care Network
http://www.sasksurgery.ca

Manitoba Health
http://www.gov.mb.ca/health/waitlist/index.html

Ontario Ministry of Health and Long-Term Care
http://www.health.gov.on.ca/transformation/wait_times/wait_mn.html

Quebec Ministry of Health and Social Services
http://www.msss.gouv.qc.ca/en/sujets/organisation/waiting_lists.html

New Brunswick Surgical Care Network
http://www.gnb.ca/0217/NBSCN-RSCNB/index-e.asp

Nova Scotia Department of Health
http://www.gov.ns.ca/health/waittimes

Government of Prince Edward Island
http://www.gov.pe.ca/photos/original/WaitTimes.pdf

Newfoundland and Labrador Department of Health and Community Services
http://www.releases.gov.nl.ca/releases/2007/hcs_n2007.html