

# The economic burden of irritable bowel syndrome in Canada

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JD Bentkover, C Field, EM Greene, V Plourde, JP Casciano. The economic burden of irritable bowel syndrome in Canada. *Can J Gastroenterol* 1999;13(Suppl A):89A-96A. In the treatment of irritable bowel syndrome (IBS), medical practitioners and policymakers face the task of providing both high quality and cost effective medical care for a condition with no certain cure. To date, studies have examined only total medical costs to patients with symptoms consistent with an IBS diagnosis. However, these studies have not examined the direct and indirect costs incurred in the course of treatment for IBS, excluding the costs of unrelated medical conditions. Because patients with IBS have been shown to differ significantly from non-IBS patients in their desire to seek medical care, one cannot consider solely the cost differential in medical costs for IBS and non-IBS patients. The present study examines a set of patients who have been diagnosed with IBS and seek medical care for IBS.

**Key Words:** *Cost of illness, Economic analysis, Irritable bowel syndrome*

## Le fardeau économique du syndrome du côlon irritable au Canada

**RÉSUMÉ :** Dans le traitement du syndrome du côlon irritable (SCI), les médecins et les décideurs ont le devoir de fournir des soins médicaux de grande qualité et économiquement efficaces pour une maladie contre laquelle il n'y a pas de remède certain. À ce jour, les études ont permis de ne calculer que les coûts médicaux totaux associés au traitement des patients présentant des symptômes de SCI. Toutefois, ces études n'ont pas tenu compte des coûts directs et indirects associés au traitement, à l'exclusion des coûts de traitement pour d'autres problèmes de santé non reliés. Étant donné que les patients qui souffrent de SCI diffèrent significativement des autres dans leur recherche de soins médicaux, il est impossible de ne tenir compte que de la différence de coût quand on compare les patients selon qu'ils sont ou non atteints de SCI. La présente étude se penche sur une série de patients qui ont reçu un diagnostic de SCI et qui consultent à ce sujet.

Irritable bowel syndrome (IBS) presents a unique problem to the medical community. To treat the condition, medical practitioners and policymakers face the task of providing both high quality and cost effective medical care for a condition with no certain cure. To complicate matters further, many people consider cost effective, high quality medical care to be an oxymoron. On one hand, high quality care entails a substantial financial burden, whereas cost effective care typically requires a limitation on the available resources to treat specific medical conditions. This apparent double standard poses severe problems for society at large. Consideration of how best to achieve both goals simultaneously necessitates a clear understanding of the costs and

available treatment options for medical conditions. The costs of a specific medical condition, IBS, were studied in an attempt to demonstrate its considerable cost. The treatment of IBS-related symptoms consumes vast financial resources, usually without any symptom-free cure. Any improved treatment algorithm may save scarce resources, and improve the physical and mental well being of those afflicted with the condition.

IBS is a functional disorder of the gastrointestinal tract for which there is no known organic cause. Researchers have posited the existence of potentially associated conditions but remain uncertain of the mechanism through which IBS alters the well being of its victims. Moreover, there is no bio-

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logical marker to determine when or whether individuals are suffering from the condition. Treatment options vary widely, depending upon the medical practitioner and the specific case, but are generally believed to be imperfect at removing symptoms for long time periods. These facts make treatment of IBS problematic and often costly.

Researchers have estimated that the cost of working hours lost because of IBS may be as high as that for the common cold (1). To date, studies have examined only total medical costs to patients with symptoms consistent with an IBS diagnosis. However, these studies have not examined the direct and indirect costs incurred during the course of treatment for IBS, excluding the costs of unrelated medical conditions. The distinction is important because patients with IBS have been shown to differ significantly from non-IBS patients in their desire to seek medical care; IBS patients tend to seek more care. Thus, one cannot consider solely the cost differential in medical costs for IBS and non-IBS patients. Such analyses may be substantially biased, failing to understand the different proclivities to seek care. The present study examines a set of patients who have been diagnosed with IBS and seek medical care for IBS. Consideration of such a set of people eliminates the effect of differing tendencies to seek care and may provide a more reliable estimate of the true cost to society of treating IBS.

The analysis used data from a retrospective chart review of IBS patients that were obtained from four medical clinics in Canada – two in Quebec and two in Ontario.

Patients were diagnosed with IBS by a medical practitioner and sought care for the condition over the course of up to seven years. Information on each patient's received treatments were obtained by a chart review of each patient. Compilation of the chart information provides a longitudinal database of patients who can be assumed to have IBS or who have been treated in a manner consistent with IBS. Analysis of these patients provides information on both the timing of IBS-related resource consumption and the total cost of the condition. In addition, a Delphi panel of expert medical practitioners was conducted to augment the chart review data for the cost of emergency visits.

The available literature on IBS is discussed, detailing its prevalence throughout the world. The clinical algorithm that has been used in the determination of the cost of IBS is discussed, and the data set and patient characteristics that have been analyzed are described in detail. The methodology for analyzing costs is described, and the results of the statistical model presented. Finally, the findings and potential implications, including suggestions for further research, are discussed.

#### DISCUSSION OF IBS AND OTHER STUDIES

Researchers have shown that IBS is the single largest disorder for which patients seek primary and secondary care (2). Studies indicate that 30% of the general population experience symptoms potentially compatible with the clinical diagnosis of IBS (3,4). Most afflicted individuals never seek medical care but have symptoms of IBS (5). For this reason,

many studies potentially understate the true number of persons afflicted with IBS. Still, studies have shown that IBS is a serious and costly condition, accounting for up to half of all out-patient referrals to gastroenterologists and many more consultations with general practitioners (GPs) (5).

The scope of IBS has been difficult to measure because the syndrome is typically a condition of exclusion. Patients usually only receive a diagnosis of IBS after organic diseases have been ruled out by a process of exclusion. Many patients drop out of treatment before receiving a final diagnosis, having been discouraged by ineffective treatments. Thus, IBS cannot be considered in the same way as other diseases that possess clinical or pathological markers, and those that can be treated in known and conventional manners.

IBS afflicts individuals throughout the world. However, there is evidence that the condition is particularly common in Western societies. Thompson (6), citing other studies, documented that the condition is common in North America, Europe and urbanized Africa. However, the syndrome apparently does not occur frequently in Uganda and among black South Africans in rural areas. In Africa, the condition only manifests in westernized metropolitan areas. Moreover, the proportion of males to females with the condition varies geographically. In India and Sri Lanka, more men seek care than women. In most of the rest of the world, care seekers are primarily female. It appears that cultural and socioeconomic factors may explain a great deal about the condition and about who seeks care for symptoms.

Manning and colleagues (7) documented the importance of 15 symptoms that are highly predictive of IBS. Of these 15 symptoms, the following six have been determined to be especially predictive of whether a patient suffers from an organic bowel dysfunction or IBS:

- Pain that often is relieved by defecation (more than 25% of the time)
- Looser stools occur frequently when pain begins
- More frequent stools when pain begins
- Frequent visible abdominal distension
- Frequent feelings of incomplete evacuation
- Mucus per rectum

Manning et al (7) defined IBS as occurring when a patient suffers from abdominal pain on more than six occasions in the preceding year, in addition to satisfying at least two of the above 'Manning' criteria. Jones and Lydeard (8) sent a questionnaire to 2280 adults, randomly selected from a list of eight GPs. Of the 1620 respondents, 25% reported six or more periods of abdominal pain in the preceding two years. Approximately 85% of these respondents possessed symptoms consistent with the above diagnosis of IBS. This implies a one-year prevalence rate of 21.6% to 24.3% for women and 18.7% for men. Over 15% of these people satisfied at least three of the Manning criteria. No noticeable difference appeared between those who consulted physicians about the ailment and those who did not. Thus, IBS appears to be widespread in many geographic regions.

**TABLE 1**  
Irritable bowel syndrome (IBS) population proportion

Author (reference)	IBS prevalence (%)	IBS patients who consult physicians (%)	IBS/consulting estimate (%)
Drossman et al (11)	9.4	45.8	4.3
Sandler et al (5)	15	48	7.2
Jones and Lydeard (8)	21.6	33.4	7.2
Mean	15.3	42.4	6.2

The Jones and Lydeard study (8) also provides information on the characteristics of the populations of patients who have IBS symptoms. Only 33% of the afflicted population sought medical care in the two years preceding the questionnaire, although the consultation rate varied dramatically according to which practitioner the individual had seen previously. Consultation rates varied by symptom type – those with rectal bleeding appeared to be the most likely to seek treatment. In addition, several characteristics of IBS emerged. Autonomic symptoms such as flushing and sweating, migraines, urinary symptoms and gynecological problems occur substantially more frequently in those with IBS. Moreover, there was a high prevalence in 30- to 50-year-old women.

Efforts to study the costs of IBS have suffered from several serious drawbacks. First, because there is no pathological or biological marker, many patients go untreated. These patients may seek care but be misdiagnosed because IBS is typically a last diagnosis, issued after other diagnoses have been proved to be inaccurate. In addition, patients with IBS often seem to improve over the course of a few weeks on any new regimen or when participating in a therapeutic trial. Researchers have noted a high placebo effect and a correspondingly high rate of relapse following the end of trials. Finally, as has been noted by Harvey et al (9), hospital activity analyses constitute the central means of determining the costs and difficulties of treating conditions. However, gastroenterologists typically treat IBS patients as out-patients. This limits the availability of information to assess the importance of the disorder as it appears to gastroenterologists and GPs.

Given the difficulties in determining the costs of IBS, few researchers have developed reliable estimates of the costs of treating patients with IBS-consistent symptoms. Recently, Talley et al (10) documented the costs, excluding the cost of medications, of treating IBS patients over the course of a year in Rochester, Minnesota. The study used an age- and sex-stratified random sample of residents of Olmstead county, Minnesota, which encompasses the Rochester community. Importantly, each medical care provider in the region uses a dossier, or unit record system, which tracks all the treatments given to any individual person. The system provides data on each patient, regardless of the provider, as long

**TABLE 2**  
Canadian irritable bowel syndrome (IBS) prevalence estimates

	Geographic area		
	Canada	Ontario	Quebec
IBS proportion (%)	6.2	6.2	6.2
Total population estimate			
Total population*	29,954,193	11,261,293	7,378,119
Total IBS patients	1,857,160	698,200	457,443
Population over age 20 years			
Total population	21,956,078	8,280,684	5,486,308
IBS patients	1,361,277	513,402	340,151

\*From reference 12

as the provider is in the county. This eliminates the aforementioned problems of potentially missing patients, based on which provider they use. The study determined that the average IBS patient consumed approximately US\$313 more in resources than comparable patients with no gastrointestinal symptoms and US\$128 more than those with some gastrointestinal symptoms. For those who used medical services, the median nondrug charges were US\$742 for IBS patients, US\$429 for those without gastrointestinal symptoms and US\$614 for those with some symptoms. The high differential cost in treating such patients testifies to both the financial and medical importance of the condition.

The medical literature provides abundant information on the prevalence of IBS in many parts of the world. However, no satisfactory studies have used solely Canadian data. To derive estimates of the prevalence of the condition in the Canadian population, a small-scale meta-analysis of available studies was employed. Table 1 summarizes the findings of the meta-analysis and provides information on the prevalence of IBS. To calculate figures for the respective provinces within Canada, it was assumed that the prevalence rate does not vary from province to province. Table 2 depicts estimates of the population experiencing IBS in Canada.

The study was restricted to those over 20 years of age. There is extensive documentation that children and very young adults also suffer from IBS. However, most cost studies have excluded this population because the practitioners who treat this patient group may differ substantially from those who work with the adult population.

#### DATA SET AND STUDY DETERMINATION

To obtain data on the prevailing treatment patterns in Canada, a multicentre retrospective chart review of IBS patients in Quebec and Ontario was conducted. As a supplement to these data, a physician Delphi panel was established to estimate medical resource use that is not typically recorded in a patient's chart, such as emergency room visits.

The chart review sites were selected to balance the study population between Ontario and Quebec to develop a sample that closely resembles all of Canada. Physicians at each of the treating institutions, each of whom had extensive experience with IBS and non-IBS patients, were asked to de-

**TABLE 3**  
**Chart review sites**

	Ontario	Quebec
Gastroenterology	McMaster University Medical Centre, Hamilton	Hôpital Saint-Luc, Montreal
General practitioner	Dundas Family Medical Centre, Dundas	Brossard Medical Centre, Brossard

Data from reference 12

termine which patients either suffered from IBS or were treated in a manner consistent with IBS based on their symptoms and ensuing treatments. A total of 120 charts were determined to be satisfactory and were reviewed at four sites across Canada – two in Quebec and two in Ontario. Table 3 depicts the sites by province and type.

Patients who have symptoms consistent with IBS typically enter the medical system via a consultation with a GP. Following an initial visit, the GP may refer the patient to a gastroenterologist or continue to see the patient regularly or as needed. In this way, patients may migrate back and forth between the generalist and the specialist. With the relatively rare exception of some hospital-based practices and multidisciplinary self-contained clinics, the medical charts for these patients reside in multiple and disparate locations. Estimating the cost of treating a single patient requires capturing resource consumption across the spectrum of care providers. To track patients through their courses of treatment, GP sites that commonly refer patients to the selected gastroenterology sites were identified. A cohort of patients common to both sites, as well as a cohort of patients that

were not common to both sites, was constructed. These patients moved from different practitioners, and the data provide information on the characteristics of patients throughout their treatment periods. Table 4 depicts the numbers of patients at each site in Quebec and how many of each were common to other sites.

In Quebec, patients treated at the gastroenterologist level were selected from two sites – Hôpital Saint-Luc, Montreal and The Brossard Medical Centre, Brossard. The patients at Hôpital Saint-Luc were not common to any other sites in the study. However, all of the patients that were treated at the gastroenterology practice of The Brossard Medical Centre were referred from the Brossard GP practice. In addition, the Saint-Luc patients received treatment by the same gastroenterologists as the patients treated at The Brossard Medical Centre.

In Ontario, the patient sample comprised 28 patients who were treated at the Dundas Family Medical Centre, Dundas (Table 5). At this site, patients received care from GPs. Thirteen patients received gastroenterological treatment at the other Ontario site, McMaster University, Hamilton. In addition, 19 patients received only gastroenterological care at McMaster and did not consult a GP. The demographic characteristics of the patients were roughly equivalent in the different sites. As has been commonly noted by practitioners, the typical IBS patient is a 48-year-old female, which is shown in Table 6.

At the GP level, data were collected for five years. At the gastroenterologist level, data were collected for at least two years. This allowed for a maximum of seven years to study the diagnostic procedures and the follow-up care for the disease. Because it may take at least two years to detect a case of IBS at the GP level, five years of follow-up provides ample time to collect the necessary information on the treatment

**TABLE 4**  
**Quebec chart sample**

Site name	Site type	Charts reviewed	Charts that satisfied exclusion and inclusion criteria	Charts common to other sites	Years of chart review data reviewed
Hôpital Saint-Luc, Montreal	GI	40	20	0/20	2
The Brossard Medical Centre, Brossard	GP	75	22	22/22	5
The Brossard Medical Centre, Brossard	GI	49	25	25/25	2

GI Gastroenterologist; GP General practitioner

**TABLE 5**  
**Ontario chart sample**

Site name	Site type	Charts reviewed	Charts that satisfied exclusion and inclusion criteria	Charts common to other site	Years of chart data reviewed
Dundas Family Medical Centre, Dundas	GP	200	28	13/28	5
McMaster University, Hamilton	GI	40	33	13/33	2

GI Gastroenterologist; GP General practitioner

patterns of IBS patients. At the gastroenterologist level, less time is required to diagnose the condition; consequently, less time is required to capture the diagnostic and treatment patterns of patients being treated by gastroenterologists. In addition, many gastroenterologists routinely refer patients back to GPs for further care if necessary.

The cost of treatment information was obtained from several Canadian sources. Physicians' fees and the cost of diagnostic tests were extracted from the provincial reimbursement registers. The costs of prescribed drugs were taken from the private plan reimbursement schedules, and the provincial formularies and reimbursement rates, depending upon the applicable payer. For individuals under the age of 65 years, private plan reimbursement schedules applied, whereas provincial formularies reimburse drug costs for those over the age of 65 years.

To capture the indirect costs associated with the disease, an additional societal cost, lost time at work, was included in the analysis. To compute the quantity and cost of lost time on the job, the average Canadian wage rate was multiplied by the estimated number of lost days at work due to IBS multiplied by the percentage with IBS who seek care. All data were taken either from Canadian national statistics or from a study by Drossman et al (11) that studied the number of lost work days because of IBS symptoms.

Individuals who are afflicted with IBS face chronic and episodic symptoms. Treating such episodes results in substantial costs that are distributed throughout the entire period of affliction with IBS. Full consideration of such costs requires a longitudinal study of patients and their respective treatments. In the absence of such data, the likely costs to society of treating the condition can be inferred. The present model does so by considering a retrospective chart review of IBS patients. The cost of treating a 'typical' IBS patient can be estimated by considering the cost per episode per year and combining this estimate with Canadian prevalence data on IBS. Doing so requires the completion of three distinct phases of analysis. First, individual medical chart data need to be studied and analyzed to determine the projected time pattern of treatment, given the demographic characteristics of the patient. This phase ignores costs and simply considers how a patient is treated and the ensuing resource consumption pattern. The time pattern of resource use is considered to allow for the calculation of not only what but also when resources are expected to be used. In the second phase, data are analyzed to determine the costs of all resources used in the treatment of IBS. In the final phase, the patient pool that is provided by the chart review is matched to that of all of Canada by using estimates of the prevalence of IBS. The following paragraphs discuss each in detail.

The data observed in the chart review indicate a time pattern of resource use during what is presumed to be a single episode of IBS. Patients are assumed to travel to and from medical practitioners during the course of treatment. It is further assumed that, after undergoing a series of examinations and receiving various treatments, a patient enters an interim state of either self-care or freedom from symptoms,

**TABLE 6**  
**Patient demographics by site**

Site	Male patients (%)	Mean age (years)	Population >65 years of age (%)	Total patients
The Brossard Medical Centre, Brossard	36.3	46.59	6.0	33
Hôpital Saint-Luc, Montreal	8.3	46.54	12.5	24
Dundas Family Medical Centre, Dundas	42.8	46.46	10.7	28
McMaster University Medical Centre, Hamilton	26.3	53.60	31.6	33

marking the end of the resource use during the recorded episode of IBS.

The specific treatment algorithm for a patient provides a foundation for the analysis of how the costs of treatment can be studied. Individuals move between states of health with certain probabilities during the course of treatment. Markov models have been used extensively in the economic and medical literature to study how individuals in similar situations progress through stages of illness and recuperation. Such models provide a natural correspondence between clinical algorithms and econometric specifications of costs. Thus, the model naturally meshes with medical as well as economic considerations and can be used to answer both sets of questions. Other methodologies do not offer such flexibility in considering both sets of questions. The present study used a Markov model to determine the structure by which individuals pursue treatments and how specific patient characteristics alter the usual courses of therapy.

A multistate Markov model is used to indicate how patients move over time from GPs and gastroenterologists during the course of treatment to the final state of either self-care or freedom from symptoms. The final state is assumed to be an interim state, indicating the end of the current episode of IBS. It is assumed that the Markov model provides fixed probabilities of transition from states. To estimate such a model, the common technique of using a multinomial logistic regression was employed. This estimation provides information on how individuals move over time in the aforementioned states, while controlling for demographic and medical characteristics of patients. Thus, an individual with a set of demographic and medical characteristics who has just visited a GP faces a certain probability of visiting another GP, visiting a gastroenterologist or never returning for further care for the current episode of IBS.

The derived transition matrix allows for an understanding of the quantity of resources that individuals consume over the course of their treatment. The probability of any course of treatment can be estimated from the transition matrix. By iteratively multiplying the matrix by itself, probabilities of an individual either having any number of visits or

**TABLE 7**  
**Total annual costs of irritable bowel syndrome by direct medical cost component (societal perspective)**

Cost component	Ontario average cost (90% CI)	Cost to Ontario (%)	Quebec average cost (90% CI)	Cost to Quebec (%)
Doctors' fees	\$37,512,410 (\$31,416,643 to \$40,911,972)	29	\$15,900,709 (\$11,716,312 to \$16,319,148)	18
Diagnostic tests	\$59,785,405 (\$55,565,257 to \$61,074,892)	46	\$41,007,091 (\$25,022,694 to \$43,182,977)	45
Drugs	\$7,033,577 (\$4,571,825 to \$13,949,927)	5	\$17,574,467 (\$14,729,077 to \$39,500,708)	19
Medical professional referrals	\$12,894,891 (\$10,315,913 to \$14,770,551)	10	\$9,205,673 (\$6,527,659 to \$10,084,397)	10
Emergency room visits	\$13,941,378 (\$6,117,010 to \$28,374,083)	11	\$6,700,381 (\$976,574 to \$17,090,041)	7
Totals	\$131,167,660	100	\$90,388,321	100

seeing a specific type of physician on any particular visit can be obtained. This allows for a full characterization of the distribution function for outcomes associated with IBS.

The model estimates the timing of events in addition to the type of events that occur. To do so, the model assumes that individuals return for follow-up visits according to an exponential distribution function. This equation states that an individual's return visits may range from shortly after prior visits to long after an earlier visit. This equation is used in conjunction with the aforementioned model to provide an understanding of when visits are expected to occur.

The parameters of the model indicate the probability that an individual in any given state will move to another state over any specified time interval. Using this information, the model simulates how all the individuals in the study might move over time to obtain a time-dependent distribution of treatments. This information provides an estimate of resource use as well as the number of years during which resources are expected to be used. This, in turn, provides an estimate of the use of medical goods and services during a year in which treatment is sought. This information provides a crucial link to extrapolate the cost of IBS from Canadian prevalence figures.

Estimation of the cost of resources used in the treatment of IBS follows simply from the computation of the sample averages of resources used during visits to medical practitioners. The cost of resources that are used at the GP or gastroenterologist level for patients, based on sex, age, symptom group, province and medical practitioner type, is estimated. This information provides costs that can be applied to the data on patient medical visits to obtain a time profile of cost for IBS patients. The estimation imputes the cost of resources used for missing observations to ensure that drug costs are properly accounted for in the absence of complete information from all patients. Unknown duration and frequencies of drug therapies are replaced by averages of known similar drug therapies. Similar adjustments are applied to the use of diagnostic tests.

Due to the absence of emergency room visit documentation in out-patient charts, a physician Delphi panel was conducted to estimate the effect of these occurrences on the

total cost of IBS. Because GPs and gastroenterologists offer two distinct types of care, the panels were conducted separately for each physician group. Similarly, because practice patterns may vary among the Canadian provinces, groups were segmented further by province, resulting in four separate panel groups. The Delphi panel process involved the following steps:

- Physician recruitment
- Survey design
- Survey administration
- Tabulation and analysis of the first round of results
- Panel member consensus conference call
- Tabulation and analysis of consensus (second round) results

Through this process, the typical IBS practice patterns and patient behaviours within each province were delineated, including the frequency of emergency room visits within a given year.

Canadian population statistics were applied to prevalence data taken from studies conducted in the United States and the United Kingdom to determine the number of individuals seeking care for IBS in Canada during any given year. The cost of treating IBS in Canada is computed as the product of the expected cost of treating a patient with IBS during a year in which care is sought, derived from the chart data, and the number of individuals who seek care in any given year. The emergency room visit and indirect costs, determined via adjunct analyses, were independently added to the final cost estimates of IBS for each province and Canada overall.

## RESULTS

The analysis provides information on both the direct costs and indirect costs that are incurred because of IBS. Further, subdivisions are made to show the allocation of direct costs according to the payer of the medical goods and services. The distinction allows for a natural consideration of the incidence of the financial burden of IBS. All figures are in 1996 Canadian dollars.

**TABLE 8**  
Physician fee schedules for patients with irritable bowel syndrome in Quebec and Ontario

Health professional visit	Ontario reimbursement type	Quebec reimbursement type	Ontario plan cost (\$)	Quebec plan cost (\$)
General practitioner, initial visit	Specific assessment	Complete	47.7	29.3
General practitioner, follow-up	Minor assessment	Ordinary	16.1	14.7
Gastroenterologist, initial visit	Consultation	Main visit (mean)	104.4	34.32
Gastroenterologist, follow-up visit	Partial assessment	Follow-up visit (mean)	22.9	17.25
General surgeon, initial visit	Consultation	Main visit (mean)	55.9	29
General surgeon, follow-up visit	Specific assessment	Follow-up visit (mean)	37.9	13.5
Psychiatrist	Consultation	Main visit (mean)	113.45	35.75
Psychiatrist	Partial assessment	Follow-up visit (mean)	22.9	21
Psychologist	Unit costs	Unit costs	65.02	65.02
Social counsellor	Unit costs	Unit costs	51.71	51.71
Nutritionist	Unit costs	Unit costs	65.75	65.75
Hospital stay (gastroenterology ward, daily rate)	Unit costs	Unit costs	391.53	391.53

**TABLE 9**  
Emergency care costs

Geographic region	ER visit cost/min (\$)	Mean time spent in ER (mins)	Cost of ER doctor visit (\$)	% of IBS population that visits the ER	IBS prevalence (age ≥20 years)	Costs for patients ≥20 years of age??
Ontario	9.13	30	13.20	9	513,402	13,941,378
Quebec	9.13	30	13.20	7	340,151	6,700,381
Canada	9.13	30	13.20	8	1,361,277	31,890,037

ER Emergency room

**TABLE 10**  
Indirect costs of irritable bowel syndrome (IBS)

Geographic area	Total IBS population over age 20 years	Population workforce (%)*	Average hourly wage (\$)†	Average number of lost work days‡	Total indirect cost (\$)
Ontario	513,402	49	15.01	13.4	400,658,975
Quebec	340,151	49	14.05	13.4	248,481,724
Canada	1,361,277	49	14.39	13.4	1,018,458,445

\*Data from reference 13; †Data from reference 14; ‡Data from reference 11

Costs of the various goods and services for treating IBS are summarized in Table 7. Confidence intervals are provided for all dollar figures. Doctors' fees are substantially higher in Ontario than in Quebec. This occurs primarily because the physician fee schedule in Ontario is substantially higher than that in Quebec for all consultations and services. (Table 8). The cost of providing diagnostic tests accounts for nearly one-half of the total cost of care in both provinces. In contrast, the costs of drugs, referrals and emergency room visits appear to be consistent in both provinces, and substantially smaller than either physicians' fees or diagnostic tests.

The costs of emergency room care were obtained by employing information on the relative need for emergency room care, based on the results of a physician Delphi panel. The panel reached the consensus that approximately 8% of the overall Canadian IBS population each year requires a visit to the emergency room to treat IBS-related symptoms. The total cost of emergency room care was estimated from data on the typical cost per minute in the emergency room and the prevailing fee structure for such services (Table 9).

Indirect costs need to be handled separately from direct

costs because there is no accounting procedure to determine the exact sum of costs borne by IBS victims. This figure includes the costs for both diagnosed and undiagnosed IBS patients. The estimates employed were obtained in a study by Drossman et al (11), which found that patients typically miss 13.4 days of work each year because of IBS symptoms. Data from Statistics Canada (12) were used to estimate that the indirect cost of IBS is approximately the product of the IBS population that is in the workforce and the number of hours of lost work at the relevant wage rate. Table 10 summarizes the calculation.

These separate analyses can be combined to provide a complete characterization of the costs of IBS to all of Canadian society. Estimates of the incidence of the financial burden of the condition can be obtained by segregating costs according to the payer. Table 11 provides data on the average annual cost of IBS patients by payer perspective. In addition, indirect costs are broken out to highlight the indirect economic impact of the condition, as well as the sum total of the likely costs.

Indirect costs are typically paid by a variety of sources and

**TABLE 11**  
**Average annual cost per patient of irritable bowel syndrome for patients over 20 years of age**

	Direct cost (\$)	Indirect cost (\$)	Total cost (\$)
Societal perspective*			
Ontario	255.48	780.40	1,035.88
Quebec	265.73	730.51	996.24
Canada	258.82	748.16	1,006.98
Provincial health plan perspective			
Ontario	247.10	Excluded	247.10
Quebec	220.78	Excluded	220.78
Canada	235.86	Excluded	235.86

\*Sum total of costs, regardless of payer

cannot be pinpointed, although the afflicted individuals may be expected to bear a large share of the burden. The provincial health plans reimburse individuals for health care expenses; however, drug costs are not covered for those under 65 years of age. The differential in costs between the societal and provincial health plans reflects this fact.

The estimated costs agree quite closely with similar calculations obtained by Talley et al (10), who studied the costs of IBS in Minnesota. The model suggests that there is strong statistical evidence that the cost is substantial. With or without indirect costs, IBS represents a major cost to the Canadian medical system.

## DISCUSSION

The treatment of IBS entails considerable expense. In both provinces of Canada from which patients were studied, patients endured lengthy courses of treatment and consumed great financial resources. Diagnostic tests were the largest single cost component of care in both provinces. Given that IBS is a diagnosis of exclusion, this finding accords well with clinical belief. With a more available clinical marker for the condition, diagnostic costs might be substantially reduced.

The relative uniformity of costs between the provinces provides interesting information. Table 8 details the fees for physicians and other medical services. In all categories, medical consultations are more expensive in Ontario than in Quebec. This appears to result in a substantially higher share of total expenditures for doctor's visits. However, reduced expenditures on other components of care made up for the extra cost of doctor's fees. This raises an interesting possibility that the behaviour and treating patterns of physicians in Ontario and Quebec are different. Analyses indicate that, after adjusting for demographic characteristics, the study population required fewer visits ( $P < 0.0003$ ) in Ontario than in Quebec. There is no clinical evidence of substantially different treatment patterns in the data set; however, the evi-

dence points to reduced costs and shorter durations of treatment in one province over the other. This suggests the merits of further investigation into the cause of the discrepancies in costs between the two provinces and potentially all of Canada.

The treatment for IBS ranges widely based on the beliefs of individual practitioners and the medical characteristics of patients. The literature has documented that many diagnostic tests and surgeries are being performed on patients who may not need such invasive procedures. Whether this is true is outside the scope of the present article. However, developing a consistent and reliable means of treating patients may provide massive cost savings. Ineffective treatment, whether surgical-, pharmaceutical- or counselling-based, needs to be replaced with treatments that have proved their effectiveness. A microanalysis of the treatment patterns in Quebec and Ontario may provide important clues as to how best to treat those afflicted with IBS.

IBS represents an enormous financial burden to all of Canada. Given the lack of knowledge of how to treat IBS, the medical community needs to consider how best to treat the condition. If this is done properly, medical practitioners may be able to simultaneously improve the standard of care for patients and provide cost effective treatment.

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