

## **The Centre for Spatial Economics**

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

# **The Economic Cost of Wait Times in Canada**

---

*Prepared for:*

**British Columbia Medical Association**

1665 West Broadway, Suite 115

Vancouver, BC, V6J 5A4

**Canadian Medical Association**

1867 Alta Vista Drive

Ottawa, ON, K1G 3Y6

*Prepared by:*

**The Centre for Spatial Economics**

15 Martin Street, Suite 203

Milton, ON L9T 2R1

**June 2006**

## Abstract

This study is the first in Canada to examine the economic costs associated with excessive wait times in Canada's medical system. Previous studies have examined the overall cost of wait lists which have had limited value in determining the appropriate level of health care services. 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 by successful health care policy initiatives to eliminate these wait times. A key feature of this analysis is that these estimates, when combined with information on the cost of providing the health care services required to reduce or eliminate wait times, can be used in cost-benefit analysis to help determine an appropriate level of health care services.

Of the four priority areas reviewed in this study, the highest economic costs are generated for total joint replacement surgery (an average of over \$10,000 per patient), followed by CABG surgery (\$8,200) and MRIs (\$3,800) with cataract surgery yielding the lowest costs (\$1,500). Whilst 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 British Columbia Medical Association (BCMA) and the Canadian Medical Association (CMA) to provide analysis of the economic costs of wait times in Canada's medical system. The BCMA is a voluntary association of British Columbia's medical doctors, and its role is to advance the practice and science of medicine and the health of British Columbians by working for the improvement of medical education, health care legislation, hospital and other health services. The CMA's membership includes more than 60,000 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<sub>4</sub>SE). The C<sub>4</sub>SE 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.



# Table of Contents

<b>EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>INTRODUCTION .....</b>	<b>5</b>
<b>ECONOMICS AND WAIT LISTS.....</b>	<b>7</b>
Determining Optimal Wait Times.....	7
Empirical Research .....	8
<b>WAIT TIMES.....</b>	<b>12</b>
The Wait Time Clock .....	12
Maximum Recommended Wait Times .....	13
Median Treatment Wait Times .....	15
Excess Wait Times.....	16
Morbidity Rates.....	18
The Queue .....	20
<b>METHODOLOGY .....</b>	<b>22</b>
Patient Costs .....	22
Caregiver Costs.....	25
Health Care System Costs.....	26
C <sub>4</sub> SE Provincial Modeling System .....	30
Critical Assumptions .....	30
<b>COST OF WAITING .....</b>	<b>32</b>
Economic Cost Measures .....	32
Impact on GDP .....	33
Impact on Government Revenue.....	36
Wait Time Cost Curves.....	39
<b>CONCLUSIONS AND SUGGESTIONS FOR FURTHER RESEARCH.....</b>	<b>42</b>
<b>APPENDIX: C<sub>4</sub>SE PROVINCIAL MODELING SYSTEM.....</b>	<b>44</b>
<b>REFERENCES .....</b>	<b>46</b>



## Executive Summary

The wait times experienced by patients having 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 appropriate level of health care services. In response, the British Columbia Medical Association and the Canadian Medical Association commissioned this study 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 five priority areas identified in the 2004 First Ministers Health Accord were selected for analysis: 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 the provinces of British Columbia, Alberta, Saskatchewan, and Ontario. Table 1 shows that the highest economic costs are generated for total joint replacement surgery (an average of over \$10,000 per patient), followed by CABG surgery (\$8,200) and MRIs (\$3,800) with cataract surgery yielding the lowest costs (\$1,500). Whilst 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 four provinces in 2006 is estimated to be just over \$1.8 billion. This reduction in economic activity lowers federal and provincial government revenues in 2006 by \$500 million.

Table 1

<b>Impact on Gross Domestic Product</b>				
<i>2005 Reference Year Dollars per Patient</i>				
<b>Total Costs</b>	<b>Costs per patient with excess waits</b>			
	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Total joint replacement surgery</b>	10,864	12,442	11,607	9,333
<b>Cataract surgery</b>	1,017	3,043	1,880	729
<b>Coronary artery bypass graft surgery</b>	10,238	8,700	6,066	7,634
<b>MRI Scan</b>	5,065	5,021	8,955	2,441

Our analysis is a conservative one. It only addresses the wait time from when the specialist decides upon and requests a course of treatment to the time that treatment occurs. This ignores, the admittedly important, wait times experienced by patients in getting to see the specialist or even in getting to see their family doctor. Moreover, it has only examined the costs associated with waiting for treatment – it does not assess the costs involved in actually achieving reductions in wait times. This latter analysis is required for a comprehensive review of the costs and benefits associated with achieving shorter wait times for treatment.

### Calculating Excess Waits

Provincial governments and other organizations provide some information on the wait time for treatment experienced by the median patient in their province or region for a number of different medical conditions. We used this information to report and calculate, for each of the four procedures in the four provinces under study, the following:

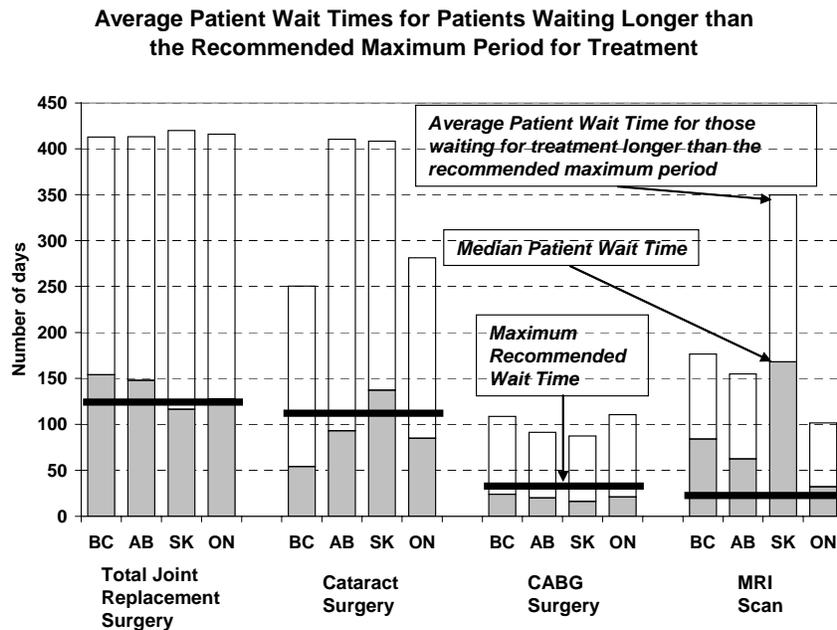
- 1) The median patient wait time (shown as the shaded bars in Figure 1).



- 2) The average excess wait time, i.e., the time spent waiting for treatment by the average patient who has to wait for longer than the maximum recommended period for treatment (shown as the clear bars in Figure 1).

We then compared this information to the wait time benchmarks developed by the Wait Time Alliance. These benchmarks represent the maximum medically reasonable wait time for treatment (shown as the bold lines in Figure 1). This comparison reveals that the median patient generally receives treatment at or before the maximum recommended wait time limit is reached. However, because the median patient is, by definition, the patient in the middle of the distribution, this means that roughly one-half of patients are *not* receiving care in a timely fashion. In addition, among those patients who must wait longer than medically necessary, average waits are quite long: over a year for hip and knee replacement surgery in all four provinces and over a year for cataract surgery in Alberta and Saskatchewan. For cardiac patients not treated within the maximum recommended period, the average wait for coronary artery bypass (CABG) surgery is over three months or about three times the maximum recommended wait. The situation for patients requiring an MRI is particularly grave. The maximum recommended wait is 25 days, but is nearly a year for the average patient in Saskatchewan who does not get their scan within that maximum recommended period.

Figure 1



### Calculating the Economic Cost of Waiting

Three types of costs are considered in this study: patient costs, caregiver costs, and medical system costs. These costs are estimated for each province and priority area.

- **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.
- **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 above, 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.
  - **Health Care System Costs** include the additional costs to the health care system from patients having to attend medical appointments, submit to tests and procedures, and take 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 largely influenced by the length of time spent waiting for patients with wait times that exceed the maximum recommended (see Figure 1) and whether the patient is able to continue their regular activities while waiting for care. The low proportion of patients that need to discontinue 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 that must discontinue 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

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 into account. From a health care policy perspective, these are the relevant costs for use in cost-benefit analysis.

Our study found that no one province has either the highest or the lowest costs in all priority areas. Per-patient costs range from a high of \$11,607 for total joint replacement surgery in Saskatchewan to a low of \$729 for cataract surgery in Ontario. Policy solutions to the wait time problem will need to reflect provincial variations and priorities.

Reducing wait times requires a real commitment in terms of resources. To clarify the tradeoffs involved, this study has developed wait time cost curves for each priority area and province. These cost curves, which represent the economic costs associated with the length of time patients spend waiting for treatment, show that the per-patient costs of waiting are highest for those waiting longest for treatment. Reducing wait times for these patients will, therefore, result in the greatest savings. These wait time cost curves could be combined with cost curves for providing health care services within the maximum recommended period for each province and priority area. The cost of providing treatment should rise, on a per patient basis, with the number of patients treated. From an economic policy perspective, the efficient level of health care should be determined by the point at which the costs of providing treatment equal the benefits from reducing wait times.

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

- 
- Conduct a study to estimate the cost of reducing wait times for these priority areas that, when combined with the information from this study, will 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 the other provinces and/or 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 should 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 BCMA and the CMA are concerned by lengthy wait times. The recent Supreme Court decision in favour of Dr. Chaoulli and Mr. Zelliotis suggests that physicians' concerns—voiced repeatedly over many years—are well-founded and patients' legitimate medical needs are not being met. While physicians have drawn attention to the *health* impact of excessive waits for care, this study is the first to attempt to determine the *economic* impact of these waits. By making government policy makers aware of the costs that these excessive waits entail, we hope that this analysis will stimulate discussion on this issue.



## 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. This issue has come to national prominence with physicians and patients demanding change and federal and provincial politicians promising solutions.

This study is the first in Canada to examine the economic costs associated with excessive wait times in Canada's medical system. It differs from others that have examined the overall cost of wait lists in that its focus is on the cost of 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 by successful health care policy initiatives to eliminate these wait times.

The collection of data on wait times by province and procedure was a very 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 with "excess wait times," this information was then put into the C<sub>4</sub>SE's dynamic multi-sector provincial economic model to produce analysis of 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.

### Priority Health Care Sectors

The research in this study focuses on four of the "priority" areas identified in the 10-year Plan to Strengthen Health Care (2004)<sup>1</sup>:

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

The costs of waiting for treatment in each of these areas are provided for the provinces of British Columbia, Alberta, Saskatchewan and Ontario. These four provinces account for about 65% of Canada's population. Analysis of the remaining priority areas and for other provinces was excluded to limit the scope of the work.

The scope of the study is limited in several respects. First, it only examines wait lists in British Columbia, Alberta, Saskatchewan and Ontario. Second, it only addresses wait lists for hip and knee replacements, cataract surgery, cardiac artery bypass graft surgery, and MRI scans. Finally, it only examines the costs associated with waiting for treatment – it does not assess the costs involved in actually achieving reductions in wait times. This latter analysis is required for a comprehensive review of the costs and benefits associated with achieving shorter wait times for treatment.

---

<sup>1</sup> Available at [www.parl.gc.ca/38/1/parlbus/chambus/house/bills/summaries/c39-e.pdf](http://www.parl.gc.ca/38/1/parlbus/chambus/house/bills/summaries/c39-e.pdf).

The next section discusses the reasons – from an economist’s perspective – why wait lists for medical treatment are so prevalent. The third section reviews statistics on wait times for the four provinces and the priority areas covered by the study. The fourth section of the report describes the methodology taken to estimate the cost of waiting and the following section discusses the results of that analysis. The report concludes with some thoughts about the findings and suggestions for further research on this topic.



---

## Economics and Wait Lists

This chapter briefly reviews the economic reasons for wait lists, definitions of what an optimal wait time might be, the costs and benefits of waiting, and reviews some estimates from the economic literature of the cost of waiting for health care.

### Determining Optimal Wait Times

How long should people wait for service? The answer to this question would require 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? This estimation is necessary because 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?

While this analysis sounds straightforward, it is complicated by a lack of agreement on what is actually 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 – and the resulting impacts on the resources available to the economy as a whole and the efficiency of the resulting 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 ability of the individual 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 could 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 are 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 are in terms of both higher spending and lower revenues. Government expenditures, excluding health, are increased as unemployment rises and increased transfer payments to persons 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 waiting for treatment, which increases demands on and costs for the health sector. These include additional visits to medical practitioners, additional drugs, and other additional cost associated with work required both before and after treatment.

### **Benefits of Waiting**

While the costs of waiting usually receive considerable attention, there are also benefits that accrue from wait lists. The primary benefit is that wait lists 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 is likely to 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: higher drug sales, higher sales of medical devices, increased provision of certain medical services. Finally, wait lists allow resources to be allocated to the rest of the economy that might otherwise be used to increase health care services.

### **Empirical Research**

To date, the majority of statistics and research on wait times have focused on the experience of the median patient<sup>2</sup>. Provincial government health ministries have recently started to 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 the Fraser Institute's survey which has, for the last fifteen years, published their "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 is based on the survey responses of medical practitioners and constitutes the most comprehensive set of information available on wait times across the country. Their most recent survey found that wait times for surgical and other therapeutic treatments fell slightly in 2005 – for the first time since 1993. As always, this picture becomes more complicated when examining the details. While wait times fell in British Columbia, Alberta and

---

<sup>2</sup> The median patient is the patient – who when ordered by length of wait – is the middle patient: waiting less than the 50% of patients with the longest waits and more than the 50% of patients with the shortest waits.

Saskatchewan they rose in Ontario. 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. Globerman (1991) viewed wait times as a period during which productive activity (either for pay or in the household) was potentially precluded. He used the Canadian average wage as an 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 \$2,900 in Canada in 1989.

Esmail (2005) used a similar approach to Globerman except that a 10% loss of productivity was assumed in place of the reduction due to “significant difficulties in carrying out their daily activities”. Using this approach, Esmail estimated the cost of waiting per patient to be nearly \$900 in 2004 if only hours during the normal working week were considered “lost,” and as much as \$2,700 if all hours of the week (minus 8 hours per night sleeping) were considered “lost.”

Several other approaches have also been tried. Cullis and 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 \$5,600 per patient. In an interesting experiment, 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 revealed wait time costs of about \$1,100 a 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 forgo for another hour’s leisure.

Table 2 updates Globerman’s analysis of wait time costs. It shows the estimated wait time costs by province and priority area for the time spent waiting to see a specialist and the time then spent waiting for treatment once the specialist has booked the procedure. The sum of these two costs represents the total wait time cost for patients<sup>3</sup> by province and priority area. The patient weighted average is calculated by using the number of patients in each priority area as weights when summing the median patient costs. Following Globerman, the wage costs were adjusted so that only those patients who report experiencing “significant difficulties in carrying out their daily activities” are included. Statistics Canada reports that the proportion of people in this situation is: 33.1% for those waiting to see a specialist, 34.5% for those waiting for diagnostic testing and 34.7% for those waiting for non-emergency surgery<sup>4</sup>.

---

<sup>3</sup> Although these costs still ignore patient wait times to see a GP and the wait times for diagnostic tests – and their results – required to determine a course of treatment. Figure 4 on page 13 provides an overview of wait times from the patient’s perspective.

<sup>4</sup> These proportions are down from the 41% used in Globerman’s 1991 study, which reported an average wait cost in Canada of \$2,900 in 1989. As a result, the average cost of waiting for treatment for the median patient is lower in 2005 at \$2,500 than it was in 1989.



Wait times are longest for joint replacement, so wait time costs are highest for this priority area ranging from \$14,000 in Alberta to \$7,000 in Saskatchewan. Wait times for CABG patients are shortest, so wait time costs range from \$1,397 in Saskatchewan to \$1,667 in Ontario. The four-province population weighted averages are \$3,200 for specialist wait times and \$2,519 for treatment wait for a combined cost of \$5,719. The highest patient weighted wait costs are in Saskatchewan with the lowest in British Columbia. It is interesting to note that, on average, wait costs to see a specialist exceed the wait cost experienced while waiting for treatment.

Table 2

<b>Wait Time Costs for the Median Patient</b>				
	<i>measured in 2005 dollars</i>			
	BC	AB	SK	ON
<b>Total Median Patient Wait Time Costs</b>				
Orthopaedics: total joint replacement (hip and knee)	\$9,893	\$14,256	\$7,294	\$8,934
Ophthalmology: sight restoration (cataract surgery)	\$4,074	\$6,490	\$6,889	\$7,541
Cardiac Surgery: coronary artery bypass graft (CABG)	\$1,670	\$1,479	\$1,397	\$1,677
Diagnostic Procedures: MRI	\$3,167	\$2,746	\$5,462	\$1,344
<b>Patient weighted average</b>	<b>\$5,044</b>	<b>\$6,122</b>	<b>\$7,243</b>	<b>\$5,722</b>
<b>Treatment Wait Time Costs for the Median Patient</b>				
Orthopaedics: total joint replacement (hip and knee)	\$5,841	\$6,560	\$3,800	\$5,408
Ophthalmology: sight restoration (cataract surgery)	\$2,048	\$4,122	\$4,487	\$3,591
Cardiac Surgery: coronary artery bypass graft (CABG)	\$910	\$887	\$523	\$887
Diagnostic Procedures: MRI	\$3,167	\$2,746	\$5,462	\$1,344
<b>Patient weighted average</b>	<b>\$2,862</b>	<b>\$3,126</b>	<b>\$4,815</b>	<b>\$2,063</b>
<b>Specialist Wait Time Costs for the Median Patient</b>				
Orthopaedics: total joint replacement (hip and knee)	\$4,052	\$7,696	\$3,494	\$3,526
Ophthalmology: sight restoration (cataract surgery)	\$2,026	\$2,368	\$2,402	\$3,949
Cardiac Surgery: coronary artery	\$760	\$592	\$873	\$790
<b>Patient weighted average</b>	<b>\$2,181</b>	<b>\$2,996</b>	<b>\$2,428</b>	<b>\$3,659</b>

Its theoretical basis and ease of calculation<sup>5</sup> make this approach popular among researchers. While the estimates of cost generated using this approach 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. So the costs determined by the median patient 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.

<sup>5</sup> The wait time cost for the median patient is simply the amount of time spent waiting by the median patient multiplied by average labour income and the proportion of patients reporting significant difficulties in carrying out their daily activities. The calculations are also affected by variations in the average provincial wage which vary from \$34 thousand a year in Saskatchewan to \$47 thousand a year in Alberta.





## Wait Times

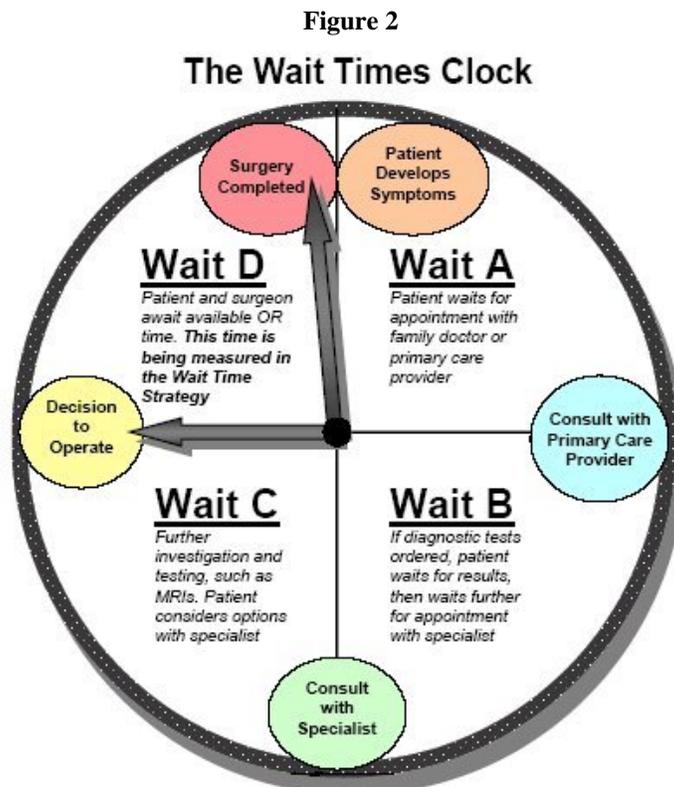
This section reviews the data and assumptions regarding wait times by province and priority area. This information is used to determine the patient and caregiver impact on the labour force and health care costs associated with waiting.

### The Wait Time Clock

Before continuing, it is worth reviewing some of the definitions of wait lists and wait times<sup>6</sup>.

#### 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.



Source: [http://www.health.gov.on.ca/transformation/wait\\_times/wt\\_understanding.html](http://www.health.gov.on.ca/transformation/wait_times/wt_understanding.html)

#### 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.

<sup>6</sup> The information in this section is drawn from the Ontario government's Ministry of Health Internet web site at <http://www.health.gov.on.ca>.



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 times clock in Figure 2 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. Increasing demand may come from a variety of sources such as an aging population that relies more on health care or from 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. 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 a variety of factors such as:

- 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.

### **Treatment Wait Times**

This study examines the economic cost associated with the wait after a specialist has decided upon and booked a treatment to the time that treatment is provided, which 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 cost fell outside the scope of this research.

## **Maximum Recommended Wait Times**

The first section of this report discussed the difficulty of deciding what is an optimal wait time. Various groups have proposed maximum wait times for each of the priority areas. Each group has used its own criteria in determining a maximum acceptable time. And differences in these criteria can lead to large differences in what is considered acceptable. Table 3 provides a summary of wait time recommendations from the Health Ministers, the Western Canada Wait List, the Wait Time Alliance, the Canadian Institute for Health Research, and the Fraser Institute.



Table 3<sup>7</sup>

Condition or procedure	Maximum Recommended Wait Time				
	Health Minister Benchmarks (1)	Western Canada Wait List (2)	Wait Time Alliance (3)	Canadian Institute for Health Research	Fraser Institute (5)
Hip and knee replacement	26 weeks	Urgency I (least urgent) : 20 weeks  Urgency II: 12 weeks  Urgency III (most urgent): 4 weeks	Scheduled Cases : Consultation 3 months, Treatment within 6 months of consultation Urgent Cases: Priority 1 within 30 days, Priority 2 within 90 days Emergency Cases: Immediate to 24 h	6 months	12 weeks
Coronary Artery Bypass Graft (*)	Level I: within 2 weeks Level II: within 6 weeks Level III: within 26 weeks	x	Scheduled Cases : Within 6 weeks Urgent Cases: Within 14 days Emergency Cases: Immediate to 48 h	x	Elective Cases: Within 6.1 weeks Urgent Cases: Within 6 days Emergent Cases: Immediate to 24 h
Cataract removal	16 weeks	Urgency I: 12 weeks Urgency II: 8 weeks Urgency III: 4 weeks	Within 16 weeks of consultation	6 months	9 weeks
MRI Scans	x	x	Scheduled Cases : Within 30 days Urgent Cases: Within 7 days Emergency Cases: Immediate to 24 h	x	x

The Health Ministers published a set of benchmarks for care in December 2005. Their standards are comparable to those published by the Canadian Institute for Health Research and both – in general – provide a high-end estimate for acceptable wait times in Canada. The Western Canada Wait List and the Wait Time Alliance wait time benchmarks are similar for hip and knee replacements but differ for cataract removal. The Fraser Institute benchmarks are from their annual wait time survey and are meant to represent a clinically reasonable wait time period.

The impacts in this study are based on the maximum recommended wait times published by the Wait Times Alliance. The Wait Time Alliance was the only organization that published a

<sup>7</sup> (\*) Listed as Cardiac Bypass Surgery.

(1) Health Minister Benchmarks: December 2005, p.15.

(2) Western Canada Wait List Maximum Acceptable Waiting Times, p.11.

(3) Summary of Wait-Time Benchmarks by Priority Level, adapted from *It's About Time! Achieving Benchmarks and Best Practices in Wait Time Management*, Wait Time Alliance, August 2005 Final Report, p.13.

(4) Canadian Institute for Health Research (CIHR): Benchmarks, p.14.

(5) Adapted from the Fraser Institute *Waiting Your Turn, Critical Issues Bulletin (2005)*, p.58 as the four-province average for British Columbia, Alberta, Saskatchewan, and Ontario.



maximum recommended wait time for each condition or procedure considered in this study. The maximum recommended wait times used are a weighted average of scheduled and urgent cases. Emergency cases are excluded from this analysis. 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 data and assumptions used in this study, these have the largest impact on the results. Choosing different wait times standards will have a direct impact on the results of this analysis.

Table 4<sup>8</sup>

<b>Maximum Recommended Treatment Wait</b> <i>maximum recommended wait for treatment after appointment with specialist (in days)</i>	
<b>Orthopaedics: total joint replacement (hip and knee)</b>	124
<b>Ophthalmology: sight restoration (cataract surgery)</b>	112
<b>Cardiac Surgery: coronary artery bypass graft (CABG)</b>	33
<b>Diagnostic Procedures: MRI</b>	25

## Median Treatment Wait Times

Median wait times for treatment represent the amount of time the patient at the 50<sup>th</sup> percentile spent waiting for treatment after their 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 for treatment). Median wait times for treatment are reported in Table 5 for each priority area and province.

Wait times for the median patient are, in general, longest for hip and knee replacement, next for cataract surgery and MRIs, and shortest for CABG surgery. Provincial variation in wait times is high. The four-province mean for cataract surgery median wait times is 92 days with a standard deviation of nearly 30 days. The disparity in wait times for an MRI is even higher with a four-province mean of 87 days and a standard deviation of 50 days. There is considerably greater parity in care for cardiac patients with a four-province mean wait of 20 days and a standard deviation of 3 days.

<sup>8</sup> The following assumptions were employed to derive the maximum recommended wait times for each priority area shown in Table 3. These were based on the Wait Time Alliance's recommendations and the following assumptions for the distribution of patients by urgency of care.

- Joint Replacement Surgery: 50% of patients require treatment within 6 months, 30% within 3 months and 20% within one month.
- Cataract Surgery: 100% of patients require treatment within 16 weeks.
- Coronary Artery Bypass Graft Surgery: 68% of patients require treatment within 6 weeks and 32% of patients within 2 weeks.
- MRI: 80% of patients require assessment within one month and 20% within one week.



Table 5<sup>9</sup>

<b>Treatment Wait Time</b>				
<i>median wait for treatment after appointment with specialist (in days)</i>				
	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Orthopaedics: total joint replacement (hip and knee)</b>	154	148	116	128
<b>Ophthalmology: sight restoration (cataract surgery)</b>	54	93	137	85
<b>Cardiac Surgery: coronary artery bypass graft (CABG)</b>	24	20	16	21
<b>Diagnostic Procedures: MRI</b>	84	62	168	32

## 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, i.e., median wait times are 110% of recommended wait times. The table below simply subtracts the two to show the number of days that the median patient is waiting in excess of the recommended period.

Median wait times for CABG surgery are below the maximum recommended in all four provinces and only higher in Saskatchewan for cataract surgery. Median wait times for joint replacement, however, exceed the maximum recommended in all provinces except Saskatchewan, and all four provinces have wait times that exceed the maximum recommended for MRIs.

Table 6

<b>Excess of Median Wait Time over Maximum Recommended for Treatment (in Days)</b>				
	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Orthopaedics: total joint replacement (hip and knee)</b>	30	24	-8	4
<b>Ophthalmology: sight restoration (cataract surgery)</b>	-58	-19	25	-27
<b>Cardiac Surgery: coronary artery bypass graft (CABG)</b>	-9	-13	-17	-12
<b>Diagnostic Procedures: MRI</b>	59	37	143	7

It is important, however, 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

<sup>9</sup> The median wait time data for joint replacement surgery (table 3.4, p.57), cataract surgery (table 2.4, p.54) and CABG surgery (table 4.5, p.61) was drawn from *Waiting for Health Care in Canada: What We Know and What We Don't Know*, Canadian Institute for Health Information (2006). The joint replacement wait times are the weighted average of hip and knee replacement surgeries. Information for Saskatchewan was derived as the wait time for the median patient after excluding patients waiting one day or less for treatment. Median wait times for MRI scans for British Columbia and Saskatchewan were drawn from the Fraser Institute *Waiting Your Turn, Critical Issues Bulletin* (2005), p.30. Median wait times for MRI scans in Alberta were from the Alberta Ministry of Health and Wellness ([www.health.gov.ab.ca](http://www.health.gov.ab.ca)) and for Ontario from the Ontario Ministry of Health and Long-Term Care ([www.health.gov.on.ca](http://www.health.gov.on.ca)).



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 help develop a better understanding of the impact of wait times. Each row in Table 7 adds to 100 and represents the distribution of patients in terms of the number of days they had to wait for treatment. The boxed figures indicate when the maximum recommended wait time occurs for each priority area. All patients waiting to the right of the boxed figures are waiting longer than recommended. The bolded figures on each row show how long the median patient is waiting for treatment.

Table 7<sup>10</sup>

Proportion of Patients Treated by Wait Time (in days)							
British Columbia	<21	21-48	49-91	92-182	183-365	366-547	>547
Orthopaedics: total joint replaceme	3.4	9.9	23.7	<b>26.1</b>	25.0	7.5	4.4
Cataract Surgery	6.8	20.1	<b>46.1</b>	<b>17.8</b>	6.0	2.4	0.7
Coronary Artery Bypass Surgery	39.1	<b>21.8</b>	31.6	6.1	1.4	0.1	0.0
MRI Scan	13.3	<b>14.8</b>	<b>43.7</b>	24.5	3.5	0.2	0.0
Alberta	<21	21-48	49-91	92-182	183-365	366-547	>547
Orthopaedics: total joint replaceme	3.4	9.9	23.7	<b>26.1</b>	25.0	7.5	4.4
Cataract Surgery	3.0	8.8	27.0	<b>22.3</b>	25.6	10.2	3.1
Coronary Artery Bypass Surgery	<b>50.0</b>	<b>19.5</b>	24.6	4.7	1.1	0.1	0.0
MRI Scan	13.3	<b>14.8</b>	<b>43.7</b>	24.5	3.5	0.2	0.0
Saskatchewan	<21	21-48	49-91	92-182	183-365	366-547	>547
Orthopaedics: total joint replaceme	3.4	9.9	23.7	<b>26.1</b>	25.0	7.5	4.4
Cataract Surgery	3.0	8.8	27.0	<b>22.3</b>	25.6	10.2	3.1
Coronary Artery Bypass Surgery	<b>55.9</b>	<b>17.2</b>	21.7	4.2	0.9	0.1	0.0
MRI Scan	10.3	<b>11.4</b>	22.3	<b>12.0</b>	41.6	2.4	0.0
Ontario	<21	21-48	49-91	92-182	183-365	366-547	>547
Orthopaedics: total joint replaceme	3.4	9.9	23.7	<b>26.1</b>	25.0	7.5	4.4
Cataract Surgery	6.8	20.1	<b>46.1</b>	<b>17.8</b>	6.0	2.4	0.7
Coronary Artery Bypass Surgery	39.1	<b>21.8</b>	31.6	6.1	1.4	0.1	0.0
MRI Scan	38.8	<b>22.4</b>	29.5	8.1	1.1	0.1	0.0

The data in Table 7 are used to estimate the proportion of patients with wait times that exceed the maximum recommended time for treatment (see Table 8). The proportions vary from a low of 24% of patients waiting for cataract surgery in British Columbia to a high of 88% for patients waiting for an MRI in Saskatchewan. It is worth noting that despite the health system's success in ensuring median wait times for CABG surgery fall below the recommended maximum, there are still between 36% and 44% of patients that have to wait longer than recommended for treatment.

<sup>10</sup> Available information on the distribution of wait times for treatment by priority area and province varies widely. The estimates in 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 distribution of patients by length of wait for the other provinces was adjusted using a mathematical algorithm based on differences in that province's median wait time compared with Alberta's. The results were then compared with over 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, 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 8

Proportion of Patients with Wait Times Exceeding Maximum Recommended				
	BC	AB	SK	ON
Orthopaedics: total joint replacement (hip and knee)	56.2	54.9	48.0	50.5
Ophthalmology: sight restoration (cataract surgery)	23.8	48.4	56.7	23.8
Cardiac Surgery: coronary artery bypass graft (CABG)	43.7	40.9	36.1	41.4
Diagnostic Procedures: MRI	83.8	83.8	87.5	57.9

The final calculation relevant for an assessment of excess wait times is a determination of the average wait time for a patient whose treatment wait time 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 4) 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 whose Treatment Wait Time Exceeds the Recommended Maximum (in Days)				
	BC	AB	SK	ON
Orthopaedics: total joint replacement (hip and knee)	259	265	304	288
Ophthalmology: sight restoration (cataract surgery)	197	318	271	197
Cardiac Surgery: coronary artery bypass graft (CABG)	85	71	71	89
Diagnostic Procedures: MRI	92	92	182	70

## Morbidity Rates

The excess wait time information developed above is combined with the number of patients to determine the (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.

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/sex distribution is applied to all four provinces. Table 11 provides the share by age and sex of patients for each priority area.

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%). Sixty seven percent of CABG surgeries 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 10<sup>11</sup>

Incidence Rates Per 100,000 People				
	BC	AB	SK	ON
Total Hip & Knee Replacement Age Standardized Rates per 100,000 Pop (2002-03)	142.6	176.7	185.1	165.0
Cataract Surgery Age-Standardized Rate Per 100,000 Pop (1999)	1032.0	986.0	1229.0	999.0
CABG Age-Standardized Rate Per 100,000 (2002-03)	74.8	88.0	106.6	93.3
MRI Exam Rates Per 100,000 (2004-05)	1840.0	3660.0	1620.0	2740.0

Table 11<sup>12</sup>

Morbidity Proportions by Age and Sex				
Male:	<45 years	45 - 54	55 - 64	>65 years
Orthopaedics: total joint replacement (hip and knee)	0%	1%	5%	36%
Ophthalmology: sight restoration (cataract surgery)	1%	2%	6%	53%
Cardiac Surgery: coronary artery bypass graft (CABG)	1%	7%	19%	50%
Diagnostic Procedures: MRI	18%	14%	10%	7%
Female:	<45 years	45 - 54	55 - 64	>65 years
Orthopaedics: total joint replacement (hip and knee)	0%	2%	11%	44%
Ophthalmology: sight restoration (cataract surgery)	1%	2%	5%	30%
Cardiac Surgery: coronary artery bypass graft (CABG)	0%	1%	4%	17%
Diagnostic Procedures: MRI	19%	14%	10%	8%

<sup>11</sup> The incidence rate data for joint replacement surgery (figure 3.2, p.55), cataract surgery (figure 2.2, p.53) and CABG surgery (figure 4.2, p.58) was drawn from *Waiting for Health Care in Canada: What We Know and What We Don't Know*, Canadian Institute for Health Information (2006). The incidence rate for MRI exams (figure A.6, p.A-13) was drawn from *Medical Imaging in Canada 2005*, Canadian Institute for Health Information (2005).

<sup>12</sup> 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 (figure A.8, p.A-8) was drawn from *Medical Imaging in Canada 2005*, Canadian Institute for Health Information (2005). 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.



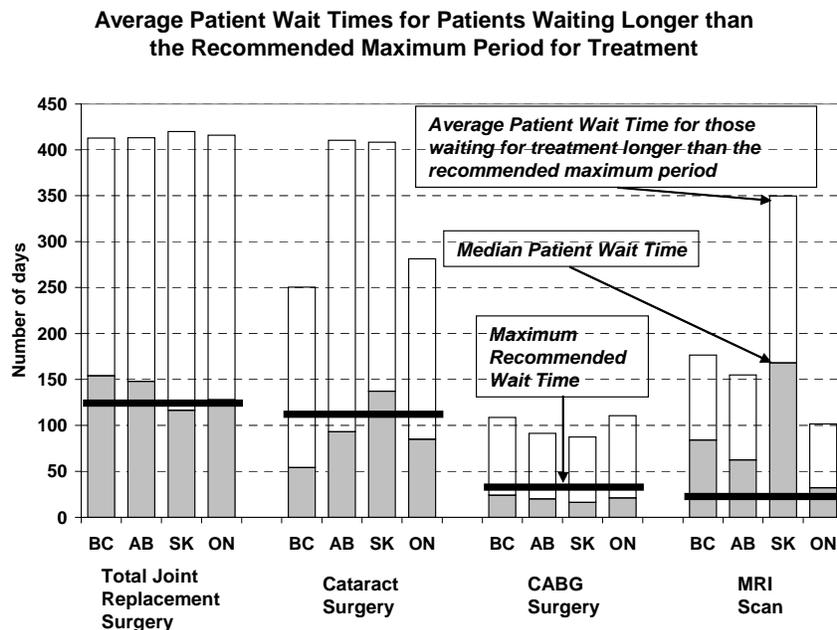
## The Queue

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

Figure 3 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 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).

With a few notable exceptions, the median patient generally receives treatment at or before the maximum recommended wait time limit is reached. This experience is not, however, shared by all patients. The average wait for patients not treated within the recommended maximum period is over a year for hip and knee replacement surgery and over a year for cataract surgery in Alberta and Saskatchewan. For cardiac patients not treated within the maximum recommended period, the average wait for coronary artery bypass (CABG) surgery is over three months or about three times the maximum recommended wait. The situation for patients requiring an MRI is particularly grave. The maximum recommended wait is 25 days but is nearly a year for the average patient in Saskatchewan who does not get their scan within that maximum recommended period.

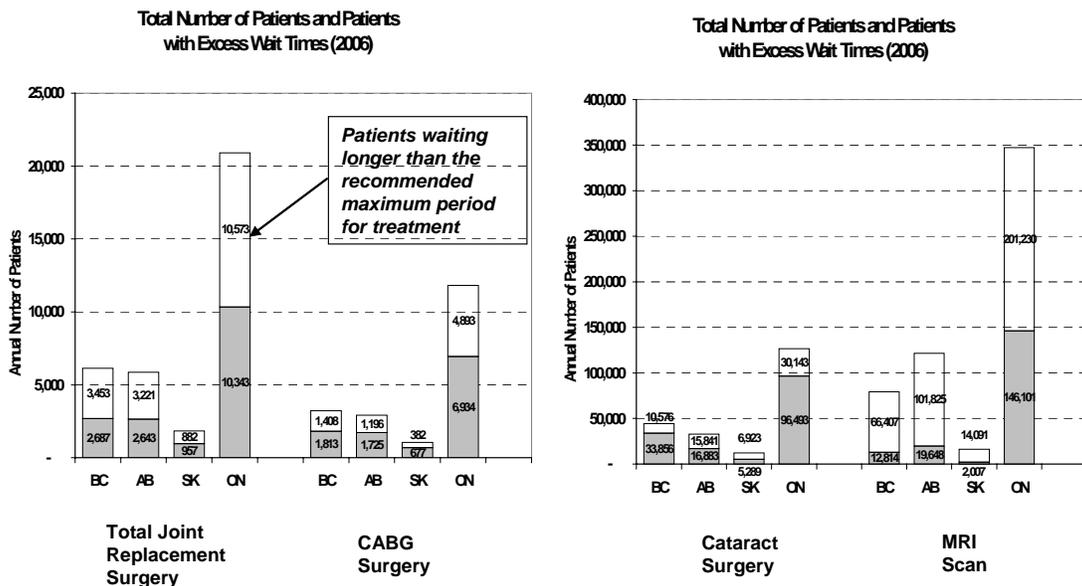
Figure 3



Although Figure 3 showed that, with some exceptions, the median patient receives treatment within the maximum time recommended by the Wait Time Alliance, the other 50% of patients do not. Figure 4 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 about half of all patients in each province receive their hip or knee replacement within the maximum recommended time while (in general) more than half have their CABG and cataract surgery performed within the maximum recommended time. This situation is reversed for MRIs where considerably more than half of all patients have to wait longer than medically recommended for their scan.

Figure 4



As will be seen later, 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.

## Methodology

This section reviews the approach taken to estimate the economic impact of wait times. The costs addressed in this study are those that could be mitigated through adherence 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 one of three categories: patient costs, caregiver costs, and health care system costs.

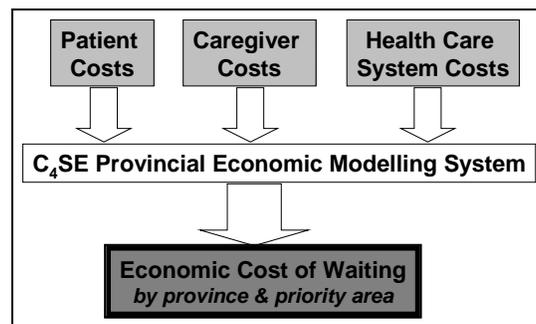
The first category is the impact from reduced economic activity as a result of patients being unable to participate in the labour force. These costs involve the direct loss in production from these people no longer producing goods and services as well as the broader reduction in economic activity resulting 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 above, 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 three sets of costs are used in the C<sub>4</sub>SE Provincial Economic Modelling System to determine the cost of waiting by province for each priority area. This section includes a brief discussion of the C<sub>4</sub>SE modelling system<sup>13</sup> and provides a summary of some of the key assumptions that have a bearing on the results obtained from this analysis.

Figure 5



### Patient Costs

A 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 a patient's 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.

<sup>13</sup> Please see the Appendix for more information on the C<sub>4</sub>SE's Provincial Economic Modelling System.

For purposes of this study, a series of studies conducted by the Western Canada Waiting List Project combined with the opinion of physicians highly experienced in each of the priority areas was solicited to answer 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 are “Immediately threatened or unable” were considered unable to continue their regular activities. To this was added a third of the respondents that indicated that their activities were “Threatened by not immediately” because this study is focusing on patients that are waiting in excess of the recommended period and, as a result, some of these patients may have progressed to being unable to function while waiting for treatment.

The answers to this question are shown in Table 12 and 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 12**

<b>Proportion of Patients That Need to Discontinue Their Regular Activities</b>	
<b>Orthopaedics: total joint replacement (hip and knee)</b>	32%
<b>Ophthalmology: sight restoration (cataract surgery)</b>	7%
<b>Cardiac Surgery: coronary artery bypass graft (CABG)</b>	95%
<b>Diagnostic Procedures: MRI</b>	22%

The proportion of cataract surgery patients that need to discontinue their regular activities is quite 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 threatened. Current wait list research only looks at the level of disability when the patients are put on the waiting list. There is no literature published which 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 have a significant impact on the estimated economic cost of wait times for cataract surgery.

Although the most recent survey conducted by Statistics Canada indicated a 35% proportion of patients waiting for an MRI experienced a negative impact on their lives, the research in this study used the survey statistics from the Western Canada Waiting List Project for MRIs. This choice was made for a few reasons: (i) for consistency with the other priority areas, (ii) because it would yield a more conservative outcome and (iii) because of uncertainty about what the precise limitations or negative impacts on patients were from the Statistics Canada research.

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 6 through Figure 9. The information in the light grey shaded text boxes in these figures



can be found in this and the previous section of the report, the information in the clear text boxes is data from the C<sub>4</sub>SE’s provincial economic modelling system, and the information shaded in the dark grey text boxes is the result of calculations using these information sets.

Figure 6

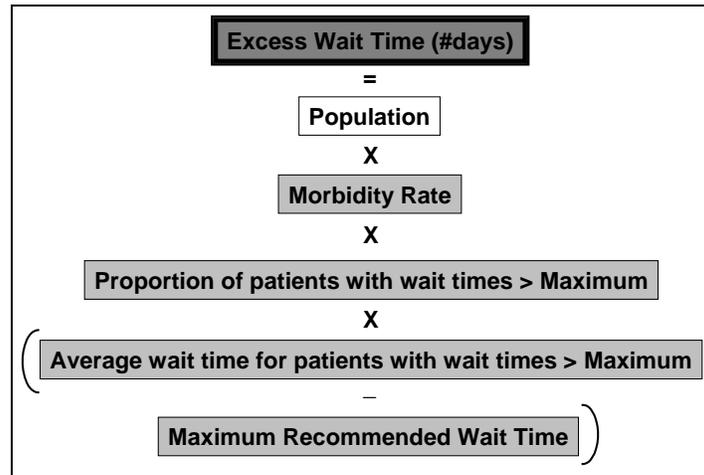
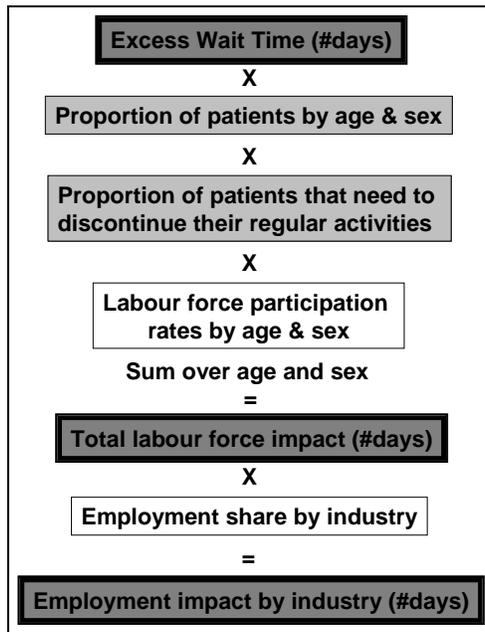


Figure 7



The first step is to estimate the excess wait time (measured in days) for each province and priority area. This is followed by determining the excess wait times experienced 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 and adjusting for the proportion of patients that need to discontinue their regular activities. The sum of these labour force impacts is then distributed across the fourteen 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.

## 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 in order 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 purposes of 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 physician's responses to the first of these questions are summarized in Table 13. 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, however, rises to 25%.

Table 13

Proportion of Patients That Require a Caregiver	
Orthopaedics: total joint replacement (hip and knee)	20%
Ophthalmology: sight restoration (cataract surgery)	5%
Cardiac Surgery: coronary artery bypass graft (CABG)	25%
Diagnostic Procedures: MRI	N/A

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 sum to 100% for each of the priority areas in Table 14.

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 which 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 fourteen industry sectors in the model based on their shares of total employment. These are the values used in the model to determine

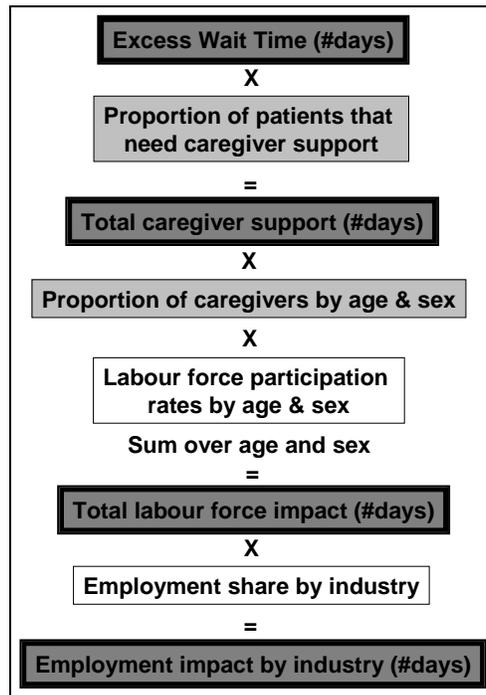


the impact of caregiver support on each province’s economy for each of the priority health care areas.

Table 14

Caregiver Proportions by Age and Sex				
Male:	<45 years	45 - 54	55 - 64	>65 years
Orthopaedics: total joint replacement (hip and knee)	16%	6%	10%	22%
Ophthalmology: sight restoration (cataract surgery)	7%	4%	5%	24%
Cardiac Surgery: coronary artery bypass graft (CABG)	10%	4%	5%	12%
Diagnostic Procedures: MRI	N/A	N/A	N/A	N/A
Female:	<45 years	45 - 54	55 - 64	>65 years
Orthopaedics: total joint replacement (hip and knee)	15%	6%	7%	18%
Ophthalmology: sight restoration (cataract surgery)	7%	4%	6%	42%
Cardiac Surgery: coronary artery bypass graft (CABG)	10%	8%	15%	35%
Diagnostic Procedures: MRI	N/A	N/A	N/A	N/A

Figure 8



### 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 a National Accounts perspective spending on goods and services within the medical system represents an increase in economic activity. These goods and services must, however, be paid for so 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 purposes of 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 welfare perspective, the patient is 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 they are covered by the provincial health care system.

As before, 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)?*

*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 physicians are summarized in Table 15. Additional medical system costs for each patient waiting longer than the maximum recommended period are \$217 for hip and knee replacement surgery, \$35 for cataract surgery and \$317 for CABG surgery.

### **Orthopaedics**

The average cost for a 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.

Table 15

<b>Health Care System Costs by Priority Area</b>			
<i>Dollars per Patient Waiting Longer than the Maximum Recommended Period</i>			
	<b>Hip &amp; Knee Replacement Surgery</b>	<b>Cataract Surgery</b>	<b>CABG Surgery</b>
<b>Proportion of Patients Requiring Additional Pre-op Appointments:</b>			
<i>0 Additional Appointments</i>	15%	5%	10%
<i>1 Additional Appointment</i>	35%	85%	40%
<i>2 Additional Appointments</i>	45%	10%	30%
<i>3 Additional Appointments</i>	5%	0%	20%
<b>Proportion of Patients Requiring Additional Post-op Appointments:</b>			
<i>0 Additional Appointments</i>	100%	100%	70%
<i>1 Additional Appointment</i>	0%	0%	10%
<i>2 Additional Appointments</i>	0%	0%	10%
<i>3 Additional Appointments</i>	0%	0%	10%
<b>Average Cost of an Additional Appointment:</b>			
<i>Average Cost</i>	\$36	\$33	\$42
<b>Other Tests &amp; Procedures:</b>			
<i>Prop. Requiring Additional Tests</i>	100%	0%	Varies
<i>Avg. Cost of Additional Tests</i>	\$45	\$0	\$103
<b>Proportion of Patients Requiring Medication:</b>			
<i>Prop. Requiring Additional Drugs</i>	80%	0%	100%
<i>Avg. Monthly Cost of Additional Drugs</i>	\$153	\$0	\$174
<b>Proportion of Patients Requiring Additional Medications:</b>			
<i>Prop. Requiring Additional Drugs</i>	20%	0%	10%
<i>Avg. Monthly Cost of Additional Drugs</i>	\$153	\$0	\$76
<b>Summary of Costs</b>			
<b>Appointment Costs</b>	\$50	\$35	\$92
<b>Test / Procedure Costs</b>	\$45	\$0	\$103
<b>Drug Costs</b>	\$153	\$0	\$181
<b>Total Additional Medical Costs:</b>	<b>\$248</b>	<b>\$35</b>	<b>\$376</b>
<b>Drug costs for patients over 65</b>	\$122	\$0	\$122
<b>Total Additional Medical System Costs:</b>	<b>\$217</b>	<b>\$35</b>	<b>\$317</b>

### Ophthalmology

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

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



**Cardiology**

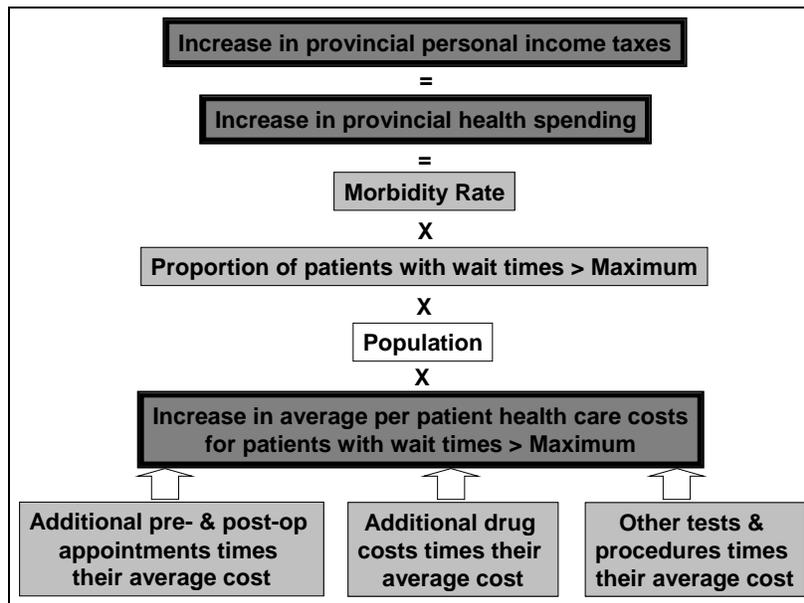
The average cost of visit to a general practitioner is \$30 and \$65 for a specialist. This analysis assumes that two thirds of the additional visits are to a GP and one third to a specialist for a weighted average cost of \$42.

All patients waiting in excess of the recommended period 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 that experience a wait time longer than the maximum recommended period will need to purchase about one and a half additional month's 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).

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.

**Figure 9**



## C<sub>4</sub>SE Provincial Modeling System

The C<sub>4</sub>SE's Provincial Modeling System is a dynamic multi-sector regional economic model of the country. This model is a bottom up set of macroeconomic models for the provinces plus a combined territories and rest of world model with economic activity in one region linked to activity in the other regions through trade in a national model. It 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<sub>4</sub>SE's Provincial Modeling System can be found in the Appendix to this report.

## Critical Assumptions

The following assumptions were made for this study, and have varying impacts on its outcome. Most were made to simplify the analysis and because of the lack of readily available information to reliably quantify an alternative set of assumptions.

### Assumptions with no clear impact on the cost estimates

- The study assumes that the probability of a patient 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 a patient waiting for treatment for a period longer than recommended being unable to continue their normal activities is independent of their age or sex.

### Assumptions that may raise the cost estimates

- One of the primary benefits 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 the National Accounts. The reduction in these patients quality of life is clearly real, but is not valued 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 a patient experiencing a negative outcome from their treatment is independent of their wait time. This assumption ignores the possibility that the patient's outcome may be affected by the length of time they have to wait for treatment.



- This study does not consider the costs associated with waiting to see a specialist, waiting for results from diagnostic tests, or waiting to see a family doctor.

### **Assumptions that may reduce the cost estimates**

- The private purchase of drugs, health care appliances and services by patients (and by private insurance) while waiting for treatment are 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 welfare perspective, the patient is 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<sup>14</sup>.
- 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<sup>15</sup>, 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 a patient leaving the wait list prior to treatment is independent of their wait time. This assumption, therefore, ignores the likelihood that a patient dies, gets better without treatment, or decides not to pursue treatment does not depend on the length of time they have to wait for treatment.

On balance, the C<sub>4</sub>SE believes the cost estimates generated by this research are conservative. Two assumptions in particular significantly reduce the estimated impacts. First, because it only addresses the wait time from when the specialist decides upon and requests a course of treatment to the time that treatment occurs and ignores the wait times experienced by patients in getting to see the specialist or even in getting to see their family doctor a large proportion of patient costs are missing. Second, the study has ignored the costs imposed on the economy through the elevated tax rates required by governments in order to recover the revenues lost through reduced economic activity.

---

<sup>14</sup> Where these costs are covered by private insurance then they can be considered to have been “prepaid” (ignoring deductibles) so patients need not reduce spending on other goods and services. If, however, these costs are not covered by insurance then, at some point (if not immediately), the patient must reduce spending on other goods and services because their income has not changed (ignoring possible offsets from non-refundable income tax credits for medical expenses). Including this spending reduces the economic costs of waiting by \$130 for total joint replacement patients, \$36 for cataract patients and \$262 for cardiac patients.

<sup>15</sup> 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.



---

## Cost of Waiting

This section provides an estimate of the costs of wait lists. These impacts were derived using the C<sub>4</sub>SE'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, two economic projections were made with the modelling system. In the first projection it was assumed that there are no wait lists. In the second projection the wait lists and their associated costs are included. The results of the two projections are then compared for the various economic indicators to determine the impacts. The projections are 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 are presented for each of the priority areas covered by this study and highlight the impacts in terms of output and federal and provincial government revenues on a province-by-province basis. A four-province (patient weighted) summary figure is also produced for reference purposes.

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 three costs

The costs are presented in two 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 2006.

### 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 impact measures are measured as the average annual difference between the projections with and without wait lists over a ten-year projection horizon.

**Gross Domestic Product:** is the impact on the value of goods and services produced per patient expressed in 2005 reference year dollars. Values greater than zero indicate that wait lists impose a cost on the economy.

**Federal Government Revenue:** is the impact on federal government revenue generated per patient in the province expressed in 2005 reference year dollars. Values greater than zero indicate a reduction in government revenues.



**Provincial Government Revenue:** is the impact on provincial government revenue generated per patient in the province expressed in 2005 reference year dollars. Values greater than zero indicate a reduction in government revenues.

### Impact on GDP

The economic costs of wait times vary widely by province and priority area and are summarized in Figure 10. The highest costs are generated for total joint replacement surgery, followed by CABG surgery and MRIs with cataract surgery yielding the lowest costs.

The costs are determined primarily by the interaction of two measures developed in the preceding sections. The first is shown in Figure 3, which are the average patient wait times for patients waiting longer than the recommended maximum period for treatment. This information provides insight into which province is likely to experience the highest cost for a given priority area. Long wait times in Saskatchewan for an MRI drive the high cost associated with that priority in the province. The second factor is shown in Table 12, which is the proportion of patients that need to discontinue their regular activities while waiting for treatment. The low proportion of patients that need to discontinue 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 that must discontinue their regular activities while waiting for treatment raises the per patient wait time cost despite the relatively short duration of that wait.

Figure 10

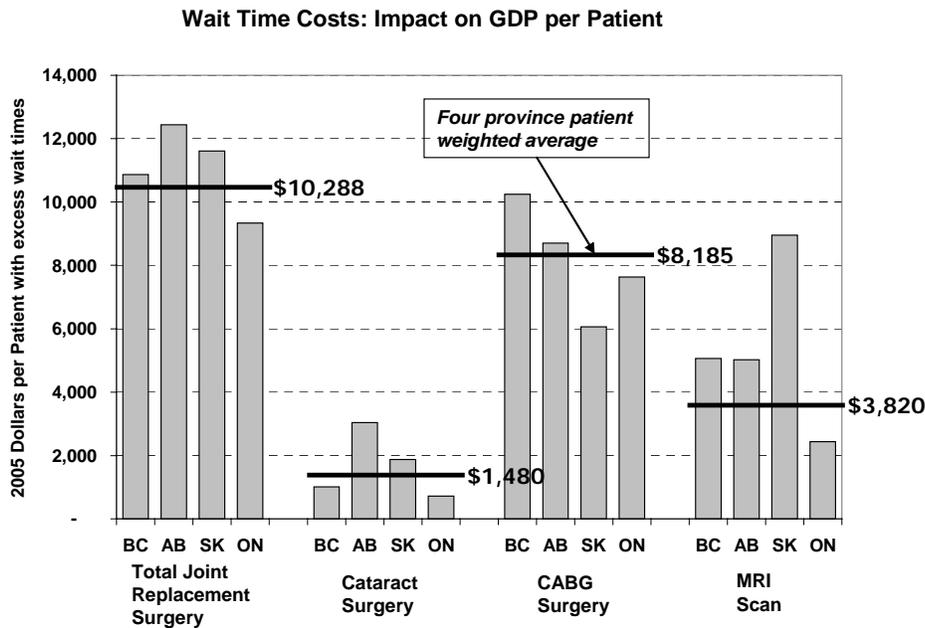


Figure 10 provides the four-province, patient weighted, average cost for each priority area as a benchmark value for the provinces and to compare across priority areas. At over \$10,000 per

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 \$12,000 while Ontario's is just over \$9,000.

The differences in costs among the provinces are quite stark for CABG surgery: ranging from just over \$6,000 in Saskatchewan to over \$10,000 in British Columbia. The difference from top to bottom is even larger for MRIs where Ontario's average patient cost of \$2,400 is dwarfed by Saskatchewan's \$9,000. Wait time costs are low in all four provinces for cataract surgery ranging from a low of \$700 in Ontario to a high of \$3,000 in Alberta.

It is interesting to note that no one province has either the highest or the lowest costs in all priority areas. Ontario comes closest. Ontario avoids having the highest cost for the four priority areas and actually has the lowest cost for three of the four priority areas.

Table 16 provides the wait time costs by province, priority area, and for the three contributing factors to wait time costs.

Table 16

<b>Impact on Gross Domestic Product</b>				
<i>2005 Reference Year Dollars per Patient</i>				
<b>Total Costs</b>	<b>Costs per patient with excess waits</b>			
	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Total joint replacement surgery</b>	10,864	12,442	11,607	9,333
<b>Cataract surgery</b>	1,017	3,043	1,880	729
<b>Coronary artery bypass graft surgery</b>	10,238	8,700	6,066	7,634
<b>MRI Scan</b>	5,065	5,021	8,955	2,441
<b>Patient Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Total joint replacement surgery</b>	4,097	5,042	4,777	3,545
<b>Cataract surgery</b>	488	1,516	964	352
<b>Coronary artery bypass graft surgery</b>	7,825	6,772	4,807	5,819
<b>MRI Scan</b>	5,065	5,021	8,955	2,441
<b>Caregiver Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Total joint replacement surgery</b>	7,098	7,660	7,063	6,005
<b>Cataract surgery</b>	578	1,565	953	409
<b>Coronary artery bypass graft surgery</b>	2,898	2,314	1,600	2,129
<b>MRI Scan</b>				
<b>Health Care System Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Total joint replacement surgery</b>	-331	-259	-234	-217
<b>Cataract surgery</b>	-49	-38	-37	-32
<b>Coronary artery bypass graft surgery</b>	-485	-386	-340	-314
<b>MRI Scan</b>				

The distribution of economic costs across the three cost categories considered in this study is instructive (see Figure 11). 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 that require the assistance of a caregiver (relative to the proportion of patients that 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 quite close to the proportion of patients



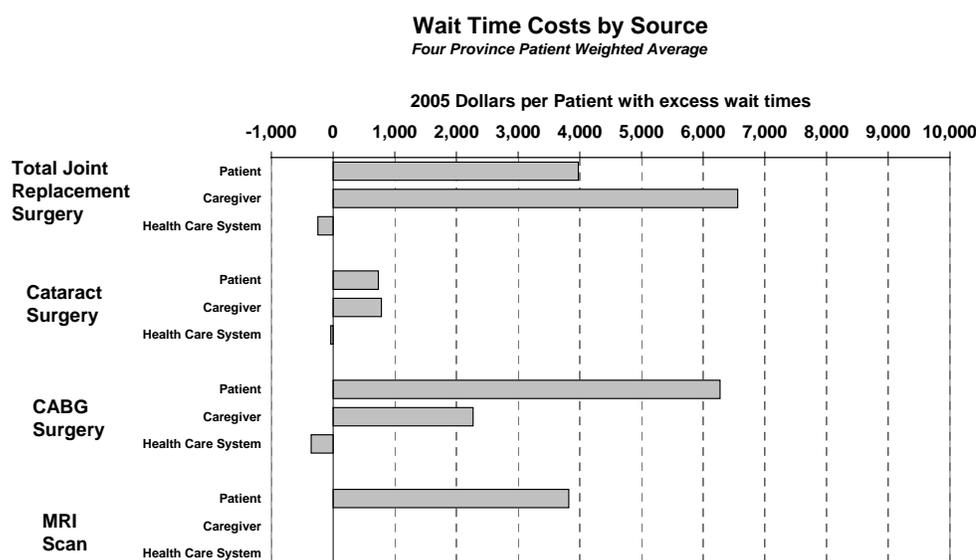
that need to discontinue their regular activities, although 66% of these caregivers are over 65 years old.

For CABG surgery, the high proportion of patients that must discontinue their regular activities leads to patient costs exceeding caregiver costs by a margin of nearly three to one. 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 system lead to a small net positive impact on the economy, as they 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.

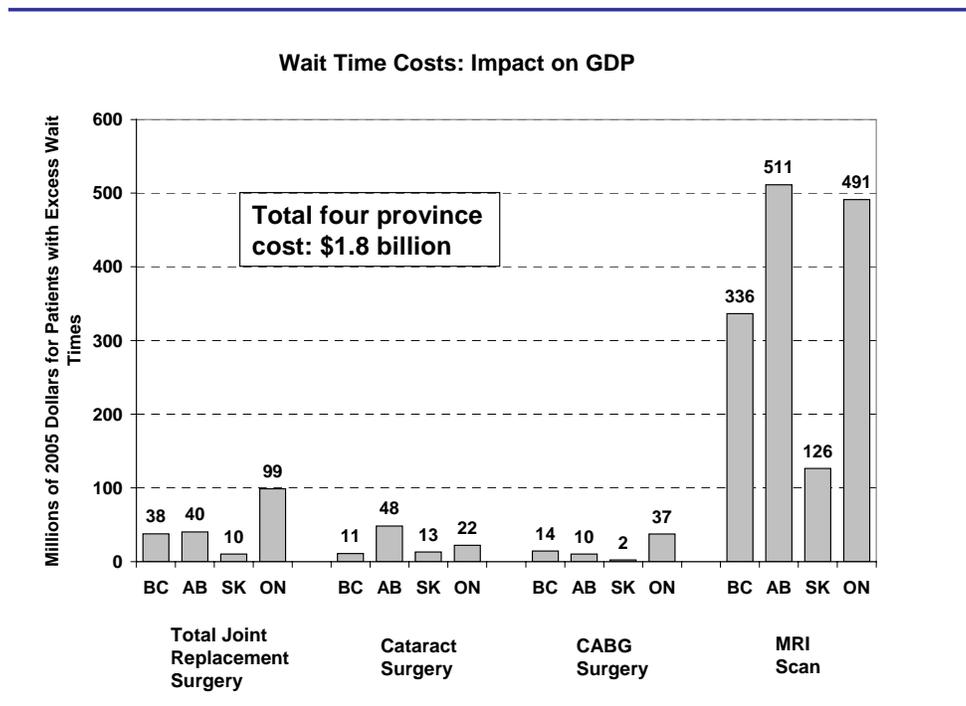
Figure 11



The estimated overall cost of waiting in terms of foregone GDP by province and priority area in 2006 are presented in Figure 12. 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. In absolute terms, the costs associated with waiting for an MRI far exceed any of the other priority areas examined for this study. This result is because of the large number of patients that need an MRI and the relatively young age of these patients.

The costs for the four priority areas can be added for each province to yield a partial estimate of the cost of waiting for health care. The total estimated cost across the four provinces in 2006 is just over \$1.8 billion<sup>16</sup>. 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.

Figure 12



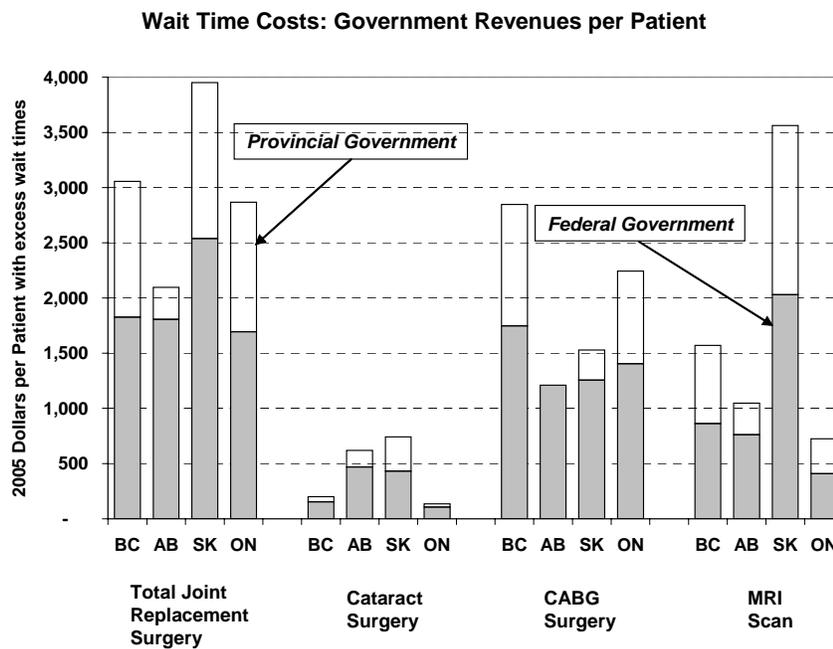
### Impact on Government Revenue

As discussed in the previous section, provincial government personal income tax revenues are 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 offset this increase. Reduced personal incomes reduce federal and provincial personal income taxes and reduced personal spending reduce sales and excise tax revenues. Business activity is also reduced so federal and provincial corporate income tax revenues are also affected.

Figure 13 summarizes the wait time costs to federal and provincial government revenues per patient waiting longer than the recommended maximum period for treatment. Table 17 provides impacts on federal government revenues by province, priority area and source. Table 18 provides the same information for the provincial governments.

<sup>16</sup> The four provinces included in this report represent 65% of the national population in 2006.

Figure 13



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 on a per patient basis are similar to those seen in terms of GDP per capita (see Figure 10). This is not surprising since changes in tax revenue are positively related to changes in income. The costs to governments are highest for total joint replacement – nearly \$4,000 per patient in Saskatchewan – 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 and, although the costs do vary widely across provinces, the variance in provincial and federal government revenue costs is quite similar. The total cost in terms of foregone government revenue across the four provinces in 2006 is about \$300 million for the federal government and \$200 million 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<sub>4</sub>SE model, also reduces government spending so that the overall impact on government deficits is less severe than the reduction in government revenues.

Table 17

<b>Impact on Federal Government Revenues</b>				
<i>2005 Reference Year Dollars per Patient</i>				
	<b>Costs per patient with excess waits</b>			
<b>Total Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	1,826	1,806	2,539	1,693
Cataract surgery	154	468	430	106
Coronary artery bypass graft surgery	1,747	1,210	1,255	1,405
MRI Scan	864	762	2,029	408
<b>Patient Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	686	741	1,058	641
Cataract surgery	73	235	223	51
Coronary artery bypass graft surgery	1,332	958	1,021	1,071
MRI Scan	864	762	2,029	408
<b>Caregiver Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	1,196	1,116	1,552	1,091
Cataract surgery	89	242	219	61
Coronary artery bypass graft surgery	495	325	337	393
MRI Scan				
<b>Health Care System Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	-55	-51	-71	-40
Cataract surgery	-8	-8	-12	-5
Coronary artery bypass graft surgery	-80	-73	-103	-58
MRI Scan				

Table 18

<b>Impact on Provincial Government Revenues</b>				
<i>2005 Reference Year Dollars per Patient</i>				
	<b>Costs per patient with excess waits</b>			
<b>Total Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	1,230	291	1,413	1,173
Cataract surgery	45	151	310	28
Coronary artery bypass graft surgery	1,099	-62	275	838
MRI Scan	706	286	1,534	316
<b>Patient Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	553	220	707	535
Cataract surgery	39	94	181	31
Coronary artery bypass graft surgery	1,120	221	529	909
MRI Scan	706	286	1,534	316
<b>Caregiver Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	979	315	992	916
Cataract surgery	53	97	177	40
Coronary artery bypass graft surgery	418	70	162	334
MRI Scan				
<b>Health Care System Costs</b>	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
Total joint replacement surgery	-302	-244	-285	-278
Cataract surgery	-47	-39	-48	-43
Coronary artery bypass graft surgery	-439	-353	-416	-406
MRI Scan				



## Wait Time Cost 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 (see Table 7), 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 those 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 cost curves can be developed for each priority area and province which represents the economic costs associated with the length of time spent waiting for treatment.

Figure 14

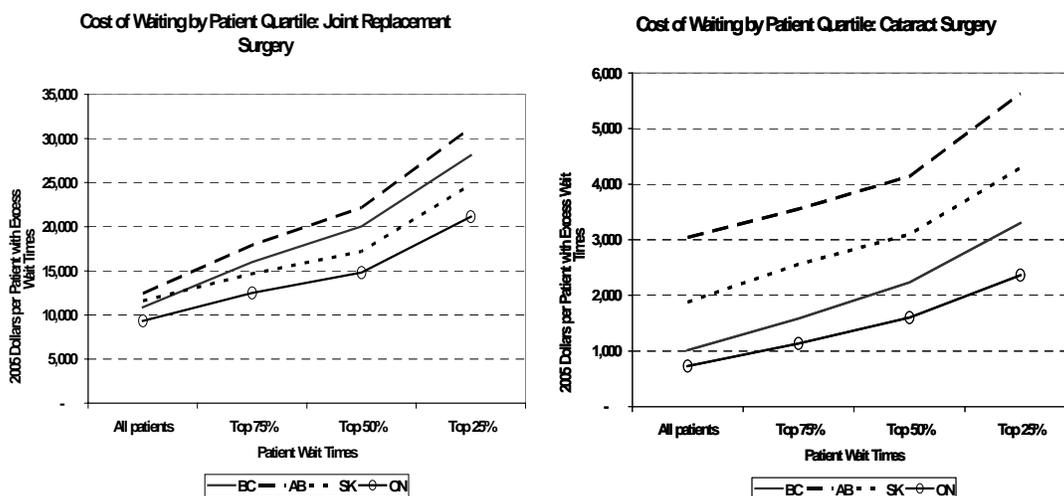


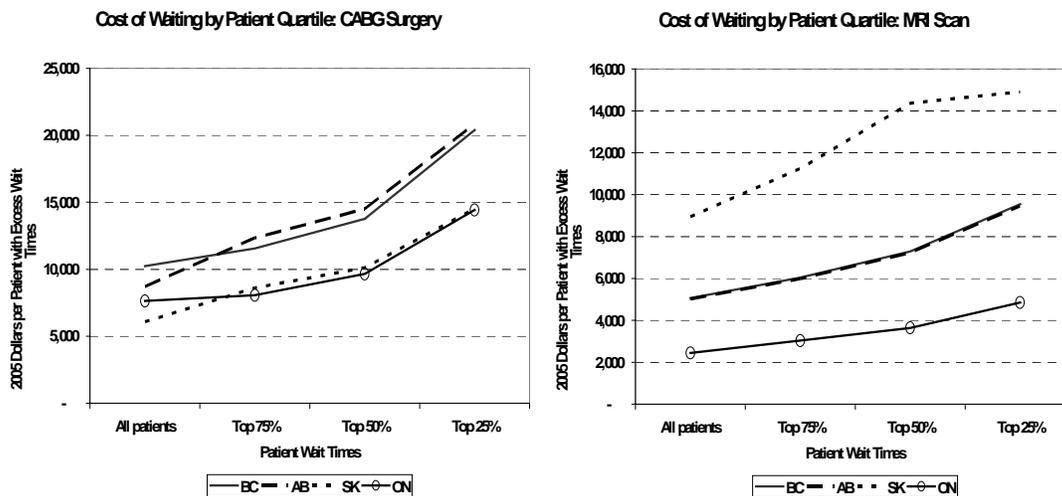
Figure 14 and Figure 15 show the cost curves for each of the four priority areas. Each point on the curve in these charts represents the wait time costs associated with that proportion of patients (with wait times in excess of the recommended maximum) waiting the longest for treatment. For example, the 25% of patients waiting the longest for joint replacement surgery impose costs on the economy of just over \$20,000 per patient in Ontario up to more than \$30,000 in Alberta. The 50% of patients with the longest wait impose costs of between \$15,000 and \$22,000 per patient. The costs shown for all patients are those imposed on average across all the patients waiting longer than the recommended period for treatment (reported in Figure 10).

The per patient costs for joint replacement surgery more than double for the 25% of patients with the longest wait times relative to the average cost for all patients with wait times exceeding the maximum recommended for treatment. The wait time costs are highest in Alberta and lowest in

Ontario with the difference in costs among provinces widening for patients with the longest wait times.

The slopes of the curves differ a bit more by province for cataract surgery. The costs more than triple for British Columbia and Ontario but are not quite double for Alberta. Per patient costs are lowest in Ontario and rise from less than \$1,000 for all patients to over \$2,000 for the 25% of patients with the longest wait times. In Alberta, per patient costs are highest and rise from \$3,000 for all patients to about \$5,500 for the 25% of patients with the longest wait times.

Figure 15<sup>17</sup>



Although patients in Saskatchewan impose the lowest average wait time costs for CABG surgery, Ontario’s cost curve does not rise quite as rapidly so the 25% of patients with the longest wait times in that province impose the lowest costs at nearly \$15,000 per patient. In British Columbia and Alberta wait time costs for the 25% of patients with the longest wait times are over \$20,000 per patient – up from about \$10,000 for the average of all patients with wait times exceeding the recommended maximum.

The largest absolute differences across provinces for the cost curves are for MRIs. The per patient costs in Saskatchewan for the 25% of patients with the longest waits are about \$15,000 and about \$9,000 for the average of all patients with wait times exceeding the recommended maximum. Costs are lowest in Ontario, rising to just under \$5,000 for the 25% of patients with the longest wait times.

<sup>17</sup> The MRI cost curves for British Columbia and Alberta are too close together to distinguish in the chart: British Columbia’s costs are marginally higher than Alberta’s.

Policymakers understand that reducing wait lists requires a real commitment in terms of resources. Information on the costs of providing timely care can be developed for each province and priority area. These costs 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 system.

The wait time cost curves can be combined with cost curves for providing health care services within the maximum recommended period for each province and priority area. As noted, the cost of providing treatment should rise, on a per patient basis, with the number of patients treated. From an economic policy perspective, the efficient level of health care should be determined by the point at which the costs of providing treatment equal the benefits from reducing wait times.

Table 19

<b>Annual Number of Patients Waiting in Excess of Recommended Maximum Time (2005)</b>				
	<b>BC</b>	<b>AB</b>	<b>SK</b>	<b>ON</b>
<b>Orthopaedics: total joint replacement (hip and knee)</b>	3,406	3,149	885	10,456
<b>Ophthalmology: sight restoration (cataract surgery)</b>	10,432	15,484	6,942	29,812
<b>Cardiac Surgery: coronary artery bypass graft (CABG)</b>	1,388	1,169	383	4,839
<b>Diagnostic Procedures: MRI</b>	65,501	99,533	14,129	199,019

Table 19 shows the number of patients with excess wait times by province and priority area in 2005. The number of patients in this table can be used to help put the cost curve information in context. The 25% of patients waiting for joint replacement surgery impose economic costs of about \$25,000 a patient. If treatment for about 221 patients in Saskatchewan can be provided within the maximum recommended wait time period for less than \$25,000 a patient then there is clear incentive for the provincial government to provide the additional resources to reduce the wait list.



---

## Conclusions and Suggestions for Further Research

This study is 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.

To date, the majority of statistics and research on wait times have focused 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. The per patient costs of providing treatment within the maximum recommended period can be compared with the cost curves developed in this study to help determine the appropriate level of public funding for health care.

While 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 patient 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. The second factor is the proportion of patients that 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 over \$10,000 per patient), followed by CABG surgery (\$8,200) and MRIs (\$3,800) with cataract surgery yielding the lowest costs (\$1,500).

Significant differences in costs exist among the provinces for joint replacement surgery with Alberta's per patient cost exceeding \$12,000 while Ontario's is just over \$9,000. The differences in costs among the provinces are quite stark for CABG surgery: ranging from just over \$6,000 in Saskatchewan to over \$10,000 in British Columbia. The difference from top to bottom is even larger for MRIs where Ontario's average patient cost of \$2,400 is dwarfed by Saskatchewan's \$9,000. Wait time costs are low in all four provinces for cataract surgery ranging from a low of \$700 in Ontario to a high of \$3,000 in Alberta. While 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, Ontario comes closest with the lowest cost for three of the four 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. The analysis indicated that caregiver costs exceed patient costs for total joint replacement surgery, were about the same for cataract surgery, and about 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 instead to reduce wait times rather than to support them.

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



- 
- Conduct a study to estimate the cost of reducing wait times for these priority areas which, when combined with the information from this study, will 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 the other provinces and/or 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 should 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 BCMA and the CMA are concerned by lengthy wait times. The recent Supreme Court decision in favour of Dr. Chaoulli and Mr. Zelliottis suggests that physicians' concerns—voiced repeatedly over many years—are well-founded and patients' legitimate medical needs are not being met. While physicians have drawn attention to the *health* impact of excessive waits for care, this study is the first to attempt to determine the *economic* impact of these waits. By making government policy makers aware of the costs that these excessive waits entail, we hope that this analysis will stimulate discussion on this issue.



## Appendix: C<sub>4</sub>SE Provincial Modeling System

The C<sub>4</sub>SE's Provincial Modeling System is a dynamic multi-sector regional economic model of the country. This is a bottom up set of macroeconomic models for the provinces plus a combined territories and rest of world model with economic activity in one region linked to activity in the other regions through trade in a national model. This 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 modelling 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 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<sub>4</sub>SE Model – Industry Sectors

Agriculture	Finance, Insurance & Real Estate
Other Primary	Professional, Scientific & Management Services
Manufacturing	Accommodation & Food
Construction	Health Services
Utilities	Other Services
Transportation & Warehousing	Education Services
Trade	Government Services

The following sections provide the reader with 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 very similar in structure – 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 four broad sectors. Firms employ capital and labour to produce a profit-maximizing output under a Cobb-Douglas constant-returns-to-scale technology.



Households consume the domestic and foreign products and supply labour under the assumption of utility maximization. Governments purchase the domestic and foreign products and produce output. Foreigners purchase the domestic product and supply the foreign product.

There are two 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 price 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<sub>4</sub>SE'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 is 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<sub>4</sub>SE'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 modelling 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.



---

## References

- Arnett, Gordon, David Hadorn, and the Steering Committee of the Western Canada Waiting List Project, *Developing Priority Criteria for Hip and Knee Replacement Surgery: Results from the Western Canada*, Canadian Journal of Surgery, 2003, 46(4):290-296.
- Canadian Institute for Health Information, *Health Care in Canada 2005*, Ottawa 2005, available at [www.cihi.ca](http://www.cihi.ca).
- Canadian Institute for Health Information, *Medical Imaging in Canada 2005*, Ottawa 2005, available at [www.cihi.ca](http://www.cihi.ca).
- Canadian Institute for Health Information, *Canadian Joint Replacement Registry (CJRR) Report Total Hip and Total Knee Replacements in Canada*, Ottawa 2005, available at [www.cihi.ca](http://www.cihi.ca).
- Canadian Institute for Health Information, *Waiting for Health Care in Canada: What We Know and What We Don't Know*, Ottawa 2006, available at [www.cihi.ca](http://www.cihi.ca).
- Canadian Medical Association, *The Taming of the Queue: Toward a Cure for Health Care Wait Times*, Ottawa 2004, available at [www.cma.ca](http://www.cma.ca).
- Cardiac Care Network of Ontario, *Driven by Data, Consensus & Concern*, Toronto, available at [www.ccn.on.ca](http://www.ccn.on.ca).
- Cullis, John G. and Philip R. Jones, *Rationing by Waiting Lists: An Implication*, American Economic Review, March 1986, 76, 250-6.
- Esmail, Nadeem, *The Private Cost of Public Queues, Fraser Forum (March)*, Vancouver: The Fraser Institute, 2005, available at [www.fraserinstitute.ca](http://www.fraserinstitute.ca).
- Esmail, Nadeem and Michael Walker, *Waiting Your Turn: Hospital Waiting Lists in Canada (15<sup>th</sup> edition)*, Vancouver: The Fraser Institute 2005, available at [www.fraserinstitute.ca](http://www.fraserinstitute.ca).
- Globerman, Steven, *A Policy Analysis of Hospital Waiting Lists (1991)*, Journal of Policy Analysis and Management, 1991, 10: 247-62.
- Hadorn, David C and the Steering Committee of the Western Canada Waiting List Project, *Developing Priority Criteria for Magnetic Resonance Imaging: Results from the Western Canada*, Canadian Association of Radiologists Journal, 2002, 53(4), 210-218.
- Health Canada, *Economic Burden of Illness in Canada, 1998*, Ottawa: Health Canada, 2000, available at [www.hc-sc.gc.ca](http://www.hc-sc.gc.ca).
- Heart and Stroke Foundation of Canada, *The Changing Face of Heart Disease and Stroke in Canada 2000*, 1999, available at [www.statcan.ca](http://www.statcan.ca).
- Ipsos-Reid Corporation, *Health Care Professionals Views on Access to Health Care*, 2004, available at [www.cma.ca](http://www.cma.ca).
- Lindsay, Cotton M and Feigenbaum, Bernard, *Rationing by Waiting Lists*, American Economic Review, June 1984, 74, 405-17.
- Propper, Carol, *Contingent Valuation of Time Spent on NHS Waiting Lists*, The Economic Journal, 1990, 100: 193-9.



Romanchuk, Ken, Suren Sanmugasunderam, David Hadorn 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 Ophthalmology, 2002, 37(3), 145-154.

Statistics Canada, *Health Reports: How healthy are Canadians? Catalogue 82-003-XPE*, Ottawa: Ministry of Industry, 2005, available at [www.statcan.ca](http://www.statcan.ca).

Statistics Canada, *Access to health care services in Canada, 2005, Catalogue 82-875*, Ottawa: Ministry of Industry, 2005, available at [www.statcan.ca](http://www.statcan.ca).

Wait Time Alliance for Timely Access to Health Care, *It's about time! Achieving benchmarks and best practices in wait time management*, Ottawa 2005, available at [www.cma.ca](http://www.cma.ca).

Western Canada Waiting List Project, *Moving Forward (Final Report)*, 2005, available at [www.wcwl.ca](http://www.wcwl.ca).

### **Government and Government Agency Maintained Wait List Web Sites**

British Columbia Ministry of Health

[http://www.healthservices.gov.bc.ca/cpa/mediasite/access\\_waittimes.html](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>

Ontario Ministry of Health and Long-Term Care

[http://www.health.gov.on.ca/transformation/wait\\_times/wait\\_mn.html](http://www.health.gov.on.ca/transformation/wait_times/wait_mn.html)

Cardiac Care Network of Ontario

<http://www.ccn.on.ca/index.cfm?fuseaction=tm&tm=17&ts=0&tsb=0>

