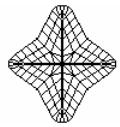

The Centre for Spatial Economics

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

The economic cost of wait times in Canada

Prepared for:

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

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Abstract

This study presents the economic costs of excessive wait times in Canada's medical system. It updates and extends analysis conducted in 2008 for the Canadian Medical Association. Unlike other studies that have examined the overall cost of wait lists and that therefore have had limited value in targeting health care spending, the costs presented in this study are those incurred by waiting longer than medically recommended for treatment. This "excess wait" is what current policy initiatives are attempting to reduce. The study, therefore, estimates the potential economic benefits that can be achieved through successful health care policy initiatives to eliminate these wait times.

Of the 4 priority areas reviewed in this study, the highest economic costs are generated for MRI exams (an average of about $6 100 per patient), followed by total joint replacement surgery ($3 000 per patient) and CABG surgery ($2 400), with cataract surgery yielding the lowest costs ($400). The net fiscal cost of reducing wait times to an economically efficient level is $37 million and to eliminate them entirely would cost $74 million.

About this study

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

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

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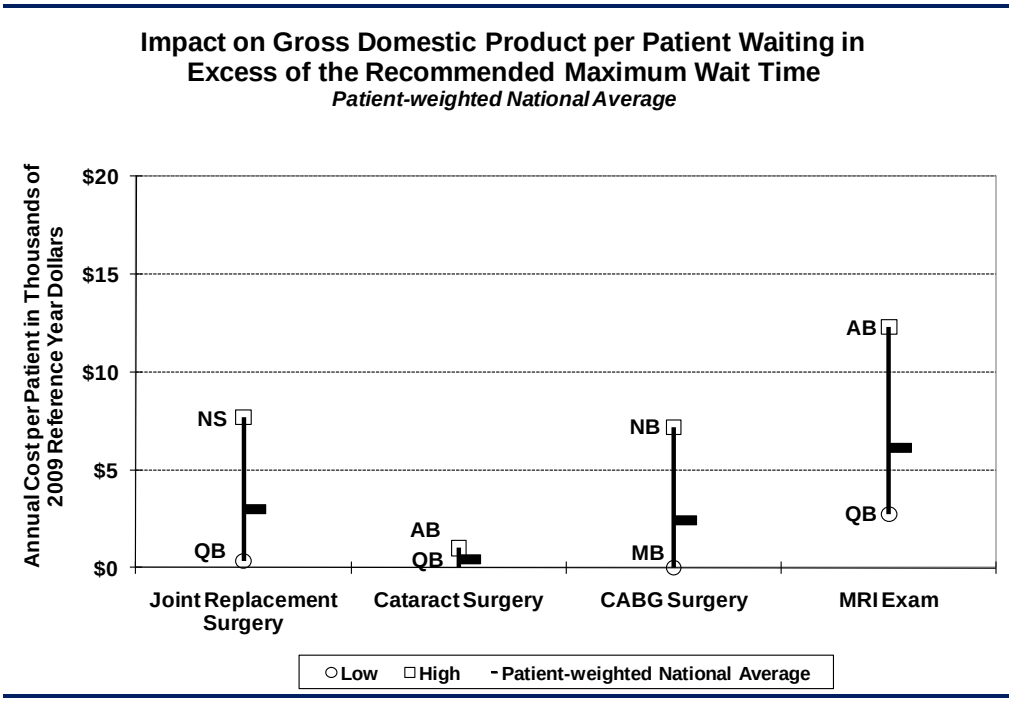
Executive Summary

The wait times experienced by patients who have to wait longer than medically reasonable for treatment impose costs not only on the patients themselves, but also on the economy as a whole. Previous economic studies of wait times, which have examined the overall cost of wait lists, have had limited value in determining the best way to target public spending to reduce wait times. In response, the Canadian Medical Association commissioned a 2008 study, which has been updated and expanded in this report, to examine the cost of waiting longer than medically recommended for treatment. The costs of these "excess waits" are relevant to policy-makers because they measure costs that could be avoided if wait times were reduced or eliminated.

Figure 1



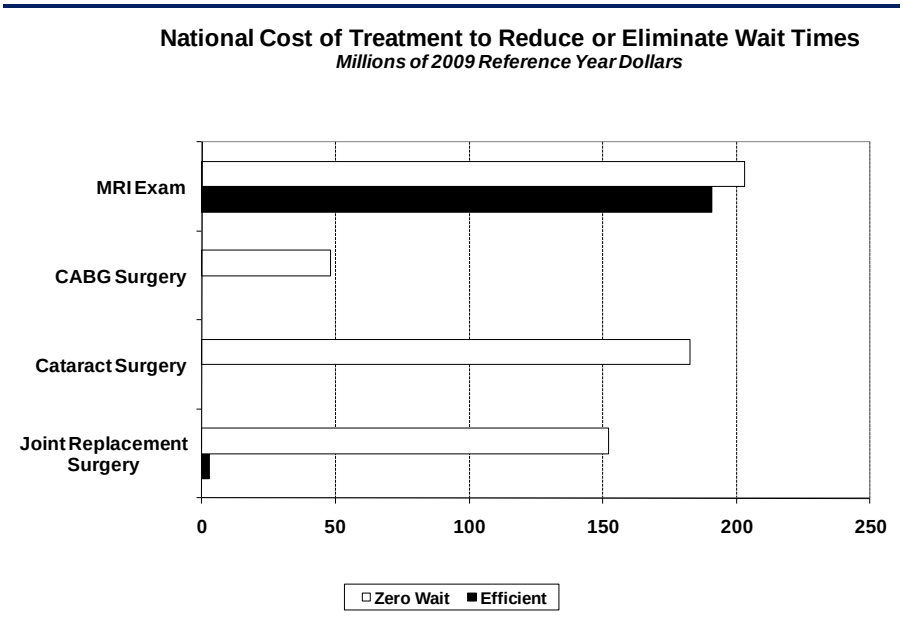
Source: The Centre for Spatial Economics

Four of the 5 priority areas identified following the 2003 First Ministers' Accord on Health Care Renewal were analyzed: total joint replacement surgery, cataract surgery, coronary artery bypass graft (CABG) and MRI scans. Costs of the excess waits for these procedures were calculated for each province. Figure 1 shows that the highest economic costs are generated for MRI exams (an average of about $6 100 per patient), followed by total joint replacement surgery ($3 000 per patient) and CABG surgery ($2 400), with cataract surgery yielding the lowest costs ($400). Although significant differences in costs exist among the provinces, no one province has either the highest or the lowest costs in all priority areas. The cumulative economic cost of waiting for treatment across these 4 priority areas in 2010 was an estimated $4.7 billion. This reduction in economic activity lowers federal and provincial government revenues in 2010 by a combined $1.8 billion.

The economic cost of waiting for treatment depends on the length of time spent waiting — the costs are highest for those waiting longest. Since not all patients wait the same length of time for treatment, it is possible to determine the costs borne by patients depending on the length of time spent waiting for treatment. This information, when combined with information on the cost of providing the health care services required to reduce or eliminate wait times, be used in cost-benefit analysis to help determine an appropriate level of health care services. The information on the cost of reducing wait times can provide policy makers with evidence of the economic and fiscal benefits of controlling wait times for medical treatment.

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

Figure 2



Source: The Centre for Spatial Economics

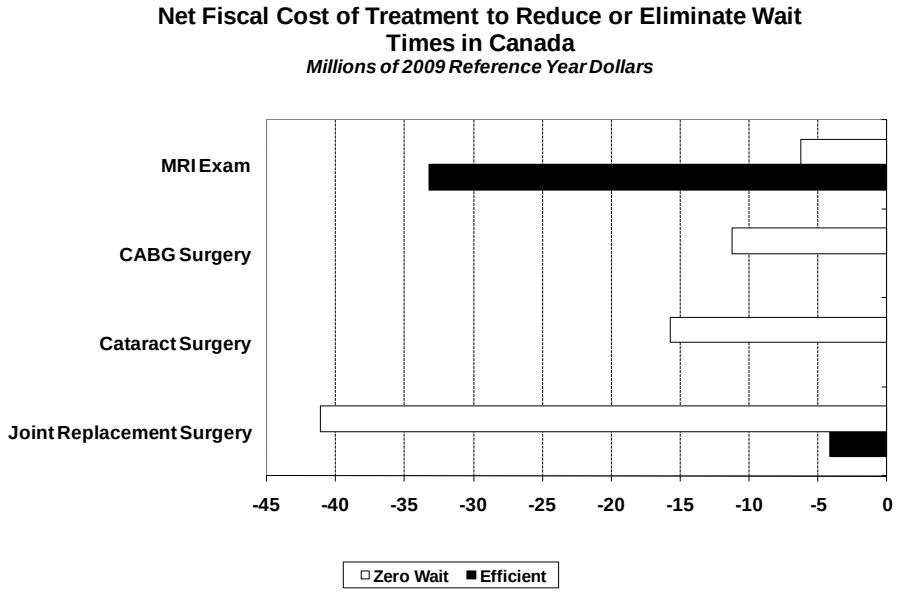
The economically efficient level of public spending on health care is determined by the intersection of the downward sloping wait time cost curves with the per-patient cost of treatment by province and priority area. This intersection provides one approach to determine an appropriate level of spending to reduce wait times. Alternately, the objective of public policy could be to eliminate wait times for the priority areas.

The economically efficient provision of medical services occurs at the intersection of the wait time cost curves and the treatment cost curves. The two curves intersect for total joint replacement surgery patients in just two provinces: Manitoba and Nova Scotia. For all other provinces, the cost of treatment exceeds the cost of waiting for all patients and it is, therefore, not

economically efficient to provide any additional treatment. This is also true for both CABG and cataract surgery. The additional cost of providing an MRI exam, however, is below the wait time cost for nearly all patients in every province. It is, therefore, economically efficient to reduce the queue for this priority area.

Figure 2 shows the economically efficient cost of providing additional treatment is $191 million for MRI exams, $3 million for joint replacement surgery and zero for the other two priority areas. The cost of providing treatment to eliminate wait times entirely for the four priority areas would require an increase in health care spending of about $590 million.

Figure 3



Source: The Centre for Spatial Economics

Figure 3 shows the net impact on government finances of either eliminating or reducing (to the economically efficient level) wait times. It is arrived at by subtracting the cost of treatment (i.e. additional spending) from the change in federal and provincial government revenues.

The impact of providing an economically efficient level of MRI exams across the country is a net fiscal cost of $33 million with some provinces experiencing a small net benefit and others a net cost while for joint replacement surgery, the impact on Manitoba and Nova Scotia, the two provinces experiencing wait time costs in excess of treatment, the net cost is $3 million and $2 million respectively. Eliminating wait times entirely for the four priority areas would lead to a net fiscal cost of $74 million to the federal and provincial governments.

Findings and recommendations

Our analysis is a conservative one. It only addresses the wait time from when a specialist requests a course of treatment to the time that treatment occurs. This ignores the wait times endured by patients in getting to see the specialist or even in getting to see their family doctor. And it ignores the other 6000 patient-doctor categories of care that are of concern to Canadians.

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

- The analysis in this study could be expanded to cover other medical conditions.
- Similar analysis could be conducted for other aspects of the patient wait time experience such as waiting to see a specialist or waiting to see a family doctor.
- A study could be conducted — preferably in conjunction with a cost-benefit analysis — to review the impact on patient demand for medical services if wait times are reduced or eliminated.

In conclusion, the study found that the cost of eliminating wait times is more costly than expanding treatment to an economically efficient level. It also found that the net fiscal cost is considerably less than the cost of providing additional treatment. This is due to (i) the economic and fiscal benefit resulting from reduced wait times and (ii) the tax multipliers associated with the increased health care spending.

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

1. Introduction

Most Canadians have had either direct or indirect experience waiting for health care. In a large number of cases, perhaps the majority, the wait does not have a material impact on their lives. For too many people, however, the wait can be excessive, leading to mounting frustration and inflicting pain and suffering. In the five years that have passed since first ministers developed the *10-Year Plan to Strengthen Health Care* considerable progress has been made in (i) measuring wait times and (ii) reducing them.

When the C_4SE examined the economic costs associated with excessive wait times in Canada's medical system in 2006 and 2008 headlines like the ones below were common in the media:

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

Since then, considerable progress in the measurement of wait times has occurred with most provinces now regularly reporting wait times for priority-area procedures on publicly accessible websites. Efforts have also been made to improve the quality and comparability across provinces of this data. To the extent allowed by the data, there is evidence of declines in wait times for all priority areas[1]. The Fraser Institutes survey of wait times throughout the health care system, however, urges continued vigilance:

> *Despite a two week fall from the high reached in 2007, the total wait time remains high, both historically and internationally. Compared to 1993, the total waiting time in 2009 is 73 percent longer. Moreover, academic studies of waiting times have found that Canadians wait longer than Americans, Germans and Swedes (sometimes) for cardiac care, although not as long as New Zealanders or the British.*[2]

Unlike other studies that have examined the overall cost of wait lists and that therefore have had limited value in targeting health care spending, the costs presented in this study are those incurred by waiting longer than medically recommended for treatment. This "excess wait" is what current policy initiatives are attempting to reduce. The study, therefore, estimates the potential economic benefits that can be achieved through successful health care policy initiatives to eliminate these wait times.

The collection of data on wait times by province and procedure was an important part of the work for the study. These data were used to determine the number of patients waiting for treatment for a period longer than medically recommended. Along with information on caregiver support and other health care spending related to "excess wait times," this information was then put into the

[1] Canadian Institute for Health Information, *Wait Times Tables – A Comparison by Province, 2010*, (Ottawa: Canadian Institute for Health Information, March 2010), p.7.

[2] Nadeem Esmail, *Waiting Your Turn 19th Edition: Hospital Waiting Lists in Canada* (Vancouver: The Fraser Institute, 2009), p.7.

C_4SE's dynamic multi-sector provincial economic model to analyze the overall impact of wait times. This approach captures the impact from reduced sales by business as a result of lower personal incomes and the implications for provincial government finances as a result of higher spending and lower revenues.

The research in this study focuses on 4 of the "priority" areas identified in the 10-year plan to strengthen health care that stemmed from the 2003 First Ministers' Accord on Health Care Renewal[3]:

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

The costs of waiting for treatment in each of these areas are provided for each province and nationally as a patient-weighted national average. The scope of the study is limited in that it only addresses wait lists for hip and knee replacements, cataract surgery, cardiac artery bypass graft (CABG) surgery and MRI exams. The fifth priority area, oncology radiation therapy, was excluded from the study because of a lack of comparable data.

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

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

2. The economics of wait lists

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

The wait times clock

Before continuing, it is worth reviewing some of the definitions of wait lists and wait times[4].

What is a wait list?

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

What is a wait time?

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

Why do we have wait times?

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

Who will go on a wait list?

A patient needing emergency surgery is treated as quickly as possible and does not go on a wait list[5]. Anyone needing surgery or treatment that is not an emergency will be placed on a wait list.

What influences wait times?

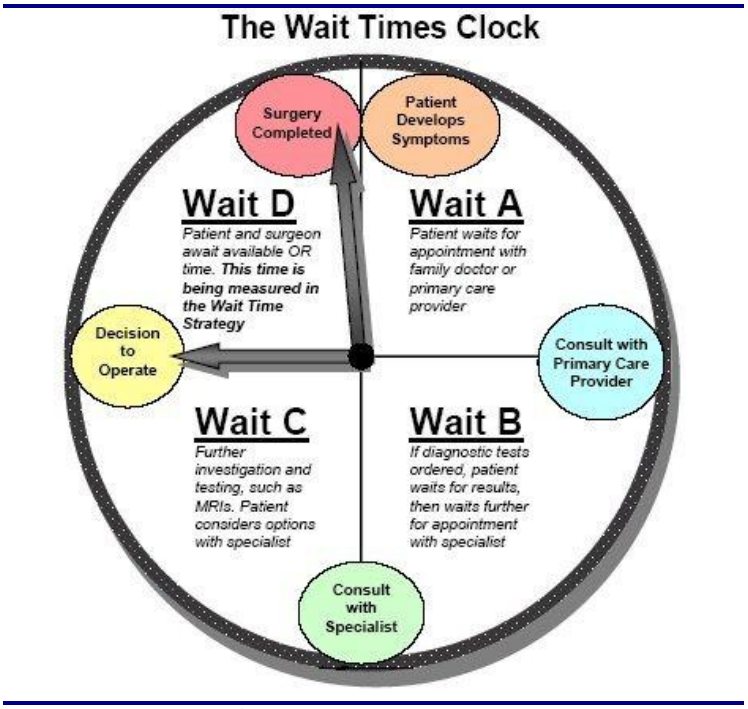
In general, wait times are influenced by factors such as:

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

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

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

Figure 4



Source: Ontario Ministry of Health and Long-Term Care

Determining optimal wait times

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

What is optimal?

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

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

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

Costs of waiting

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

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

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

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

Benefits of waiting

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

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

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

Empirical research

To date, most statistics and research on wait times have focused on the experience of the median patient[6]. Provincial government health ministry's now provide information on wait times and wait lists for some or all of the priority areas. The Canadian Institute for Health Information monitors and collates this information in a comparison of wait time tables[7]. This information joins the survey by the Fraser Institute, which has, for the last 19 years, published its *Waiting Your Turn* report on the length and size of queues for visits to specialists and for diagnostic and surgical procedures.

The Fraser Institute's information, which is based on the survey responses of medical practitioners, constitutes the most comprehensive set of information available on wait times across the country. Its most recent survey found that wait times in 2009 for surgical and other therapeutic treatments have fallen from their 2007 highs, but remain above the times experienced in the early 1990s. The Fraser Institute compares the median wait time to a physician-determined "reasonable" wait time to draw conclusions about the provision of health care services by province and area of care.

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

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

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

[7] Canadian Institute for Health Information, *Wait Times Tables – A Comparison by Province, 2010*, (Ottawa: Canadian Institute for Health Information, March 2010).

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

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

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

3. Calculating excess wait times

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

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

Maximum recommended wait times

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

The costs of waiting for treatment in this study are based on the maximum recommended wait times agreed to the by each provincial government in response to the 2003 First Ministers' Accord on Health Care Renewal. None of the provinces have, however, established maximum recommended wait times for an MRI exam. This study has, therefore, adopted the maximum wait time determined by the Wait Time Alliance for Timely Access to Health Care, a group of national medical specialty societies whose members are directly involved in providing care to patients. All wait times represent the maximum recommended wait time for treatment from the time the procedure is booked to the time it is performed. Of all the assumptions used in this study, these have the largest impact on the results. Choosing different wait times standards has a direct impact on the results of this analysis.

Table 1[8]

Maximum Recommended Treatment Wait Time *maximum recommended wait for treatment after appointment with specialist (in days)*	
Orthopaedics: total joint replacement surgery	182
Ophthalmology: cataract surgery	112
Cardiology: CABG level 1 surgery	14
Cardiology: CABG level 2 surgery	42
Cardiology: CABG level 3 surgery	182
Diagnostic Procedures: MRI	28

Source: CIHI and Wait Time Alliance for Timely Access to Health Care

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

Median patient wait times for treatment

Median patient wait times for treatment represent the amount of time the patient at the 50th percentile spent waiting for treatment after his or her specialist had booked it. The median is considered a more reliable measure than the average because average wait times can vary widely over time based on the presence of outliers (a few people waiting an extraordinary length of time for treatment). Median wait times for treatment are reported in Table 2 for each priority area and province.

Table 2[9]

Treatment Wait Time *median wait for treatment after appointment with specialist (in days)*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	80	110	170	140	65	70	121	188	123	107
Ophthalmology: cataract surgery	49	88	28	82	43	112	45	67	67	31
Cardiology: CABG level 1 surgery	1	3	1	10	3	1	3	0		1
Cardiology: CABG level 2 surgery	8	48	4	34	6	6	49	1		10
Cardiology: CABG level 3 surgery	21	10	9	127	18	32	80	28		10
Diagnostic Procedures: MRI	84	57	77	56	40	77	56	42	111	109

Source: CIHI and the Fraser Institute

Wait times for the median patient are, in general, longest for hip and knee replacement, next longest for cataract surgery and MRIs, and shortest for CABG surgery. Provincial variation in wait times is high. The patient-weighted national mean for joint replacement surgery median wait times is 85 days but varies from a high of 188 days to a low of 65 days. The disparity in wait times for an MRI is also high, with a patient-weighted national mean of 57 days and provincial medians ranging from a high of 111 days to a low of 40 days.

Excess wait times

The next natural calculation, and one that is frequently seen in the research on wait times, is the degree to which median wait times exceed the recommended maximum wait time for treatment. In some studies, this is presented as a ratio; for example, median wait times might be 110% of

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

- Canadian Institute for Health Information, *Wait Times Tables – A Comparison by Province, 2010,* (Ottawa: Canadian Institute for Health Information, March 2010), pp. 8-13, 17.

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

- Median wait times for total joint replacement, cataract and CABG surgery for Quebec in 2009 were drawn from: Nadeem Esmail, *Waiting Your Turn 19th Edition: Hospital Waiting Lists in Canada* (Vancouver: The Fraser Institute, 2009), Tables 5g (p.70), 5c (p.58), 5h (p.70).
- Median wait times for CABG surgery Nova Scotia in 2009 were drawn from: Ibid., Table 5h, p. 70.
- Median wait times for MRI exams for British Columbia, Saskatchewan, Manitoba, Quebec, New Brunswick, and Newfoundland and Labrador in 2009 were drawn from: Ibid., Table Chart 19, p. 52.

recommended wait times. Table 3 simply subtracts the 2 to show the number of days that the median patient is waiting in excess of the recommended period.

Table 3

Excess Wait Time *excess of median wait time over maximum recommended for treatment (in days)*	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	-102	-72	-12	-42	-117	-112	-61	6	-59	-75
Ophthalmology: cataract surgery	-63	-24	-84	-30	-69	0	-67	-45	-45	-82
Cardiology: CABG level 1 surgery	-13	-11	-13	-4	-11	-13	-11	-14	-14	-13
Cardiology: CABG level 2 surgery	-34	6	-38	-8	-36	-36	7	-41	-42	-32
Cardiology: CABG level 3 surgery	-161	-172	-173	-55	-164	-151	-102	-154	-182	-172
Diagnostic Procedures: MRI	56	29	49	28	12	49	28	14	83	81

Source: The Centre for Spatial Economics

Median wait times for nearly all surgical procedures are now below the maximum recommended across Canada — only total joint replacement surgery in Nova Scotia and level 2 cardiac surgery in Alberta and New Brunswick exceed the maximum recommended wait time. Median wait times for MRIs, however, still exceed the maximum recommended in all provinces.

These results are a significant improvement over the situation faced by Canadians back in 2003 and, although encouraging, it is important to recognize the limitations of this analysis. If, for example, the median patient experiences a wait time equal to the maximum recommended wait time, then the remaining 50% of patients have to wait longer than recommended for treatment. The analysis in this report requires a more complete understanding of the number of patients waiting longer than recommended for treatment.

An estimate of the distribution of patients by province, priority area and length of wait is needed to develop a better understanding of the impact of wait times. Tables 4a-f present the published data on the distribution of patient wait times by priority area and province. The available data is limited to the wait time in days at the 50^{th} percentile (the median), the 90^{th} percentile and the proportion of patients treated within the benchmark period (the maximum recommended wait time).

Table 4a[10]

Distribution of Patient Wait Times for Total Joint Replacement Surgery										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Wait Time in Days @ 50th percentile	80	110	170	140	65	112	121	188	123	107
Wait Time in Days @ 90th percentile	253	312	443	373	175		306	562	260	254
Proportion @ 182 day benchmark	80	75	54	60	91	86	68	49	76	75

Table 4b

Distribution of Patient Wait Times for Cataract Surgery										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Wait Time in Days @ 50th percentile	49	88	28	82	43	70	45	67	67	31
Wait Time in Days @ 90th percentile	195	270	112	161	104		135	210	163	114
Proportion @ 112 day benchmark	77	61	90	80	92	96	83	69	80	89

Table 4c

Distribution of Patient Wait Times for CABG Level 1 Surgery										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Wait Time in Days @ 50th percentile	1	3	1	10	3	1	3			1
Wait Time in Days @ 90th percentile	2	8	6	14	11		55			4
Proportion @ 14 day benchmark	100	96	92	98	94	86	81			100

Table 4d

Distribution of Patient Wait Times for CABG Level 2 Surgery										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Wait Time in Days @ 50th percentile	8	48	4	34	6	6	49	16		10
Wait Time in Days @ 90th percentile	32	149	45	39	38		123			45
Proportion @ 42 day benchmark	98	43	90	93	92	91	47	80		87

Table 4e

Distribution of Patient Wait Times for CABG Level 3 Surgery										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Wait Time in Days @ 50th percentile	21	10	9	127	18	32	80	28		10
Wait Time in Days @ 90th percentile	58	116	123	173	53		80			105
Proportion @ 182 day benchmark	100	99	94	100	100	100	100	98		100

[10] The distribution of wait times for this update was obtained from the following sources:

- Canadian Institute for Health Information, *Wait Times Tables – A Comparison by Province, 2010*, (Ottawa: Canadian Institute for Health Information, March 2010), pp. 8-13, 17.

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

- Median wait times for total joint replacement, cataract and CABG surgery for Quebec in 2009 were drawn from: Nadeem Esmail, *Waiting Your Turn 19th Edition: Hospital Waiting Lists in Canada* (Vancouver: The Fraser Institute, 2009), Tables 5g (p.70), 5c (p.58), 5h (p.70).
- Median wait times for CABG surgery Nova Scotia in 2009 were drawn from: Ibid., Table 5h, p. 70.
- Median wait times for MRI exams for British Columbia, Saskatchewan, Manitoba, Quebec, New Brunswick, and Newfoundland and Labrador in 2009 were drawn from: Ibid., Table Chart 19, p. 52.

The proportion of patients having an MRI exam by the benchmark was estimated by the C_4SE for all provinces.

Table 4f

Distribution of Patient Wait Times for an MRI Exam	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Wait Time in Days @ 50th percentile	84	57	77	56	40	77	56	42	111	109
Wait Time in Days @ 90th percentile		189			105			107	182	
Proportion @ 182 day benchmark	30	43	28	37	44	29	37	43	18	19

Source: Canadian Institute for Health Information, the Fraser Institute, and The Centre for Spatial Economics

The data in Tables 4a-f are then used to estimate the proportion of patients with wait times that exceed the maximum recommended time for treatment. The estimation is based on the assumption that patient wait times are normally distributed. The results of those estimates are shown in Table 5. The proportions vary from a low of 0% of patients waiting for CABG surgery to a high of 82% of patients waiting for an MRI in Prince Edward Island.

Table 5

Proportion of Patients with Wait Times Exceeding the Maximum Recommended Period	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	20%	25%	46%	40%	9%	14%	32%	51%	24%	25%
Ophthalmology: cataract surgery	23%	39%	10%	20%	8%	4%	17%	31%	20%	12%
Cardiology: CABG level 1 surgery	0%	4%	8%	2%	6%	14%	19%			0%
Cardiology: CABG level 2 surgery	2%	57%	10%	7%	8%	9%	53%	20%		13%
Cardiology: CABG level 3 surgery	0%	1%	6%	0%	0%	0%	0%	2%		0%
Diagnostic Procedures: MRI	70%	57%	72%	63%	56%	71%	63%	57%	82%	81%

Source: The Centre for Spatial Economics

The final calculation needed to assess excess wait times is to determine the average wait time for a patient whose wait time for treatment exceeds the recommended maximum period (Table 6). This measure excludes patients who were fortunate enough to have their treatment provided within the recommended maximum period. Subtracting the maximum recommended wait time (Table 1) from the wait times in Table 6 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 6

Average Wait for Patients with Wait Times Exceeding the Maximum Recommended Period (in Days)	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	236	234	266	295	196	200	257	315	218	237
Ophthalmology: cataract surgery	153	167	126	124	116	118	139	163	133	125
Cardiology: CABG level 1 surgery	14	12	16	7	14	18	19			14
Cardiology: CABG level 2 surgery	23	70	49	38	46	47	115	56		48
Cardiology: CABG level 3 surgery	182	182	187	182	182	182	182	229		182
Diagnostic Procedures: MRI	134	169	115	103	96	116	103	97	138	136

Source: The Centre for Spatial Economics

Morbidity rates

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

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

Table 7[11]

Age-Standardized Incidence Rates per 100,000 People										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	269	284	290	315	307	153	236	229	267	198
Ophthalmology: cataract surgery	779	786	925	776	883	837	841	770	770	674
Cardiology: CABG surgery	65	58	93	85	78	70	83	73	73	105
Diagnostic Procedures: MRI	2,040	4,090	2,210	3,230	3,510	2,930	3,270	2,630	2,050	1,680

Source: Canadian Institute for Health Information

The next step is to determine the age and sex of the patient. Information on the distribution of patients by age and sex is only available at the national level, so the same age and sex distribution is applied to all provinces. Table 8 provides the share by age and sex of patients for each priority area. These are the same as those used in the 2006 study.

Table 8[12]

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

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

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

- The age standardized incidence rates for joint replacement surgery in 2007 for patients aged 20 and over were drawn from the Canadian Institute for Health Information's web site *(http://qstat.cihi.ca)*.
- The age standardized incidence rates for cataract surgery in 2007–2008 were drawn from: Canadian Institute for Health Information, *Surgical Volume Trends, 2009* (Ottawa: Canadian Institute for Health Information, 2009), Appendix 1, pp. 22-37.
- The age standardized incidence rates for CABG surgery in 2007 were drawn from the Canadian Institute for Health Information's web site *(http://qstat.cihi.ca)*.
- The age standardized incidence rates for MRI exams in 2007 were drawn from: Canadian Institute for Health Information, *Medical Imaging in Canada, 2007*, (Ottawa: Canadian Institute for Health Information, 2008), Figure A-6, p. 153.

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

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

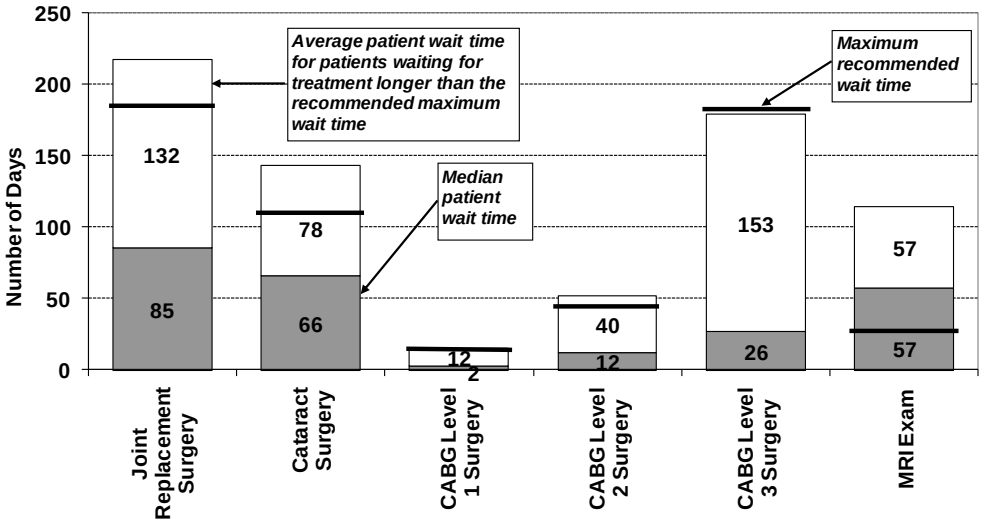
The queue

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

With a few notable exceptions, the median patient generally receives treatment at or before the maximum recommended wait time limit. This experience is not, however, shared by all patients. The average wait for patients not treated within the recommended maximum period is over 7 months for hip and knee replacement surgery and over 4 months for cataract surgery. Nearly all cardiac patients are now treated within the maximum recommended period but the situation for patients requiring an MRI remains grave. The maximum recommended wait is 28 days, but the median patient still waits 57 days, while the patient who does not get a scan within that maximum recommended period waits an average of 114 days.

Figure 5

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



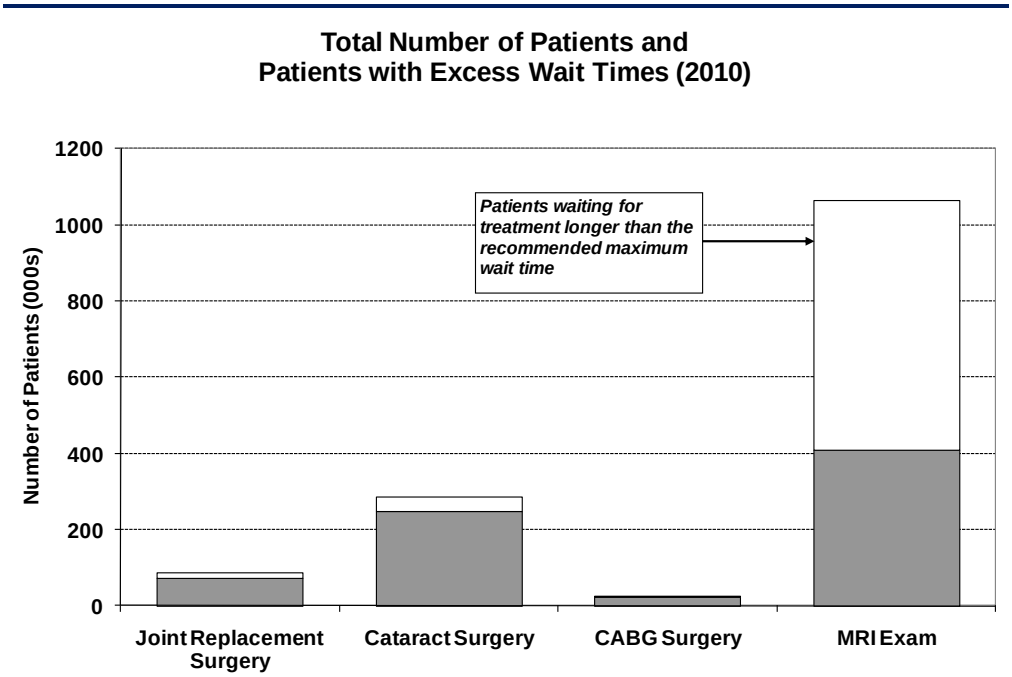
Source: The Centre for Spatial Economics based on information from CIHI and the Fraser Institute

Figure 5 shows that, with the notable exception of MRIs, the median patient receives treatment within the maximum time set by the provinces or recommended by the Wait Time Alliance.

Figure 6 shows the number of patients treated within the maximum recommended period (the shaded bar) and the number of patients waiting for longer than the maximum recommended period (the clear bar). In this chart, nearly all patients receive treatment within the maximum recommended time for all priority areas except MRIs. In this case, considerably more than half of all patients have to wait longer than medically recommended for their exam.

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

Figure 6



Source: The Centre for Spatial Economics

As will be shown in Section 4, the length of time spent waiting for treatment is a key determinant of the economic costs of waiting. Patients in provinces that have lengthy wait times for treatment experience higher economic costs from wait lists. Table 9 provides estimates of the number of patients affected by lengthy waits for treatment in 2010. Nationally, the number of patients on wait lists has fallen sharply since 2003; down to 12,000 for joint replacement surgery, 38,000 for cataract surgery, and 2,000 for CABG surgery. There are, however, still 655,000 people waiting longer than 28 days for an MRI exam. Total economic costs are determined by the number of patients in this table multiplied by per-patient costs.

Table 9

Annual Number of Patients Waiting in Excess of the Recommended Maximum Wait Time (thousands, 2010)										
	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	1.9	2.0	1.0	1.2	2.8	1.3	0.4	0.9	0.1	0.2
Ophthalmology: cataract surgery	8.1	11.5	1.0	1.9	9.3	2.6	1.1	2.2	0.2	0.4
Cardiology: CABG surgery	0.0	0.4	0.1	0.0	0.4	0.4	0.3	0.0		0.0
Diagnostic Procedures: MRI	64.4	87.4	16.5	25.2	257.8	164.9	15.5	14.0	2.4	6.9

Source: The Centre for Spatial Economics

4. Methodology for calculating the costs of waiting and treatment

This section reviews and expands the approach taken to estimate the economic impact of wait times from the 2006 and 2008 studies. The costs addressed in this study are those that could be mitigated by adhering to wait time standards, so they focus exclusively on the costs incurred by patients waiting longer than the recommended maximum period for treatment. The costs of waiting are organized in 1 of 3 categories: patient costs, caregiver costs and health care system costs. This analysis is then supplemented with estimates of the costs of treatment for patients in the queue.

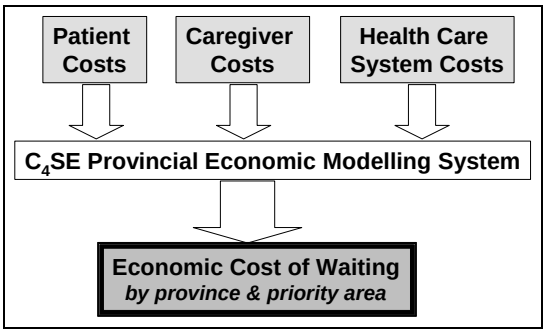
The first category of wait time cost is the impact from reduced economic activity as a result of patients being unable to participate in the labour force. These costs involve the direct loss in production from these people no longer producing goods and services as well as the broader reduction in economic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

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

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

These 3 sets of costs are used in the C_4SE Provincial Economic Modeling System to determine the cost of waiting by province for each priority area. This section also includes a brief discussion of the C_4SE modeling system[13] and summarizes some of the key assumptions that have a bearing on the results obtained from this analysis.

Figure 7

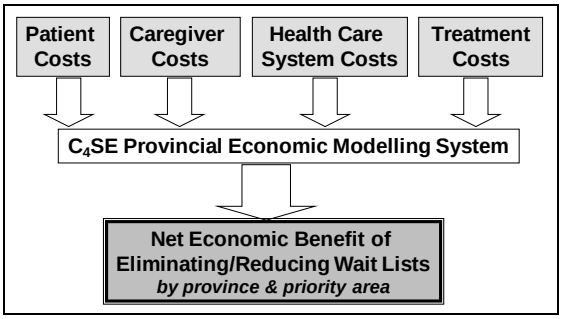


An understanding of the economic costs associated with waiting for treatment, however, provides only one half of the information required by policymakers to determine the appropriate level of resources required by the medical system. Wait time costs, when combined with information on the cost of providing 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. The

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

C_4SE's Provincial Economic Modeling System was also used to evaluate the welfare implications of (i) reducing wait times to the "economically efficient" level and (ii) eliminating wait times in each of the four priority areas on a province-by-province basis.

Figure 8



Patient costs

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

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

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

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

The answers to this question, shown in Table 10, 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 10[14]

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

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

The proportion of cataract surgery patients who need to discontinue their regular activities is low, at just 7%. This is because the majority of people present for surgery when they notice difficulty with visual tasks rather than waiting until their ability to do the activities of daily living is threatened. Current wait list research only looks at the level of disability when the patients are put on the waiting list. No published literature shows the rate of decline in function in these patients. It is possible that with cataract wait times of one year or more, an increasing proportion of patients will have to discontinue their regular activities. Any increase in this proportion would significantly increase the estimated economic cost of wait times for cataract surgery.

The approach taken to determine the impact on the labour force from patients who are both unable to continue work and are experiencing wait times longer than recommended is shown in Figure 9 through Figure 12. The information in the light grey shaded text boxes in these figures can be found in this and Section 3 of this report, the information in the clear text boxes is data from the C_4SE's provincial economic modeling system, and the information shaded in the dark grey text boxes is the result of calculations using these information sets.

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

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

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

determine the impact of excess wait times on each province's economy for each of the priority health care areas (see Figure 10).

Figure 9

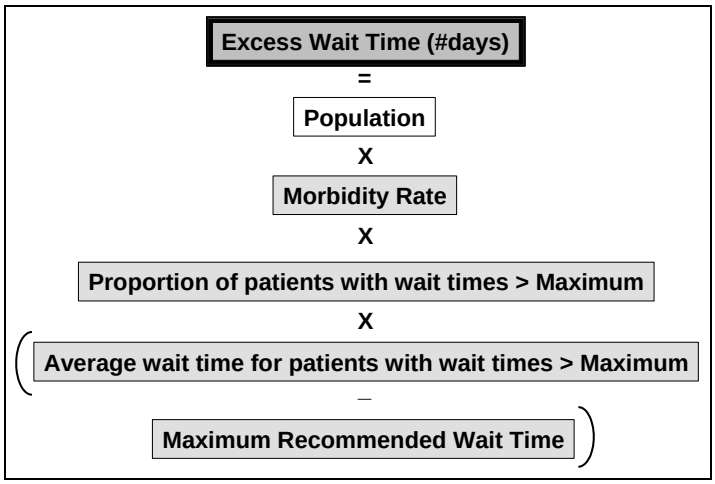
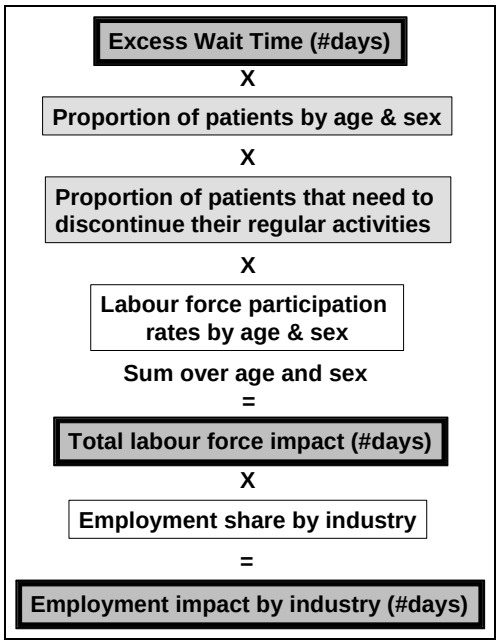


Figure 10



Caregiver costs

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

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

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

The physicians' responses to the first of these questions are summarized in Table 11. Approximately 20% of patients waiting for joint replacement surgery require the assistance of a caregiver. Frequently these patients are quite elderly and require considerable assistance. For patients waiting for cataract surgery, it was estimated that less than 10% (a value of 5% was used in the analysis) require the assistance of a family member as a caregiver. But for patients waiting for CABG surgery, this ratio rises to 25%.

Table 11

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

Source: The Centre for Spatial Economics

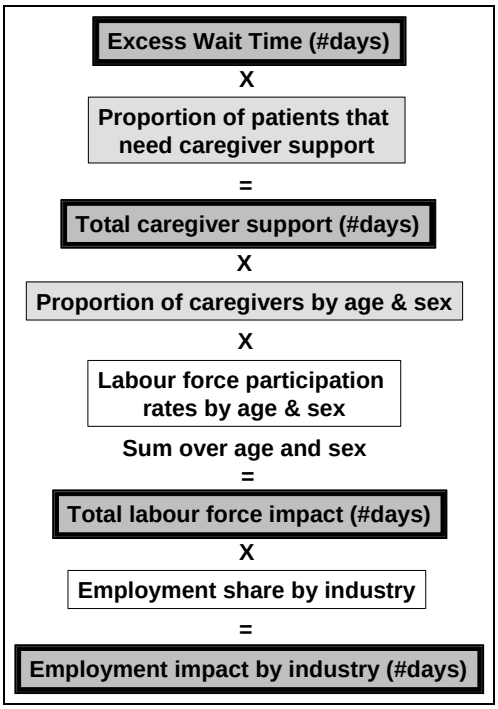
The answers to the second question are combined with the general and patient population statistics to create an estimated distribution of caregivers by age and sex. The male and female proportions for each age group add up to 100% for each of the priority areas in Table 12.

Table 12

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

Source: The Centre for Spatial Economics

Figure 11



The steps required to determine the impact of caregiver support on the labour market are similar to those taken to determine the impact from patients. The process begins with the excess wait time measure developed previously. This excess wait time is multiplied by the proportion of patients that require caregiver support to determine total caregiver support (measured in days) for each province and priority area. This step is followed by determining the level of caregiver support by sex and age cohorts for each province and priority area, which can then be used to determine the impact on the labour force by multiplying each group by its participation rate in the labour force. The sum of these labour force impacts is then distributed across the 14 industry sectors in the model based on their shares of total employment. These are the values used in the model to determine the impact of caregiver support on each province's economy for each of the priority health care areas (see Figure 11).

Health care system costs

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

A key difference between these costs and those described previously is that from the perspective of Statistics Canada's National Accounts, spending on goods and services within the medical

system represents an increase in economic activity[15]. These goods and services must, however, be paid for. Therefore, this study assumes that the cost of providing additional health care services to patients waiting for a period longer than the recommended maximum is financed through an increase in provincial personal income taxes. Imposing the requirement that these goods and services be paid for through general revenues means this study attempts to measure the net cost (or benefit) of this spending.

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

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

> *For patients waiting longer than the recommended period for treatment, what proportion requires additional specialist appointments prior to treatment? Responses were for the proportion needing 0, 1, 2 or 3 additional visits.*
>
> *What proportion requires additional visits post-treatment (beyond those that would normally be scheduled)? Responses were for the proportion needing 0, 1, 2 or 3 additional visits.*
>
> *What is the average cost of a visit (i.e., the amount billed to the provincial health authority)?*
>
> *For patients waiting longer than the recommended period for treatment, what proportion requires additional tests/procedures and what is their average cost?*
>
> *What proportion of patients waiting for treatment requires medication and what is the average cost (per month)?*
>
> *For patients waiting longer than the recommended period for treatment, what proportion requires additional medications (i.e., not normally taken) and what is the average cost (per month)?*

The responses from the 2006 study physician's survey were used for this update. In the last year, costs were assumed to have risen by 5.8%[16] for medical appointments and other tests and procedures, and by 15.0%[17] for drugs. The results are summarized in Table 13, which shows that additional medical system costs for each patient waiting longer than the maximum recommended

[15] 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.

[16] This increase is based on the change in the CPI for health and personal care since 2006.

[17] This increase is based on the change in per capita drug spending since 2006 published in: Canadian Institute for Health Information, *Drug Expenditure in Canada, 1985 to 2009*, (Ottawa: CIHI, 2010), p.65.

period are $241 for hip and knee replacement surgery, $37 for cataract surgery and $342 for CABG surgery.

Table 13

Health Care System Costs by Priority Area *Dollars per Patient Waiting Longer than the Maximum Recommended Period*	Hip & Knee Replacement Surgery	Cataract Surgery	CABG Surgery
Proportion of Patients Requiring Additional Pre-op Appointments:			
0 Additional Appointments	15%	5%	10%
1 Additional Appointment	35%	85%	40%
2 Additional Appointments	45%	10%	30%
3 Additional Appointments	5%	0%	20%
Proportion of Patients Requiring Additional Post-op Appointments:			
0 Additional Appointments	100%	100%	70%
1 Additional Appointment	0%	0%	10%
2 Additional Appointments	0%	0%	10%
3 Additional Appointments	0%	0%	10%
Average Cost of an Additional Appointment:			
Average Cost	$38	$35	$43
Other Tests & Procedures:			
Prop. Requiring Additional Tests	100%	0%	Varies
Avg. Cost of Additional Tests	$47	$0	$113
Proportion of Patients Requiring Medication:			
Prop. Requiring Additional Drugs	80%	0%	100%
Avg. Monthly Cost of Additional Drugs	$176	$0	$200
Proportion of Patients Requiring Additional Medications:			
Prop. Requiring Additional Drugs	20%	0%	10%
Avg. Monthly Cost of Additional Drugs	$176	$0	$87
Summary of Costs			
Appointment Costs	$53	$37	$94
Test / Procedure Costs	$47	$0	$107
Drug Costs	$176	$0	$209
Total Additional Medical Costs:	$276	$37	$410
Drug costs for patients over 65	$141	$0	$141
Total Additional Medical System Costs:	**$241**	**$37**	**$342**

Source: The Centre for Spatial Economics

Orthopaedics

The average cost for an orthopaedic specialist's limited consult is $48, which can be billed once every six months, and $32 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 $47.

About 80% of patients take NSAID and/or Tylenol #3, with a smaller proportion requiring a stronger narcotic, for an approximate average cost of $35 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 $35 a month.

Ophthalmology

Approximately 85% of patients waiting for longer than the recommended maximum period for cataract surgery require an additional visit to their specialist, and about 10% require 2 additional visits at an average cost of $35 a visit.

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

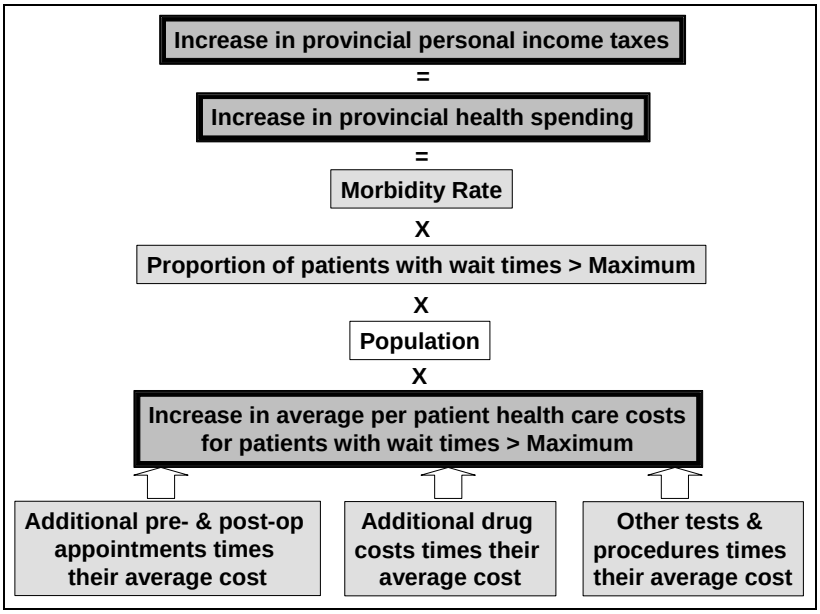
Cardiology

The average cost of visit to a general practitioner is $32 and $69 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 $43.

All patients waiting in excess of the recommended period for CABG surgery require an additional ECG at a cost of $32. Patients waiting longer than 3 to 6 months will need a repeat echocardiogram at a cost of $190, and those waiting longer than 6 to 12 months will need a repeat cardiac catheterization at a cost of $529.

Cardiac patients who wait longer than the maximum recommended period will need to purchase about one-and-one-half additional months' worth of medication. The regular medication includes ASA, B-Blocker ($20), Statin ($69), ACEI ($35) and NTG ($6). Additional medications required include anti-anginals ($58).

Figure 12



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

patient health care costs for patients with wait times that exceed the recommended maximum. This estimate is obtained by multiplying the proportion of patients experiencing these costs by their average cost. The average per-patient cost is then multiplied by the province's population, the proportion of patients with wait times exceeding the maximum recommended and the morbidity rate for the priority area. This multiplication yields the increase in provincial health spending that can be attributed to patients waiting longer than the recommended maximum period for each of the priority areas. As discussed earlier, this value is also the amount by which provincial personal income taxes are raised (see Figure 12).

Treatment costs

The wait time costs described in the preceding sections can, when combined with information on the cost of providing the health care services required to reduce or eliminate wait times, be used in cost-benefit analysis to help determine an appropriate level of health care services. The information on the cost of reducing wait times can provide policy makers with evidence of the economic and fiscal benefits of controlling wait times for medical treatment.

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

The cost of the additional hospital and physician services required to reduce or eliminate the queue in each priority area except for MRIs were estimated using data from CIHI's Canadian MIS database and its National Physician database. Physician fee-for-service costs on a cost-per-service basis for 2005-6 were drawn from CIHI's National Physician database.[18] Hospital costs for 2007-8, which exclude physician services, for each priority area where obtained from CIHI's Canadian MIS database. Estimated average costs, for all age groups, were weighted by patient volumes for the relevant case mix groups for each priority area.[19] The data were then adjusted to reflect wages and prices in 2009.

The cost of an MRI exam was estimated based on the hospital operating expenses on MRIs divided by the number of MRI exams performed in Newfoundland and Labrador, Nova Scotia, Ontario, Manitoba, and British Columbia and adjusted to reflect wages and prices in 2009.[20] No variation in the cost for an MRI exam by province was possible.

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[18] Canadian Institute for Health Information, *Physicians in Canada: Fee for Service Utilization, 2005-2006*, (Ottawa: CIHI, 2008) Table 7-3, pp. 107-109.

[19] Data obtained from: http://secure.cihi.ca/cihiweb/dispPage.jsp?cw_page=statistics_results_topic_hospspend_e in May, 2010.

[20] Canadian Institute for Health Information, *Medical Imaging in Canada, 2007*, (Ottawa: CIHI, 2008). The hospital operating expenses by type of medical imaging equipment for these five provinces in 2005-6 is found in Figure 37, p.69 and the number of exams by province in 2006-7 in Table5, p.91. Operating costs were adjusted to reflect 2006-7 prices and then the resulting cost per exam were adjusted to reflect wages and prices in 2009.

The sum of hospital and physician costs yields the total treatment cost per patient for each of the priority areas (see Table 14). Treatment costs are, not surprisingly, highest for CABG surgery; ranging from a high of $32 523 per patient in New Brunswick to a low of $23 271 in British Columbia. The cost of joint replacement surgery is approximately $11 000, for cataract surgery about $4 000 and about $280 for an MRI exam. The reader should note that these total average costs per case do not reflect possible changes in costs due to (i) more efficient use of existing staff, facilities and equipment or (ii) the need to add facilities and equipment to accommodate the increased number of procedures.

Table 14

Priority Area Average Treatment Costs per Patient
2009 Reference Year Dollars per Patient

	BC	AB	SK	MB	ON	QB	NB	NS	PE	NL
Priority Area Costs										
Orthopaedics: total joint replacement surgery	10,418	12,649	11,933	11,116	11,957	11,512	11,927	12,427	10,941	11,722
Ophthalmology: cataract surgery	3,856	4,536	4,340	4,073	4,354	4,026	4,082	4,715	3,846	4,274
Cardiology: CABG surgery	23,271	29,736	28,064	25,366	24,421	24,120	32,523	24,984		29,941
MRI Exam Costs	281	281	281	281	281	281	281	281	281	281
Hospital Costs										
Orthopaedics: total joint replacement surgery	9,562	11,532	11,075	10,268	11,145	10,718	10,828	11,669	10,144	10,903
Ophthalmology: cataract surgery	3,269	3,928	3,784	3,508	3,785	3,620	3,511	3,922	3,229	3,667
Cardiology: CABG surgery	20,845	26,975	25,223	23,486	22,901	22,922	30,675	23,268		28,608
Physician Costs										
Orthopaedics: total joint replacement surgery	856	1,117	858	847	812	794	1,099	758	797	819
Ophthalmology: cataract surgery	587	608	555	565	569	406	572	794	617	607
Cardiology: CABG surgery	2,425	2,760	2,841	1,881	1,520	1,198	1,848	1,715		1,333
MRI Exam Costs	281	281	281	281	281	281	281	281	281	281

Source: The Centre for Spatial Economics

The next step is to (i) estimate the cost of reducing wait times by increasing the supply of hospital and physician services and (ii) estimate the overall welfare benefits to society of reducing wait times. This analysis "completes" the work presented in the earlier reports by providing a comprehensive cost-benefit review of reducing or eliminating the queue for the four priority areas.

Reducing wait lists will reduce wait times for patients waiting longest for treatment. As previously noted, the per-patient costs of waiting are highest for those waiting longest for treatment. As a result, a set of wait time cost curves are developed for each priority area and province. These wait time cost curves represent the economic benefit of reducing the length of time spent waiting for treatment. From a health care policy perspective, these are the relevant benefits for use in cost-benefit analysis. The cost of treatment, therefore, flows from the per-patient treatment costs shown in Table 14 multiplied by the number patients waiting for treatment.

A set of wait time cost curves for each province and priority area in terms of GDP per patient by length of wait for treatment is generated based on the distribution of wait times and collapsed to patient quintiles. These are represented by the downward sloping curves in Figure 13and Figure 14. Patients waiting the longest for treatment experience the highest wait time costs while the cost falls for those with wait times that approach the maximum recommended benchmark.

Figure 13

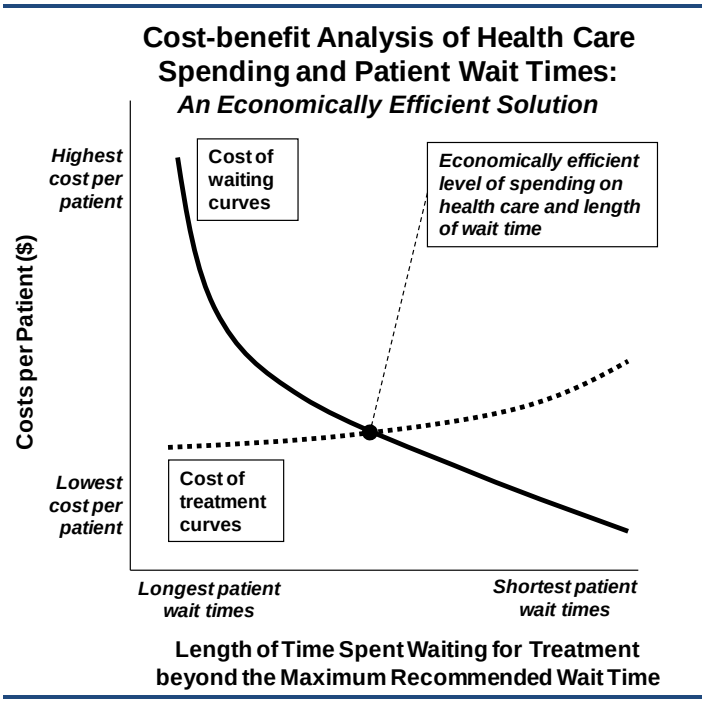
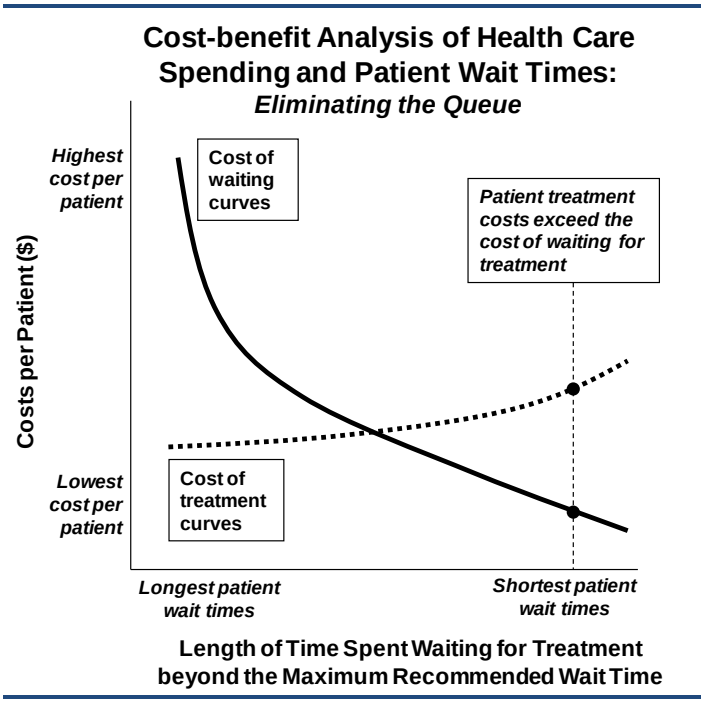


Figure 14



Figures 13 and 14 show that the cost of providing treatment can be expected to rise, on a per-patient basis, as the number of patients treated rises. This is because the costs of providing timely

care are likely to rise on a per-patient basis as available resources become fully utilized and new — more expensive — capacity has to be added to health care system. Building new operating theatres and hiring more doctors, nurses and support staff to significantly increase capacity is, for example, considerably more expensive — in both absolute terms and per patient treated — than increasing the number of procedures completed in existing facilities with current staff. The more wait times are cut, the more it costs per patient to keep cutting them, and so the curve showing health care costs per patient rises. The higher up this curve, the harder it becomes for policy-makers to justify spending public money on cutting wait times instead of other important public services.

The analysis in this study has, however, taken a simplified approach and determined the current cost of treating an additional patient. No information was available to help determine how the per-patient treatment costs may be affected by the number of patients treated. The cost of treatment curves used in the analysis are, therefore, horizontal lines.

Another limitation of the research is the assumption that reducing wait lists will have no effect on the demand for health services. This assumes that there are no discourages patients that have elected not to seek treatment because of the length of time to receive treatment.

As discussed in Section 2, there is no agreed upon definition of an optimal wait time so the economic implications of two competing notions of optimality were estimated. The first is the economist's view of providing an economically efficient level of services while the second is the complete elimination of the queue. The total cost of additional medical resources was, therefore, calculated to (i) provide the economically efficient level of services and to (ii) eliminate the queue.

The economically efficient level of public spending on health care is then be determined by the intersection of the downward sloping wait time cost curves with the treatment cost curves. The point of intersection marks the additional number of patients that should be treated and sets the maximum wait time cost of the remaining patients equal to the cost of providing additional services (see Figure 13). If, however, the cost of treatment exceeds the wait time cost experienced by the quintile waiting longest for treatment, then there is no economic rationale to increase the level of service. Alternatively, if the cost of treatment is lower than the wait time cost experienced by the quintile with the shortest wait for treatment, then there is an economic rationale for providing treatment for all the patients in the queue.

Under the alternate policy objective, eliminating the queue means that treatment must be provided for all patients. In this environment, shown in Figure 14, the cost of treatment may exceed the cost of waiting.

The C_4SE's Provincial Economic Modeling System was used to evaluate the welfare implications of (i) reducing wait times to the economically efficient level and (ii) eliminating wait times in each of the four priority areas on a province-by-province basis. The maintained assumption in this analysis was that tax policy remained unchanged while governments boosted spending on additional treatment in each of the priority areas.

C_4SE Provincial Modeling System

The C_4SE's Provincial Modeling System is a dynamic multi-sector regional economic model of the country. It includes a bottom-up set of macroeconomic models for the provinces, the territories and the rest of the world. The national model links economic activity in one region

with activity in the other regions through trade. The model includes detailed income and expenditure categories and demographic and labour market information. The purpose of the model is to produce medium- to long-term projections of the provincial economies and conduct simulation studies that require industry and demographic detail. More information on the C_4SE's Provincial Modeling System can be found in Appendix C to this report.

Critical assumptions

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

Assumptions that if relaxed may raise the cost estimates

- The primary benefit of wait lists is that they ration demand. This rationing likely discourages some patients from seeking treatment. Efforts to reduce wait times and improve service could, therefore, encourage those patients to return to the medical system limiting the overall improvement in wait times. This issue is particularly difficult to measure and account for. As a result, most studies, including this one, ignore this issue. It will be assumed that the incidence of treatment is unaffected by the availability of care.
- The direct impact on economic activity of patients not in the labour force was ignored. This ignores reductions in leisure spending or volunteer activity as a result of patients and caregivers being unable to pursue these activities to the extent that they might under normal conditions. It also ignores the value of leisure time. The reason for this assumption is that leisure (or non-work related) activity is not measured by Statistics Canada's National Accounts. The reduction in these patients quality of life is clearly real, but not given a monetary value in this study.
- This study has not imposed an overall revenue or budgetary condition on federal and provincial governments that would force them to raise taxes to recover revenues lost as a result of wait time costs.
- The study assumes that the probability of patients experiencing a negative outcome from their treatment is independent of their wait time. This assumption ignores the possibility that a patient's outcome may be affected by the length of time it takes to receive treatment[21].
- This study does not consider the costs associated with waiting to see a family doctor, a specialist or waiting for results from diagnostic tests.

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

Assumptions that if relaxed may lower the cost estimates

- The private purchase of drugs, health care appliances and services by patients (and by private insurance) while waiting for treatment is ignored by this study. This assumption is adopted because these goods and services are assumed to displace spending on other (non-health) goods and services. From a well-being perspective, patients are worse off because they would have preferred to purchase those other goods and services. But economic activity is unaffected because the overall level of consumer purchases is unchanged.
- The cost of providing additional health care services to patients waiting for a period longer than the recommended maximum is fully financed through an increase in provincial personal income taxes. This assumption is important because these costs are borne by the medical system. From the perspective of the National Accounts, they represent spending on goods and services and so raise economic activity. By imposing the requirement that these goods and services be paid for through general revenues, the study can determine the net cost (or benefit) of this spending.
- The study assumes that the probability of patients leaving the wait list prior to treatment is independent of their wait time. This assumption, therefore, ignores the possibility that patients dying, getting better without treatment or deciding not to pursue treatment depends on the length of time they have to wait for treatment[22].

Assumptions with no clear impact on the cost estimates

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

On balance, the C_4SE believes the cost estimates generated by this research are conservative. In particular, 2 assumptions significantly reduce the estimated impacts. First, this study only addresses the wait time from when the specialist decides upon and requests a course of treatment to the time that treatment occurs; it ignores the wait times experienced by patients in getting to see the specialist or even in getting to see their family doctor, so a large proportion of patient costs are missing. Second, the study ignores the costs imposed on the economy through the elevated tax rates required by governments to recover the revenues lost through reduced economic activity.

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

5. Cost of waiting

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

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

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

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

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

The costs are presented in 2 ways. The first measure is the average cost per patient for patients that experience a wait time longer than medically recommended. This measure provides an estimate of the average burden placed upon these patients and is an appropriate measure for considerations of fairness and equity. The second measure is the estimated total cost to each province's economy of wait times for each of the priority areas in 2010.

Economic cost measures

The tables in the following sections provide the economic impacts of patient wait times in excess of the recommended maximum period for several measures. These economic impacts are measured as the average annual difference between the projections with and without wait lists over a 25-year projection horizon.

Gross domestic product: This measure shows the impact on the value of goods and services produced per patient expressed in 2009 reference year dollars. Values greater than zero indicate that wait lists impose a cost on the economy.

Federal government revenue: The measure shows the impact on federal government revenue generated per patient in the province expressed in 2009 reference year dollars. Values greater than zero indicate a reduction in government revenues.

Provincial government revenue: This measure shows the impact on provincial government revenue generated per patient in the province expressed in 2009

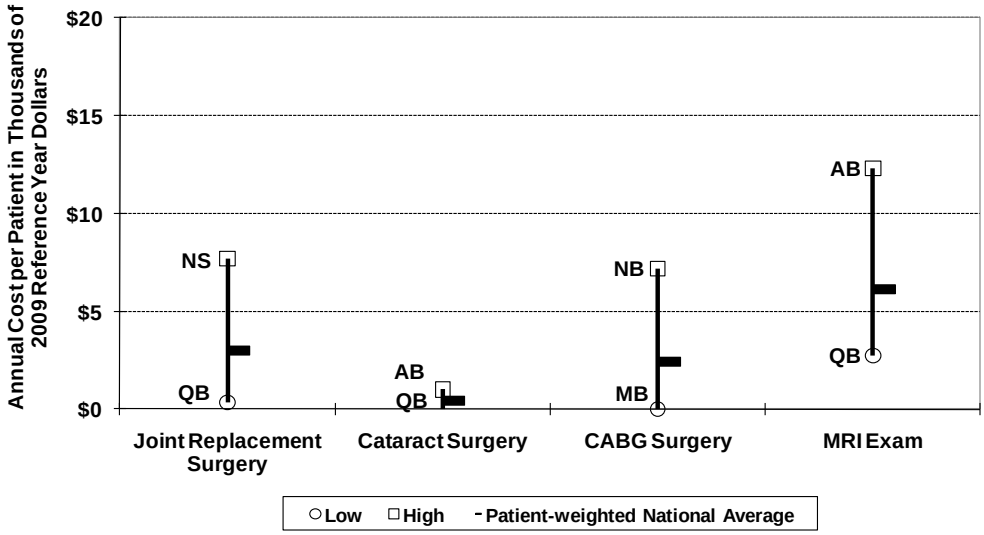
reference year dollars. Values greater than zero indicate a reduction in government revenues.

Impact on GDP

The economic costs of wait times, which vary widely by province and priority area, are summarized in Figure 15. The highest costs are generated for MRIs, followed by total joint replacement surgery and CABG surgery, with cataract surgery yielding the lowest costs.

Figure 15

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



Source: The Centre for Spatial Economics

Figure 15 provides the national, patient weighted, average cost for each priority area as a benchmark value for the provinces and compares them across priority areas. At $6 144 per patient, the wait time costs for an MRI exam are significantly higher than for the other priority areas. Significant differences in costs exist among the provinces, with Alberta's per patient cost exceeding $12 300, while Quebec's is $2 700.

The differences in costs among the provinces are also broad for both joint replacement and CABG surgery, ranging from $7 700 for joint replacement surgery in Nova Scotia to zero for CABG surgery in Manitoba. Meanwhile, the difference from top to bottom for cataract surgery is significantly less from a high of $1 000 in Alberta to a low of zero in Quebec.

It is interesting to note that no one province has either the highest or the lowest costs per patient in all priority areas. Alberta has the highest costs for two of the priority areas with the Maritime Provinces claiming the other two. The lowest costs are in Quebec for all priority areas except CABG surgery, where Manitoba has the lowest costs.

Table 15 provides the wait time costs by province and priority area for the 3 contributing factors to wait time costs.

Table 15

Impact on Gross Domestic Product *2009 Reference Year Dollars per Patient*											
	Costs per patient with excess waits										
Total Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	3,397	3,714	4,748	6,019	752	344	2,918	7,683	1,545	2,614	2,993
Ophthalmology: cataract surgery	567	1,001	157	107	10	-2	191	564	193	59	407
Cardiology: CABG surgery	4,459	5,741	838	0	40	72	7,194	2,145		5	2,449
Diagnostic Procedures: MRI	8,732	12,323	6,025	4,970	6,111	2,748	3,785	5,127	6,094	7,530	6,144
Patient Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	1,484	1,703	2,100	2,512	415	180	1,094	2,958	863	1,069	1,299
Ophthalmology: cataract surgery	314	541	114	81	33	11	99	296	175	58	231
Cardiology: CABG surgery	3,667	4,805	973	250	457	276	5,412	2,146		785	2,141
Diagnostic Procedures: MRI	8,732	12,323	6,025	4,970	6,111	2,748	3,785	5,127	6,094	7,530	6,144
Caregiver Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	2,363	2,342	2,944	3,818	624	325	2,030	5,256	860	2,047	2,010
Ophthalmology: cataract surgery	342	527	114	85	35	16	138	368	76	58	238
Cardiology: CABG surgery	2,486	1,547	412	276	128	78	2,179	1,246		253	763
Diagnostic Procedures: MRI											
Health Care System Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	-450	-331	-296	-311	-287	-161	-206	-530	-177	-502	-316
Ophthalmology: cataract surgery	-89	-67	-71	-59	-58	-29	-46	-100	-57	-57	-62
Cardiology: CABG surgery	-1,695	-611	-547	-526	-544	-282	-397	-1,247		-1,033	-455
Diagnostic Procedures: MRI											

Source: The Centre for Spatial Economics

The distribution of economic costs across the 3 cost categories considered in this study is instructive (see Figure 16). The source of total economic costs varies considerably for each of the priority areas.

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

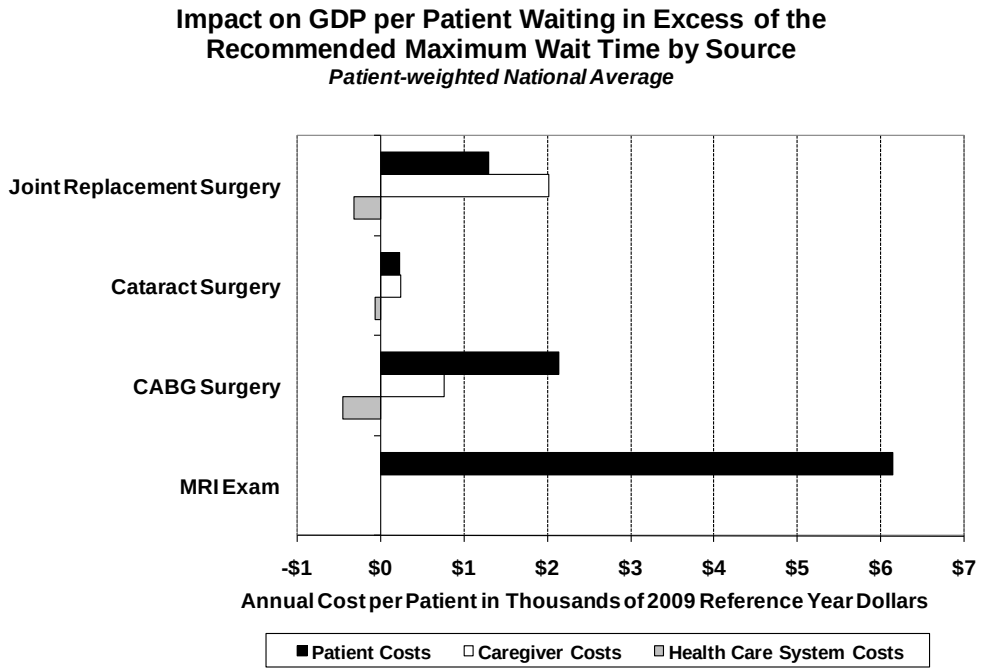
The distribution of costs between patient and caregiver is nearly equal for cataract surgery. Again, the proportion of patients requiring a caregiver is close to the proportion of patients who need to discontinue their regular activities, although 66% of these caregivers are over 65 years old.

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

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

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

Figure 16



Source: The Centre for Spatial Economics

The estimated overall cost of waiting in terms of foregone GDP for each priority area in 2010 is presented in Figure 17. This cost is simply the product of the per-patient costs presented above and the number of patients waiting for longer than the recommended maximum period for treatment.

The total estimated cost across the 4 priority areas in 2010 was $4.6 billion[23]. The true cost of wait lists in the health care system is clearly much higher because this analysis only accounts for a small proportion of the diseases for which patients are waiting for treatment and excludes several parts of the wait time process: waiting to see a specialist, waiting for diagnostic test results, waiting to see a family doctor, etc.

The cost of waiting for an MRI exam accounts for all but $104 million of the total and dominates the total wait time costs estimated in this study. This is the result of several factors conspiring together.

- First, a large number of patients need an MRI each year in Canada. The incidence rates for an MRI exam (see Table 7) are significantly higher than for any of the other priority areas.
- The second factor can be seen in Table 3 where the median patient's wait time falls far short of the maximum recommended wait time across the country. Average wait times for patients not treated within the maximum recommended period may not be the longest for the priority areas studied (see Table 6) but are still lengthy and become formidable when

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

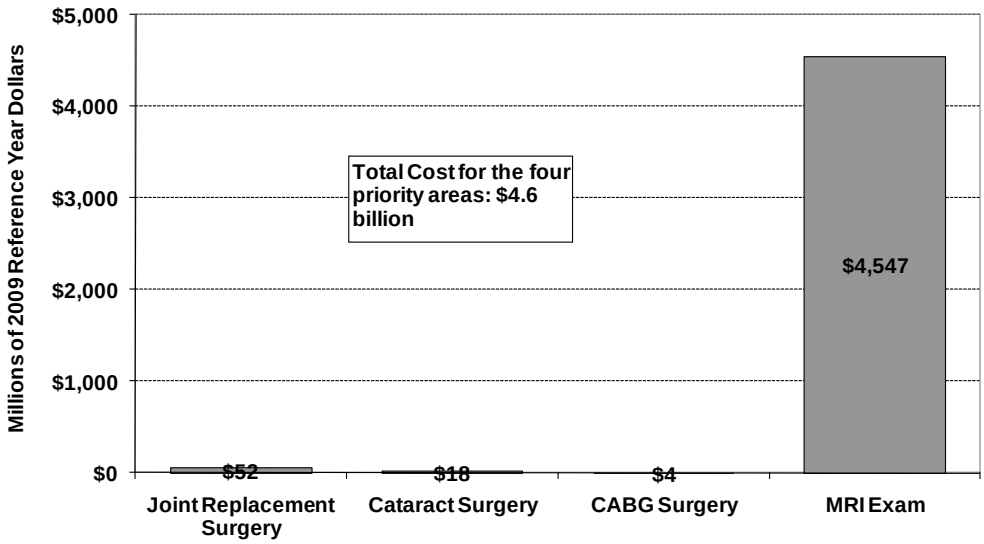
combined with the large number of patients left waiting for an exam longer than the maximum recommended time (see Table 9)[24].

- Third is the comparatively low age for patients waiting for treatment. Cataract surgeries and joint replacement surgeries are predominantly performed on people over the age of 65 (80% and 83% respectively). More joint replacement surgeries are performed on women (57%) than men (43%), while more cataract surgeries are performed on men (62%) than women (38%). Looking at the incidence of CABG surgeries shows 67% are performed on people over age 65 and 77% of all CABG surgeries are performed on men. While surgery for the priority areas is primarily performed on the elderly, MRI exams are performed on younger Canadians, with 85% of patients being under 65. Table 12 shows that over 80% of patients are under the age of 65, so this wait list has a major impact on the nation's labour force.
- The final factor is the relatively large proportion of these patients who are unable to continue with their usual activities while waiting for treatment (see Table 10).

In short, a large, young group of patients who are unable to work leads to the high total cost of wait lists for MRI exams.

Figure 17

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



Source: The Centre for Spatial Economics

[24] Lengthy wait times for an MRI exam are due in large part to the relative scarcity of equipment available in Canada. In 2005, Canada ranked 16th among Organisation for Economic Co-operation and Development (OECD) nations with just 6.1 MRI scanners per million people. The OECD median is 6.9 MRI scanners per million people, and the U.S. has 26.6 MRI scanners per million people.

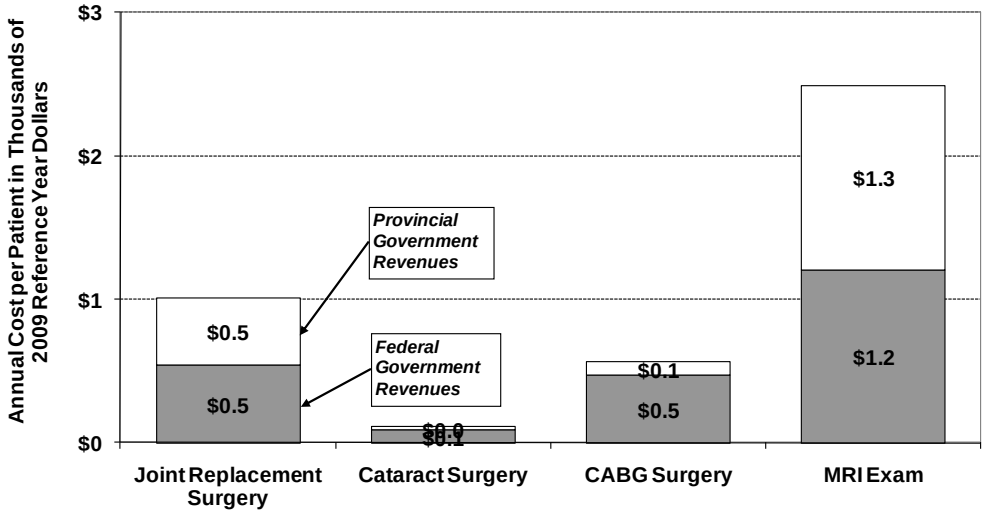
Impact on government revenue

As discussed in Section 4, provincial government personal income tax revenues must be raised to offset the cost of health care spending resulting from wait times that exceed the recommended maximum period for treatment. The reduction in economic activity does, however, more than offset this increase. Reduced personal incomes lead to lower federal and provincial personal income taxes, and reduced personal spending leads to lower sales and excise tax revenues. Business activity is also reduced so federal and provincial corporate income tax revenues are also affected.

Figure 18 summarizes the wait time costs to federal and provincial government revenues per patient waiting longer than the recommended maximum period for treatment. Table 16 provides impacts on federal government revenues by province, priority area and source. Table 17 provides the same information for the provincial governments.

Figure 18

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



Source: The Centre for Spatial Economics

The costs to the federal and provincial governments in terms of foregone revenue are significant and vary widely by province and priority area. The relative costs per patient are similar to those seen in terms of GDP per capita (see Figure 15). This is not surprising because changes in tax revenue are positively related to changes in income. The costs to governments are highest for MRI exams — nearly $2 500 per patient — and lowest for cataract surgery. Although the costs do vary widely across provinces, the variance in provincial and federal government revenue costs is similar within each of the 4 priority areas. The total cost in terms of foregone government revenue across the 4 priority areas in 2010 was about $908 million for the federal government and $971 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_4SE model, also reduces government spending, so that the overall impact on government deficits is less severe than the reduction in government revenues.

Table 16

Impact on Federal Government Revenues *2009 Reference Year Dollars per Patient*											
	Costs per patient with excess waits										
Total Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	589	693	701	873	131	205	266	1,347	262	303	543
Ophthalmology: cataract surgery	99	188	19	15	2	-6	30	103	34	8	86
Cardiology: CABG surgery	1,019	1,067	49	2	13	15	746	393		6	469
Diagnostic Procedures: MRI	1,359	2,134	913	719	949	1,196	392	897	1,057	866	1,204
Patient Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	257	325	319	365	71	123	161	518	119	123	242
Ophthalmology: cataract surgery	54	103	16	12	6	10	16	56	20	8	50
Cardiology: CABG surgery	833	914	128	69	73	191	476	402		72	455
Diagnostic Procedures: MRI	1,359	2,134	913	719	949	1,196	392	897	1,057	866	1,204
Caregiver Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	408	445	446	553	107	218	132	920	181	231	374
Ophthalmology: cataract surgery	59	101	16	13	6	11	19	65	21	10	51
Cardiology: CABG surgery	306	300	44	22	27	74	318	154		21	161
Diagnostic Procedures: MRI											
Health Care System Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	-75	-77	-64	-46	-47	-137	-27	-91	-38	-51	-74
Ophthalmology: cataract surgery	-15	-16	-13	-9	-9	-27	-5	-18	-7	-10	-15
Cardiology: CABG surgery	-120	-146	-122	-89	-87	-250	-48	-164		-88	-147
Diagnostic Procedures: MRI											

Source: The Centre for Spatial Economics

Table 17

Impact on Provincial Government Revenues *2009 Reference Year Dollars per Patient*											
	Costs per patient with excess waits										
Total Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	385	202	1,389	1,168	-73	101	179	1,591	193	240	464
Ophthalmology: cataract surgery	58	68	21	-19	-40	-49	7	95	9	-33	24
Cardiology: CABG surgery	685	238	-68	-402	-384	-353	753	113		-416	94
Diagnostic Procedures: MRI	1,410	1,180	1,925	1,136	1,016	1,513	614	1,215	1,685	1,362	1,288
Patient Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	272	187	672	577	76	185	270	701	190	194	294
Ophthalmology: cataract surgery	58	59	34	19	6	14	27	75	32	13	39
Cardiology: CABG surgery	884	527	270	105	79	287	704	544		106	474
Diagnostic Procedures: MRI	1,410	1,180	1,925	1,136	1,016	1,513	614	1,215	1,685	1,362	1,288
Caregiver Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	433	257	941	872	115	328	179	1,246	290	363	458
Ophthalmology: cataract surgery	63	58	33	20	6	17	32	88	34	16	41
Cardiology: CABG surgery	312	173	90	36	28	111	534	206		43	174
Diagnostic Procedures: MRI											
Health Care System Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	-320	-243	-224	-281	-263	-412	-270	-356	-286	-317	-289
Ophthalmology: cataract surgery	-63	-50	-46	-58	-53	-81	-52	-69	-57	-61	-56
Cardiology: CABG surgery	-512	-462	-428	-543	-491	-751	-485	-637		-566	-555
Diagnostic Procedures: MRI											

Source: The Centre for Spatial Economics

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, it is possible to determine the costs borne by patients depending on the length of time spent waiting for treatment. The analysis in this section demonstrates how the wait time cost varies depending on the length of time spent on the wait list.

Reducing wait lists will reduce wait times for patients waiting longest for treatment. As previously noted, the per-patient costs of waiting are highest for those waiting longest for treatment. The economically efficient level of public spending on health care is determined by the intersection of the downward sloping wait time cost curves with the treatment cost curves.

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

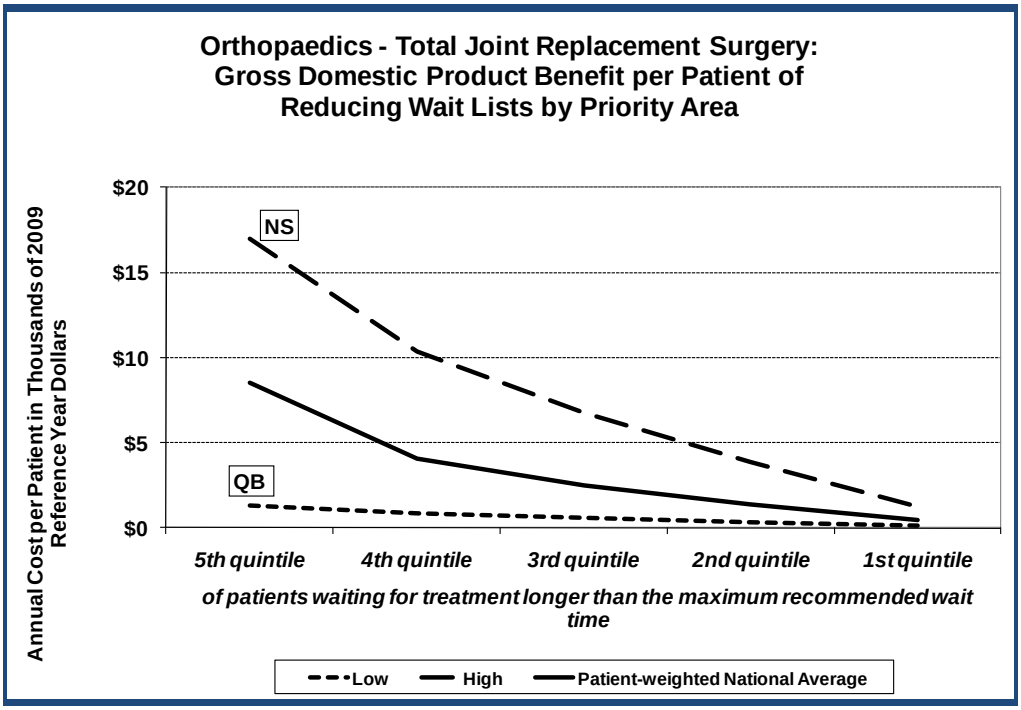
Figure 19 through Figure 23 provide a summary of the wait time cost curves for each priority area[25]. Each point on the curve in these charts represents the wait time costs associated with that proportion of patients (with wait times in excess of the recommended maximum) waiting the longest for treatment. For example, the 20% of patients waiting the longest for joint replacement surgery (the fifth quintile) impose costs on the economy of just over $58 200 per patient on average. These costs vary by province, from a high of $76 000 in Alberta to a low of $30 400 in Prince Edward Island. Providing treatment within the maximum recommended wait time for these patients would yield economic benefits equal to these costs. These benefits fall as patients with shorter wait times are treated. The 20% of patients waiting the shortest time beyond the maximum recommended wait time for joint replacement (the first quintile) impose costs on the economy of $4 700 per patient on average.

The slopes of the curves differ by priority area. The patient-weighted national average wait time cost curve for total joint replacement surgery is steeper than the curves for the other priority areas. This relationship may not hold true for the wait time cost curves of all provinces. The priority area with the largest absolute difference in benefit curves across provinces is for MRI exams.

These wait time cost curves provide the information required for policy-makers to use cost-benefit analysis to figure out the most economically efficient way to use public resources to reduce wait times. Policy-makers understand that reducing wait lists requires a real commitment in terms of resources. But this investment in health care yields dividends. For example, if an additional patient in Alberta can receive hip or knee replacement surgery at a cost of less than $10 400, cataract surgery at a cost of less than $2 400, or an MRI exam at a cost of less than $26 100, then Alberta will be better off providing treatment for that patient than leaving the patient on the wait list.

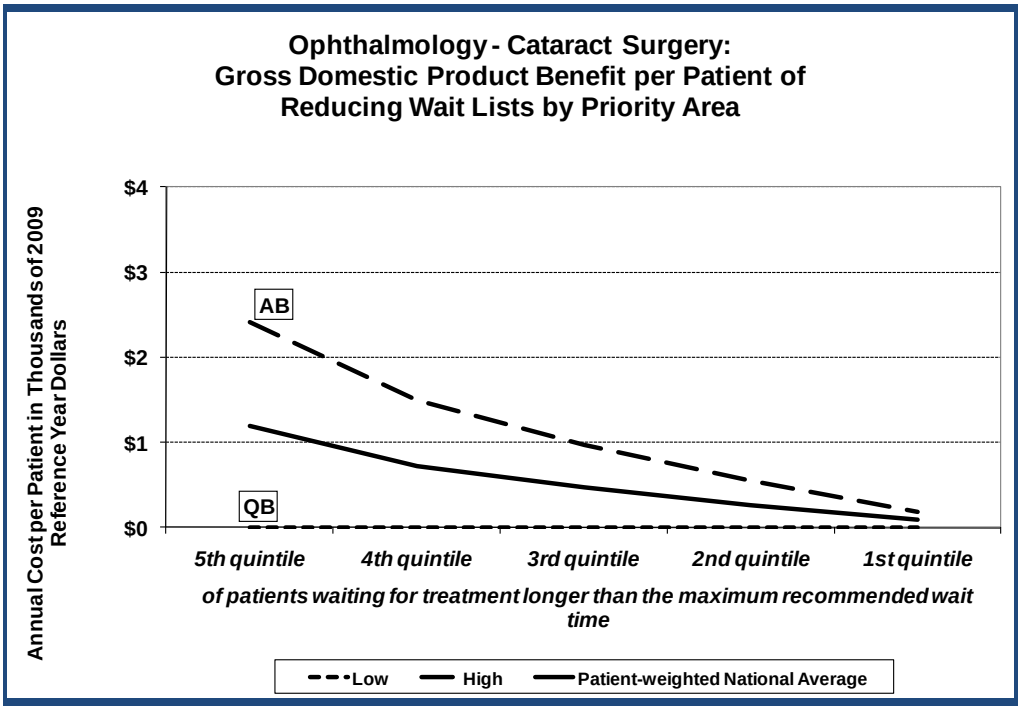
[25] Charts showing the benefit curves for each priority area by province can be found in Appendix A.

Figure 19



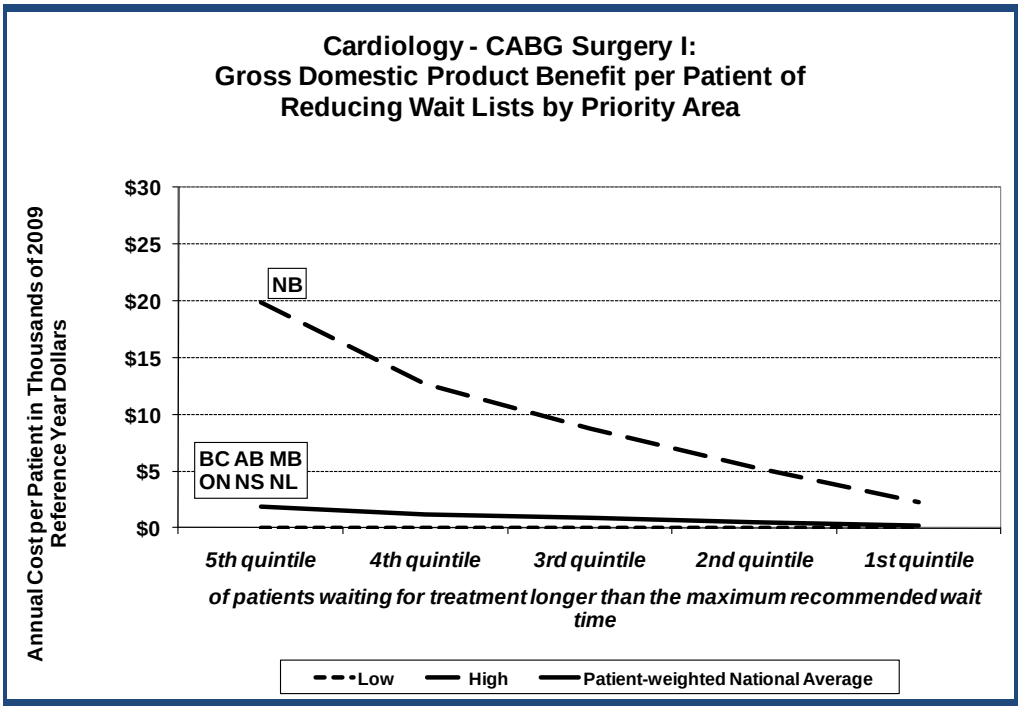
Source: The Centre for Spatial Economics

Figure 20



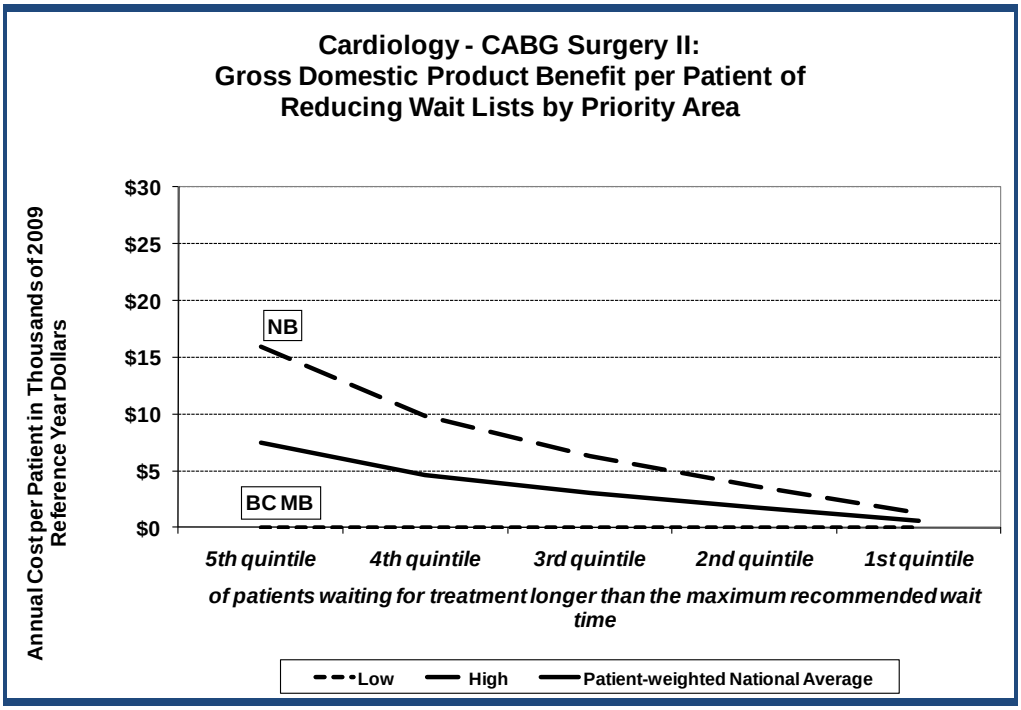
Source: The Centre for Spatial Economics

Figure 21



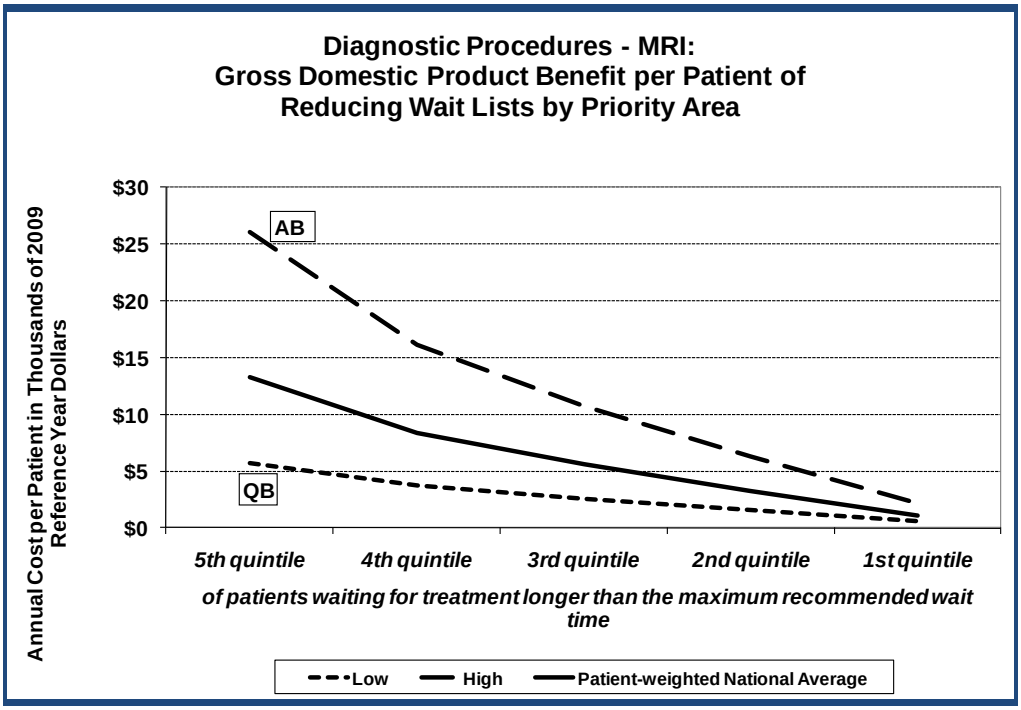
Source: The Centre for Spatial Economics

Figure 22



Source: The Centre for Spatial Economics

Figure 23



Source: The Centre for Spatial Economics

Net benefit of reducing or eliminating wait times

The economically efficient provision of medical services occurs at the intersection of the wait time cost curves shown in the previous section and the treatment cost curves from Table 14. Table 18 lists the patient quintile at which these two curves intersect for each province and priority area. For total joint replacement surgery, the two curves intersect for the 5th quintile (i.e. the patients waiting longest for treatment) for just two provinces: Manitoba and Nova Scotia. For all other provinces, the cost of treatment exceeds the cost of waiting for all patient quintiles and it is, therefore, not economically efficient to provide any additional treatment. The additional cost of providing an MRI exam, however, is below the wait time cost for all patient quintiles in every province. It is, therefore, economically efficient to eliminate the queue for this priority area.

Table 18

Treatment & Wait Time Cost Schedule Intersection by Patient Quintile										
	BC	AB	SK	MB	ON	QB	NB	NS	PE	NL
Orthopaedics: total joint replacement surgery	-	-	-	5	-	-	-	5	-	-
Ophthalmology: cataract surgery	-	-	-	-	-	-	-	-	-	-
Cardiology: CABG level 1 surgery	-	-	-	-	-	-	-	-	-	-
Cardiology: CABG level 2 surgery	-	-	-	-	-	-	-	-	-	-
MRI Exam Costs	1	1	1	1	1	1	1	1	1	1

Source: The Centre for Spatial Economics

The net economic benefit of taming the queue by providing an economically efficient level of treatment is summarized in Table 19. The table shows that cost of providing additional treatment

is $3 million for joint replacement surgery and $191 million for MRI exams for a total cost of $194 million.

The net impact on government finances is arrived at by subtracting the cost of treatment (i.e. additional spending) from the change in federal and provincial government revenues. For joint replacement surgery, the impact on Manitoba and Nova Scotia, the two provinces experiencing wait time costs in excess of treatment, is a net cost of $3 million and $2 million respectively. The impact of providing an economically efficient level of MRI exams across the country is a net cost of $33 million with some provinces experiencing a small net benefit and others a net cost.

Table 19

Economic Cost-Benefit of Taming the Queue *Average Annual Impact in Millions of 2009 Reference Year Dollars*											
	Scenario: Economically Efficient Level of Treatment										
	BC	AB	SK	MB	ON	QB	NB	NS	PE	NL	CA
Net Government Revenue Impact											
Orthopaedics: total joint replacement surgery	0	0	0	-3	0	0	0	-2	0	0	-4
Ophthalmology: cataract surgery											
Cardiology: CABG surgery											
Diagnostic Procedures: MRI	2	-8	-16	1	-21	9	-2	2	0	0	-33
Combined Costs Across Priority Areas	2	-8	-16	-2	-21	9	-2	0	0	0	-37
Provincial Government Revenue											
Orthopaedics: total joint replacement surgery	0	0	0	-1	0	0	0	0	0	0	0
Ophthalmology: cataract surgery											
Cardiology: CABG surgery											
Diagnostic Procedures: MRI	12	6	-14	5	30	34	1	3	0	1	80
Combined Costs Across Priority Areas	12	6	-14	5	30	34	1	3	0	1	79
Federal Government Revenue											
Orthopaedics: total joint replacement surgery	0	0	0	-1	0	0	0	0	0	0	-1
Ophthalmology: cataract surgery											
Cardiology: CABG surgery											
Diagnostic Procedures: MRI	10	13	3	3	25	21	1	2	0	1	78
Combined Costs Across Priority Areas	10	13	3	2	25	21	1	2	0	1	77
Cost of Treatment											
Orthopaedics: total joint replacement surgery	0	0	0	1	0	0	0	2	0	0	3
Ophthalmology: cataract surgery											
Cardiology: CABG surgery											
Diagnostic Procedures: MRI	20	27	5	7	75	46	4	4	1	2	191
Combined Costs Across Priority Areas	20	27	5	9	75	46	4	5	1	2	194

Source: The Centre for Spatial Economics

The economic case for eliminating wait times entirely is summarized in Table 20. The cost of treatment by priority area and province includes all patients waiting longer than the recommended maximum wait time multiplied by the per-patient treatment cost. The total treatment cost to eliminate wait times across all four priority areas is $586 million. The increased health care spending provides jobs for health care workers and raises GDP which, in turn, generates tax revenue for the federal and provincial governments. The net impact on government finances is arrived at by subtracting the cost of treatment (i.e. additional spending) from the change in federal and provincial government revenues and is net cost of $74 million combined across all governments and all four priority areas.

Table 20

Economic Cost-Benefit of Taming the Queue *Average Annual Impact in Millions of 2009 Reference Year Dollars*	Scenario: Level of Treatment Required to Eliminate the Queue										
	BC	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Net Government Revenue Impact											
Orthopaedics: total joint replacement surgery	4	-6	-43	2	-8	5	-3	6	0	0	-41
Ophthalmology: cataract surgery	7	-10	-14	1	-8	5	-2	5	0	0	-16
Cardiology: CABG surgery	0	-1	-7	0	0	1	-5	1	0	0	-11
Diagnostic Procedures: MRI	3	-6	-16	1	-15	26	-2	2	0	0	-6
Combined Costs Across Priority Areas	15	-23	-80	5	-31	37	-13	14	0	1	-74
Provincial Government Revenue											
Orthopaedics: total joint replacement surgery	15	7	-38	11	16	13	2	10	0	2	38
Ophthalmology: cataract surgery	24	16	-13	6	20	10	2	10	0	1	76
Cardiology: CABG surgery	0	4	-6	1	6	6	2	1	0	0	15
Diagnostic Procedures: MRI	13	7	-14	6	35	47	2	4	0	1	101
Combined Costs Across Priority Areas	52	35	-70	24	76	77	8	24	1	5	231
Federal Government Revenue											
Orthopaedics: total joint replacement surgery	12	15	9	6	13	9	1	7	0	1	73
Ophthalmology: cataract surgery	19	33	3	4	17	6	1	7	0	1	90
Cardiology: CABG surgery	0	8	1	0	5	4	1	1	0	0	21
Diagnostic Procedures: MRI	11	15	3	3	29	30	1	2	0	1	96
Combined Costs Across Priority Areas	42	71	17	14	64	49	3	17	1	3	280
Cost of Treatment											
Orthopaedics: total joint replacement surgery	22	29	14	14	36	16	6	11	1	2	152
Ophthalmology: cataract surgery	36	59	5	9	44	12	5	11	1	2	183
Cardiology: CABG surgery	0	13	2	1	12	9	9	1	0	1	48
Diagnostic Procedures: MRI	21	28	5	8	79	51	5	4	1	2	203
Combined Costs Across Priority Areas	79	129	26	32	171	88	23	28	2	7	586

Source: The Centre for Spatial Economics

6. Conclusions and suggestions for further research

This report updates 2006 and 2008 studies that were the first to attempts to determine the economic cost of waiting for treatment. The approach taken in this report expanded on the earlier studies by also examining the cost of providing treatment for persons not treated within the maximum recommended wait time. The addition of this data permitted the use of cost-benefit analysis to assess the net benefits of increased access to health care for each of the priority areas. It is hoped that this analysis will stimulate discussion on this issue, which will, with little doubt, yield useful information and insight into the appropriateness of the data sources and assumptions used.

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

Although a variety of factors contribute to the economic wait time costs developed in this study, the interaction of two of these factors dominate the results. The first is the average wait times for patients waiting longer than the recommended maximum period for treatment. This factor determines which province is likely to experience the highest cost for a given priority area. It is directly affected by the recommended maximum period chosen. The second factor is the proportion of patients who need to discontinue their regular activities while waiting for treatment. This factor determines the overall economic costs of waiting for treatment. The highest economic costs are generated for MRI exams (an average of about $6 100 per patient), followed by total joint replacement surgery ($3 000 per patient) and CABG surgery ($2 400), with cataract surgery yielding the lowest costs ($400).

Significant differences in costs exist among the provinces for MRI exams, with Alberta's per patient cost exceeding $12 300, while Quebec's is just over $2 700. There are also significant differences in costs among the provinces for joint replacement surgery, ranging from nearly $7 700 in Nova Scotia to about $300 in Quebec. The difference from top to bottom is also large for CABG surgery, where New Brunswick's average patient cost of $7 200 compares with near zero costs in Newfoundland and Labrador, Quebec, Ontario and Manitoba. Wait time costs are low in all provinces for cataract surgery, ranging from a low of near zero in Newfoundland and Labrador, Quebec and Ontario to a high of $1000 in Alberta. The economic costs in terms of GDP and government revenue show that no one province has either the highest or the lowest costs in all priority areas. Since the cost of waiting varies widely by province, wait time solutions will need to reflect provincial priorities.

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

Time spent waiting for treatment robs the economy of workers, both patients and caregivers. In this study, the cost of waiting — or the cost of time — is measured by the cost of labour. The recent recession has introduced some slack in labour markets across the country; as a result, its cost is weak relative to the previous studies. The cumulative economic cost of waiting for treatment across these 4 priority areas in 2010 was an estimated $4.7 billion, which in turn lowered federal and provincial government revenues by $1.8 billion.

This study concluded by examining the net fiscal impact of reducing or eliminating wait times. Providing an economically efficient level of service requires providing additional treatment for joint replacement patients in Manitoba and Nova Scotia at a combined cost of $3 million and expanding access to MRI exams for patients across the country at a combined cost of $191 million. The net fiscal impact of these measures is a cost of $37 million to provincial and federal governments. Eliminating wait times entirely would require an increase in health care spending of about $590 million and lead to a net fiscal cost of $74 million to the federal and provincial governments.

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

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

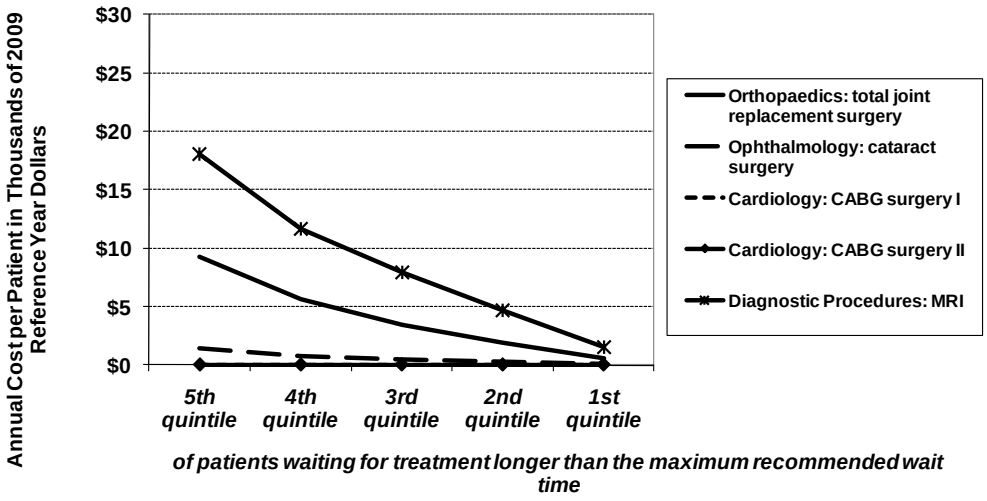
- The analysis in this study could be expanded to cover other medical conditions.
- Similar analysis could be conducted for other aspects of the patient wait time experience such as waiting to see a specialist or waiting to see a family doctor.
- A study could be conducted — preferably in conjunction with a cost-benefit analysis — to review the impact on patient demand for medical services if wait times are reduced or eliminated.

In conclusion, the study found that the cost of eliminating wait times is more costly than expanding treatment to an economically efficient level. It also found that the net fiscal cost is considerably less than the cost of providing additional treatment. This is due to (i) the economic and fiscal benefit resulting from reduced wait times and (ii) the tax multipliers associated with the increased health care spending.

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

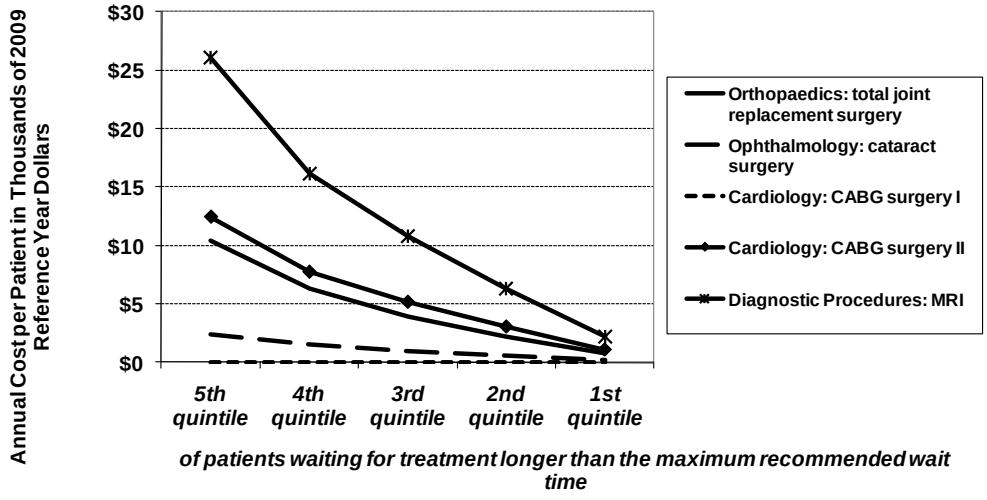
Appendix A: Provincial benefit curves

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



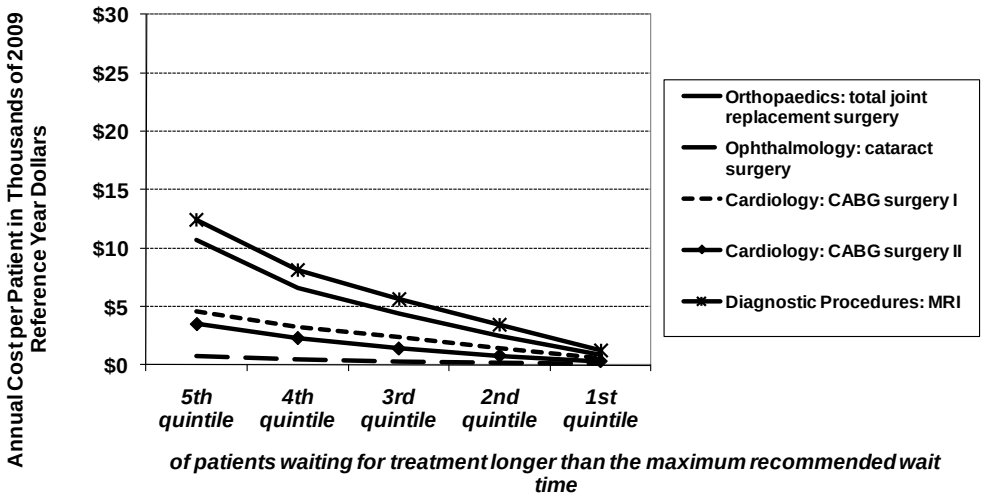
Source: The Centre for Spatial Economics

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



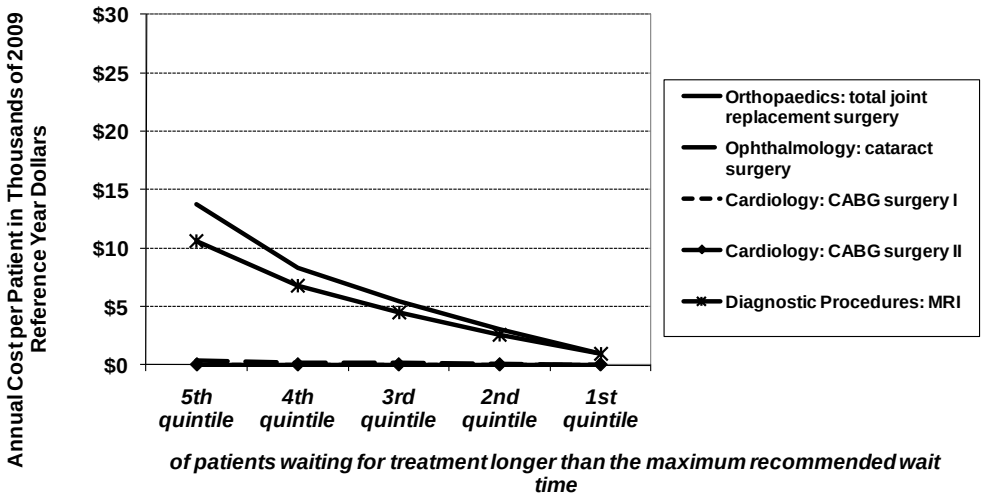
Source: The Centre for Spatial Economics

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



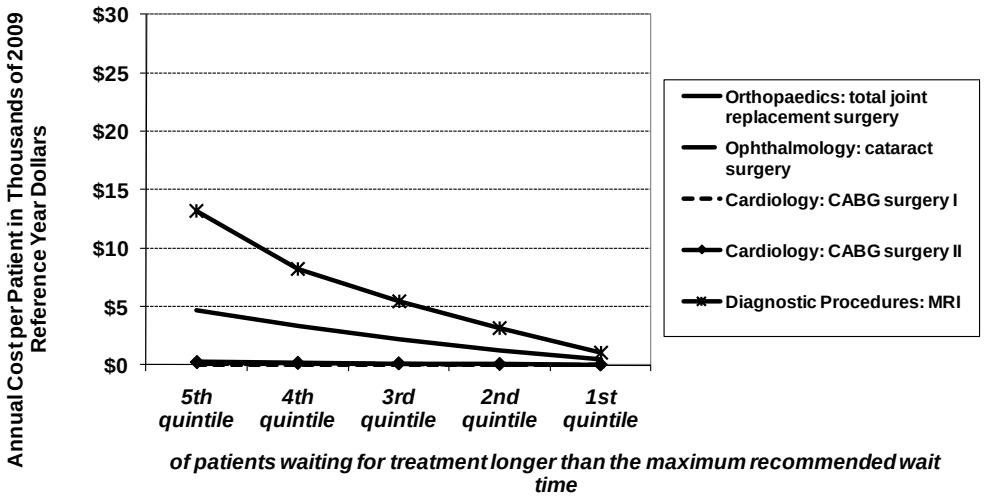
Source: The Centre for Spatial Economics

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



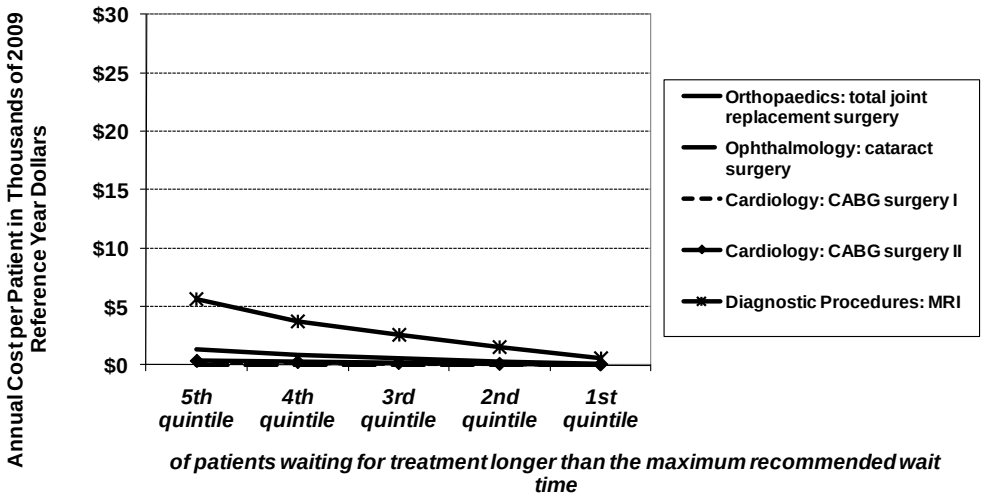
Source: The Centre for Spatial Economics

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



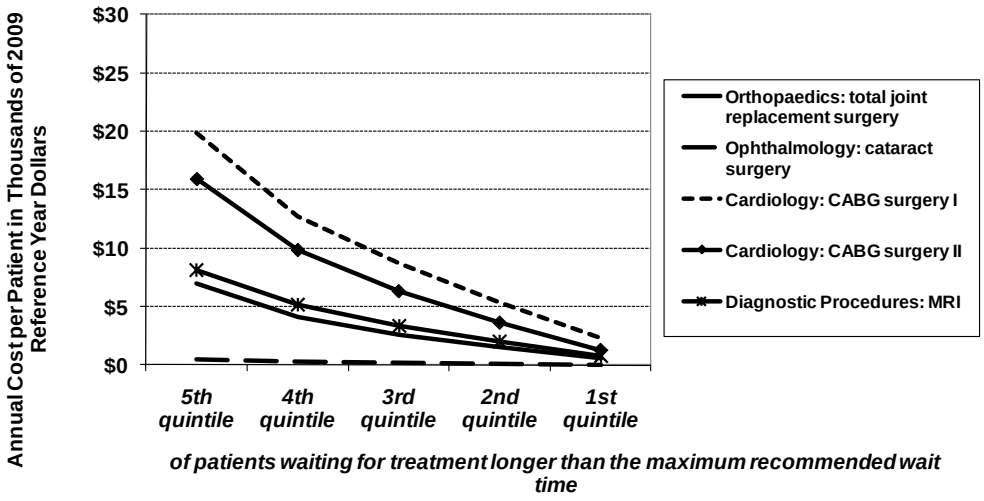
Source: The Centre for Spatial Economics

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



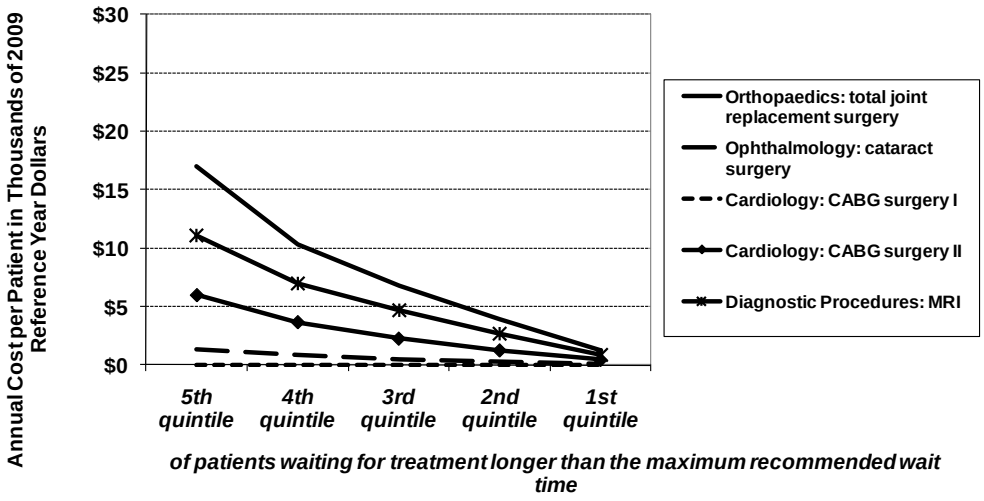
Source: The Centre for Spatial Economics

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



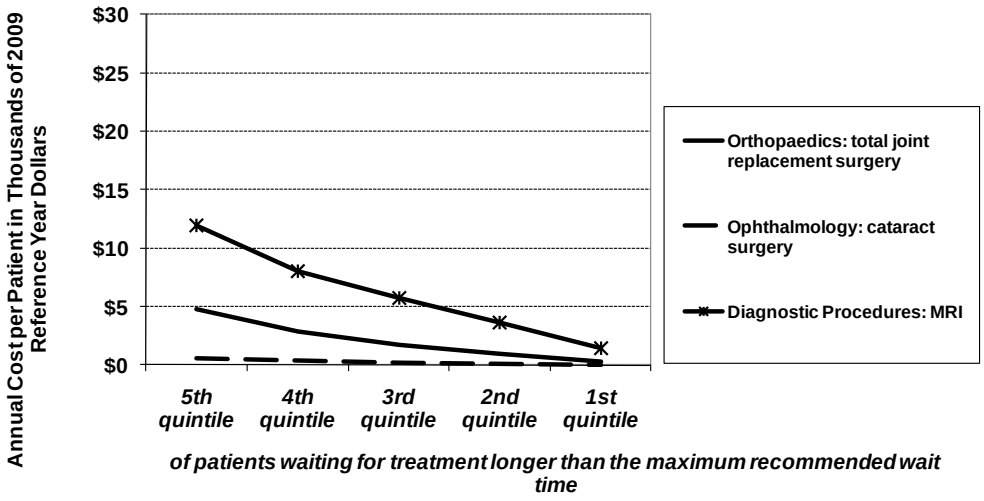
Source: The Centre for Spatial Economics

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



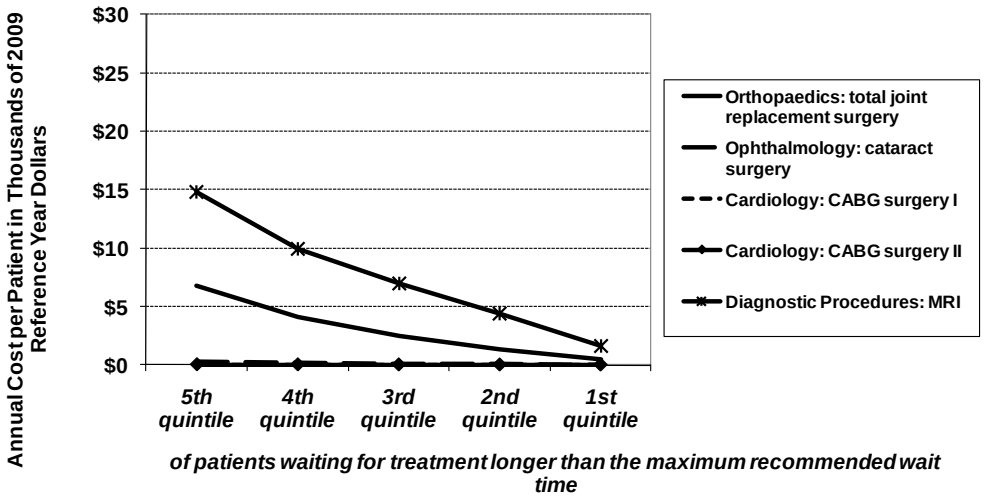
Source: The Centre for Spatial Economics

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



Source: The Centre for Spatial Economics

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



Source: The Centre for Spatial Economics

Appendix B: Wait Time Costs by Province

Total Impact in Millions of 2009 Reference Year Dollars											
Gross Domestic Product	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	9	12	8	11	3	1	2	9	0	1	55
Ophthalmology: cataract surgery	5	13	0	0	0	(0)	0	1	0	0	21
Cardiology: CABG surgery	0	3	0	-	0	0	2	0		0	5
Diagnostic Procedures: MRI	652	1,248	114	143	1,762	514	63	76	15	54	4,643
Combined Costs Across Priority Areas	*667*	*1,276*	*122*	*154*	*1,765*	*515*	*67*	*87*	*15*	*55*	*4,723*
Federal Government Revenues	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	2	2	1	2	1	0	0	2	0	0	9
Ophthalmology: cataract surgery	1	3	0	0	0	(0)	0	0	0	0	4
Cardiology: CABG surgery	0	0	0	0	0	0	0	0		0	1
Diagnostic Procedures: MRI	102	216	17	21	274	229	7	13	3	6	887
Combined Costs Across Priority Areas	*104*	*221*	*18*	*22*	*274*	*230*	*7*	*15*	*3*	*6*	*900*
Provincial Government Revenues	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	1	1	2	2	(0)	0	0	2	0	0	8
Ophthalmology: cataract surgery	1	1	0	(0)	(0)	(0)	0	0	0	(0)	1
Cardiology: CABG surgery	0	0	(0)	(0)	(0)	(0)	0	0		(0)	(0)
Diagnostic Procedures: MRI	105	119	37	33	293	291	10	18	4	10	921
Combined Costs Across Priority Areas	*107*	*121*	*40*	*35*	*292*	*291*	*11*	*20*	*4*	*10*	*930*

Source: The Centre for Spatial Economics

Total Impact in Millions of 2009 Reference Year Dollars											
Gross Domestic Product	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	9	12	8	11	3	1	2	9	0	1	55
Ophthalmology: cataract surgery	5	13	0	0	0	(0)	0	1	0	0	21
Cardiology: CABG surgery	0	3	0	-	0	0	2	0		0	5
Diagnostic Procedures: MRI	652	1,248	114	143	1,762	514	63	76	15	54	4,643
Combined Costs Across Priority Areas	*667*	*1,276*	*122*	*154*	*1,765*	*515*	*67*	*87*	*15*	*55*	*4,723*
Patient Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	4	5	3	4	1	0	1	3	0	0	21
Ophthalmology: cataract surgery	3	6	0	0	0	0	0	1	0	0	10
Cardiology: CABG surgery	0	2	0	0	0	0	1	0		0	4
Diagnostic Procedures: MRI	562	1,078	99	125	1,575	453	58	72	14	52	4,090
Combined Costs Across Priority Areas	*568*	*1,090*	*102*	*129*	*1,577*	*454*	*61*	*76*	*15*	*52*	*4,125*
Caregiver Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	6	6	4	6	2	1	1	6	0	1	32
Ophthalmology: cataract surgery	3	6	0	0	0	0	0	1	0	0	10
Cardiology: CABG surgery	0	1	0	0	0	0	1	0		0	1
Diagnostic Procedures: MRI											
Combined Costs Across Priority Areas	*8*	*13*	*4*	*6*	*3*	*1*	*2*	*7*	*0*	*1*	*44*
Health Care System Costs	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NL**	**CA**
Orthopaedics: total joint replacement surgery	(1)	(1)	(0)	(0)	(1)	(0)	(0)	(1)	(0)	(0)	(5)
Ophthalmology: cataract surgery	(1)	(1)	(0)	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(3)
Cardiology: CABG surgery	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	-	(0)	(1)
Diagnostic Procedures: MRI											
Combined Costs Across Priority Areas	*(2)*	*(2)*	*(1)*	*(1)*	*(2)*	*(0)*	*(0)*	*(1)*	*(0)*	*(0)*	*(8)*

Source: The Centre for Spatial Economics

Appendix C: C_4SE Provincial Modeling System

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

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

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

C_4SE Model — Industry Sectors

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

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

Provincial models

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

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

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

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

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

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

National Model

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

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

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

Alberta Ministry of Health and Wellness
http://www.albertahealthservices.ca

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

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

Ontario Ministry of Health and Long-Term Care
http://www.ontariowaittimes.com

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

New Brunswick Surgical Care Network
http://www1.gnb.ca/0217/surgicalwaittimes/index-e.asp

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