

Irritable bowel syndrome and health-related quality of life: A population-based study in Calgary, Alberta

Feng Xiao Li MD PhD¹, Scott B Patten MD PhD^{1,3}, Robert J Hilsden MD PhD^{1,2},
Lloyd R Sutherland MDCD MSc FRCPC FACP^{1,2}

FX Li, SB Patten, RJ Hilsden, LR Sutherland. Irritable bowel syndrome and health-related quality of life: A population-based study in Calgary, Alberta. *Can J Gastroenterol* 2003;17(4):259-263.

BACKGROUND: Little is known about the health-related quality of life (HRQOL) of nonclinical samples of people with irritable bowel syndrome (IBS) in Canada. In a pilot survey, the impact of IBS on HRQOL using a population-based, urban sample was examined.

METHODS: A random sample of Calgary residents (18 years of age or older), selected by random digit dialing (n=1521), completed a structured questionnaire including ROME II Criteria and Medical Outcomes Study Short-Form 12-Item Health Survey, version 2 (SF-12v2). The mean scale and summary scores of SF-12v2 for those who did and did not meet ROME II criteria and for those who met ROME II criteria with and without visiting a physician in past three months were determined and compared using multiple regression analyses.

RESULTS: Of the 951 households successfully contacted, 590 (62%) were willing to participate, of which 437 (74%) individuals were recruited. One hundred ten IBS cases (81 of which were women) and 327 non-IBS controls (180 of which were women) were identified. All of the eight mean scale scores and the two mean summary scores were significantly lower in people with IBS than in those without, whether or not adjusting for demographics. Forty-four of the 110 IBS cases (40%) sought medical help. Significantly lower mean physical component score and three scale scores (general health, social functioning and role physical) were found in those who sought medical help than in those who did not.

CONCLUSIONS: People with IBS experience significant impairment in HRQOL, including both physical and mental well-being. People with IBS who seek medical help report worse physical health than those who do not, but their mental health is no different.

Key Words: *Epidemiological survey; Health-related quality of life; Irritable bowel syndrome; SF-12v2*

Irritable bowel syndrome (IBS) is one of the most common gastrointestinal disorders. The illness is characterized by chronic or recurrent abdominal pain and altered bowel habits, including diarrhea, constipation, or alternating diarrhea and constipation (1,2). The reported prevalence in developed countries was 5% to 19% in men and 14% to 24% in women (3). It is the reason for 20% to 50% of referrals to gastroenterology clinics (4). To date, there is no consensus as to the cause of IBS and there is no universally effective treatment.

Although not a life-threatening illness, IBS can cause great distress to the patients. People with IBS may also experience

Le syndrome du colon irritable et la qualité de vie reliée à la santé : Une étude représentative à Calgary, en Alberta

HISTORIQUE : On ne sait pas grand-chose sur la qualité de vie reliée à la santé (QVRS) d'échantillons non cliniques de personnes atteintes du syndrome du colon irritable (SCI) au Canada. Dans une enquête pilote, ont été examinées les répercussions du SCI sur la QVRS au moyen d'un échantillon urbain représentatif.

MÉTHODOLOGIE : Un échantillon aléatoire d'habitants de Calgary (de 18 ans ou plus), sélectionnés au moyen d'appels téléphoniques à composition aléatoire (n=1 521), ont rempli un questionnaire structuré incluant les critères ROME II et le *Medical Outcomes Study Short-Form 12-Item Health Survey, version II* (SF-12v2). L'échelle moyenne et les indices sommaires du SF-12v2 pour ceux qui respectaient et ne respectaient pas les critères ROME II et pour ceux qui respectaient les critères ROME II et qui avaient consulté ou non un médecin au cours des trois mois précédents ont été déterminés et comparés au moyen d'analyses de régression.

RÉSULTATS : Sur les 951 maisons jointes, 590 (62 %) étaient prêtes à participer, et 437 individus (74 %) ont été recrutés. Cent dix cas de SCI (dont 81 femmes) et 327 cas témoins sans SCI (dont 180 femmes) ont été repérés. Les huit indices d'échelle moyens et les deux indices sommaires moyens étaient beaucoup plus faibles chez les personnes atteintes du SCI que chez celles n'en souffrant pas, avec ou sans rajustement démographique. Quarante-quatre des 110 cas de SCI (40 %) ont demandé une aide médicale. L'indice des éléments physiques moyens et les trois indices d'échelle (santé générale, fonctionnement social et examen physique) étaient beaucoup plus faibles chez ceux qui avaient demandé de l'aide médicale que chez ceux qui n'en avaient pas demandé.

CONCLUSIONS : Les personnes atteintes du SCI présentent une importante dégradation de la QVRS, y compris le bien-être physique et mental. Les personnes atteintes du SCI qui demandent de l'aide médicale font état d'une santé physique plus détériorée que celles qui n'en demandent pas, mais leur santé mentale ne diffère pas.

other symptoms such as nausea, fatigue, headache, sexual dysfunction and urinary symptoms (eg, incomplete bladder emptying). These intestinal and extraintestinal symptoms can adversely affect the health-related quality of life (HRQOL) of people who suffer from IBS. To date, few studies, especially those using population-based data, were conducted that evaluated the HRQOL in people with IBS. There have been no population-based Canadian studies.

Most people with IBS do not seek medical care (4). Community-based studies show that only 25% to 60% of people with IBS present for medical care for evaluation or treat-

Departments of ¹Community Health Sciences, ²Medicine and ³Psychiatry, University of Calgary, Calgary, Alberta

Correspondence: Feng Xiao Li, Department of Community Health Sciences, University of Calgary, 3330 Hospital Drive NW, Calgary, Alberta T2N 4N1. Telephone 403-220-8843, fax 403-270-7307, e-mail flf@ucalgary.ca

Received for publication September 24, 2002. Accepted February 24, 2003

ment of their symptoms (5). How frequently people with IBS seek medical help in Canada and how the help-seeking behaviour of people with IBS is affected by their HRQOL in general have not been well studied. As part of a multipurposed pilot study, the goals of the present study were to examine the impact of IBS on the HRQOL using a population-based urban sample and to compare the HRQOL of people with IBS who did and did not seek medical help.

METHODS

A random sample of the Calgary general population (18 years of age or older) was recruited during March and August 2001 using Random Digit Dialing (RDD). RDD is an established sampling procedure that, theoretically, provides an equal probability of reaching a household (6). The list of RDD numbers within the Calgary Census Metropolitan Area was generated by Canada Survey Sampler (a private firm) using traditional Mitofsky-Waksberg methodology (7). The list contained telephone numbers for all potential households on the list, and names and addresses for the households that were listed in telephone directory. A total of 1521 RDD numbers was used in this study.

The diagnosis of IBS was made using the Rome II Criteria, derived from the section on bowel disorders from the Rome II modular questionnaire, for which two algorithms were created (8) (Table 1). A study subject was determined as a case of IBS if "Q20 = Yes, plus two of (Q21 or Q22 or Q23) = Yes" or if "Q10 = Yes, plus two of (Q13 or Q14a or Q14b) = Yes". The Rome II Criteria are widely used by investigators and are considered to be valid and having good predictive value for IBS (9). All the individuals in the sample who met the Rome II criteria were considered as cases of IBS; otherwise, as control subjects.

The HRQOL was assessed using Medical Outcomes Study Short-Form 12-Item Health Survey, version 2 (SF-12v2) (10). SF-12 is a validated HRQOL measure (11) and can be used to compare patients with healthy individuals. SF-12v2 includes eight scale scores, ie, physical functioning, social functioning, role limitation-physical, role limitation-emotional, mental health, vitality/energy, bodily pain and general health. From the eight scale scores, two summary scores (physical component score and mental component score) are derived. All the scale and summary scores have a range of zero to 100 and are designed (using 1998 general United States population) to have a mean score of 50 and a standard deviation of 10 so that a high score indicates better health. For example, a mean score of 45 in the IBS group would mean that 69% of the general population has a better HRQOL than the average IBS patient group.

A questionnaire was developed that included the above standard forms and sections on demographics and history of health-related visitation. Based on the respondent's request, the questionnaire was either interviewer-administered (by telephone) or self-completed (through the web, by interactive voice telephony, or by mailed/emailed questionnaire). Before data collection commenced, each mode of the questionnaire administered was pilot-tested in five subjects and proved to be easy to answer.

The data collection involved three steps: recruiting households by mail or phone; selecting an individual from the households; and completing the questionnaire by the selected individuals. A self-addressed stamped card with a cover letter was first mailed to the addressed households. On the card, the households could specify if they would be willing to participate in the study and which method they would use to complete the questionnaire. The card also specified a Web site, a 1-800 number and a mail and email address, to be

TABLE 1
Questions for diagnosis of irritable bowel syndrome derived from the Rome II Criteria

Q10.	In the last 3 months, did you often* have discomfort or pain centered in your upper abdomen (above your belly button, or the pit of your stomach)?
Q13.	Does your upper abdominal discomfort or pain usually get better or stop after you have a bowel movement?
Q14a.	When the upper abdominal discomfort or pain starts, do you usually have a change in your usual number of bowel movements (either more or fewer)?
Q14b.	When the upper abdominal discomfort or pain starts, do you usually either have softer or harder stools than usual?
Q20.	In the last 3 months, did you often* have discomfort or pain in your abdomen?
Q21.	Does your discomfort or pain get better or stop after you have a bowel movement?
Q22.	When the discomfort or pain starts, do you have a change in your usual number of bowel movements (either more or fewer)?
Q23.	When the discomfort or pain starts, do you have either softer or harder stools than usual?

*Often means that the symptoms were present during at least three weeks (at least one day in each week) in the last three months

used to complete the questionnaire. The households that did not respond to the mailing or did not have an address were called directly. The study was introduced verbally over the phone. The recruited households would then select an individual (18 years of age or older) using the 'last birthday method' (12) detailed in the cover letter or over the phone. This individual was allowed to decide which method to use to complete the questionnaire.

To analyze the data, the SF-12v2 scale and summary scores were first determined for each individual subject. To accomplish this, the SF-12v2 items were first scored in a computerized algorithm (10) for each individual subject. The means and standard deviations were then determined for each scale and summary score separately for people with and without IBS and for IBS cases with and without a physician-visiting history. The differences of the mean scores in each category and their 95% confidence intervals (CI) were determined as both crude and demographic-adjusted (for age, sex, education and household income). The adjustment for demographic variables was conducted using multiple regression analyses.

RESULTS

Sample characteristics

Of the 1521 RDD numbers used, 951 households were contacted successfully, with the remaining being nonresidential or non-working numbers (note: RDD contains not only residential telephone numbers but also business and not-in-service telephone numbers). Of the 951 households, 590 (62%) were willing and eligible to participate, of which 437 subjects (74%) completed the questionnaire. The age distribution of the 437 subjects was similar to that of the Calgary general population for both men and women (Figure 1). The authors identified 110 individuals who met the Rome II criteria and 327 individuals who did not. Table 2 shows the demographic characteristics of individuals who did and did not meet the Rome II criteria.

HRQOL for people with and without IBS

As shown in Table 3, the mean SF-12v2 scale scores ranged from 43.7 to 47.0 for people with IBS and from 49.0 to 52.6 for

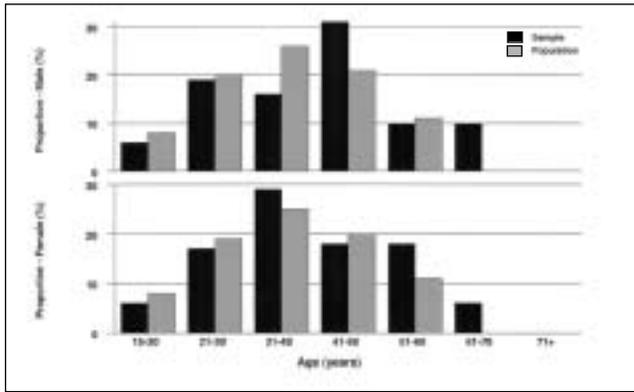


Figure 1) Age distribution of the sample and Calgary general population by sex

people without IBS. The eight scale scores were systematically lower in people with IBS than in those without. Adjustment of demographic variables (ie, age, sex, education and household income) of the study subjects did not change the differences either in direction or in significance. As with the scale scores, the two mean SF-12v2 summary scores were also significantly lower in people with IBS than in those without, with or without adjustment for demographic variables. While the mean scale and summary scores for people without IBS were close to the normal standard for the United States general population (ie, 50, Figure 2), they were all below 50 for people with IBS.

HRQOL for IBS patients with and without seeing a physician

Of the 110 subjects with IBS, 44 (40%) visited a physician for their gastrointestinal problems in the previous three months. The mean SF-12v2 scale and summary scores for those who did and did not visit a physician are presented in Figure 3 and Table 4. As shown, all the mean scale and summary scores were lower than the normal standard of 50, whether or not the subjects visited a physician. There were, however, differences in the mean scores between the two groups. As indicated by the two summary scores, people with IBS who sought medical help reported worse physical health than those who did not, but their mental health was no different. This is also reflected by the difference in the scale scores. The scales with a significant difference between the two groups include general health, social functioning and role limitation due to physical health. While the former two scales included the physical components, the latter directly indicated reduced physical well-being. No scale score on mental health showed a significant difference between the two groups. The difference remained unchanged in direction or in significance after adjusting for age, sex, education and household income.

DISCUSSION

Previous studies have demonstrated the negative effect of IBS on HRQOL of its sufferers (13-18). Most of these studies were conducted in hospital settings. Much less is known about the HRQOL of nonclinical samples of people with IBS. Using population-based data in Alberta, we examined the impact of IBS on HRQOL as measured by the SF-12v2. We found that:

1. People with IBS experienced significant impairment in HRQOL compared with that of the population-based controls;

TABLE 2
Demographic distribution by irritable bowel syndrome (IBS) status

Variables	IBS (n=110)	Non-IBS (n=327)
Female, n (%)	81 (74.3)	180 (55.7)
Age, n (%)		
Less than 30 years	29 (26.4)	72 (22.2)
31 to 50 years	52 (47.3)	149 (46.0)
51 to 70 years	23 (20.9)	81 (25.0)
70 years or older	6 (5.5)	22 (6.8)
Education, n (%)		
Less than grade 9	4 (3.7)	6 (1.9)
Grades 9-12	9 (8.3)	24 (7.4)
High school diploma	29 (26.6)	62 (19.1)
Trade certificate	5 (4.6)	31 (9.6)
Other non-university	24 (22.0)	60 (18.5)
Some university	12 (11.0)	31 (9.6)
University degree	26 (23.9)	110 (34.0)
Household income, n (%)		
Less than \$15,000	8 (8.5)	16 (5.7)
\$15,000 to \$25,000	11 (11.7)	21 (7.4)
\$25,000 to \$35,000	7 (7.4)	32 (11.3)
\$35,000 to \$45,000	14 (14.9)	27 (9.5)
\$45,000 to \$55,000	12 (12.8)	28 (9.9)
\$55,000 to \$65,000	12 (12.8)	34 (12.0)
\$65,000 to \$75,000	6 (6.4)	18 (6.4)
\$75,000 or more	24 (25.5)	107 (37.8)

2. The HRQOL of the randomly selected control subjects was close to the normal standard (ie, 50) of the United States general population;
3. People with IBS who sought medical help had reduced physical but not mental health compared with those who did not seek medical help; and
4. Forty per cent of people with IBS seek medical help in the Alberta context.

Our finding that people with IBS experienced significant impairment in HRQOL is consistent with that of the previous studies. Using a hospital-based sample of patients and the SF-36, Gralnek et al (14) found that IBS patients had significantly worse HRQOL than that of the general United States population. The reduced HRQOL covered each of the eight scales and the two summary components. Similar findings were reported by other investigators in the United States and the United Kingdom (13,19). One difference between the present study and the previous studies is that the previous studies used published general population data as the source for controls. The present study collected population-based asymptomatic individuals as control subjects. The HRQOL of the randomly selected control subjects in this study, as determined by the eight scale scores (ranging from 49.0 to 52.6) and the two summary scores (separately 51.3 and 50.2), is, however, close to that of the United States general population.

A large proportion of people with IBS do not seek help from health professionals. Our finding that 40% of people with IBS have consulted health professionals for evaluation or treatment of their illness fits the previously reported 25% to 60% range (5). Previous studies found that HRQOL affects health

TABLE 3
Comparison of mean Medical Outcomes Study Short-Form 12-Item Health Survey, version 2 scores for people with and without irritable bowel syndrome (IBS)

Scale: Mean (SD)	IBS (n=110)	Non-IBS (n=327)	Crude Difference* (95% CI)	Adjusted Difference† (95% CI)‡
Physical functioning	47.0 (10.9)	50.9 (8.9)	3.9 (1.8–5.9)	2.8 (0.7–4.8)
Role–physical	45.2 (9.7)	50.2 (8.5)	5.0 (3.1–6.9)	4.0 (2.1–6.0)
Bodily pain	43.7 (11.5)	50.9 (9.4)	7.1 (5.0–9.3)	5.6 (3.3–7.9)
General health	45.7 (11.4)	51.8 (9.4)	6.1 (3.9–8.3)	4.9 (2.6–7.2)
Vitality/energy	46.8 (8.7)	52.6 (8.2)	5.7 (3.9–7.5)	4.9 (2.9–6.9)
Social functioning	45.0 (10.2)	50.4 (9.0)	5.4 (3.4–7.4)	4.4 (2.2–6.6)
Role–emotional	44.9 (10.1)	49.0 (9.5)	4.1 (2.0–6.2)	3.1 (0.8–5.5)
Mental health	46.2 (9.5)	50.6 (8.3)	4.4 (2.5–6.3)	4.4 (2.4–6.5)
Summary: Mean (SD)				
Physical component score	45.9 (11.5)	51.3 (9.3)	5.4 (3.3–7.6)	4.2 (2.1–6.3)
Mental component score	45.8 (10.0)	50.2 (9.3)	4.4 (2.3–6.5)	4.0 (1.7–6.4)

*Difference of mean scores between people with and without IBS, without adjusting for demographic variables; †Difference of mean scores between people with and without IBS, adjusting for age, sex, education and income; ‡95% CI that does not overlap zero suggests a statistical significance or P<0.05

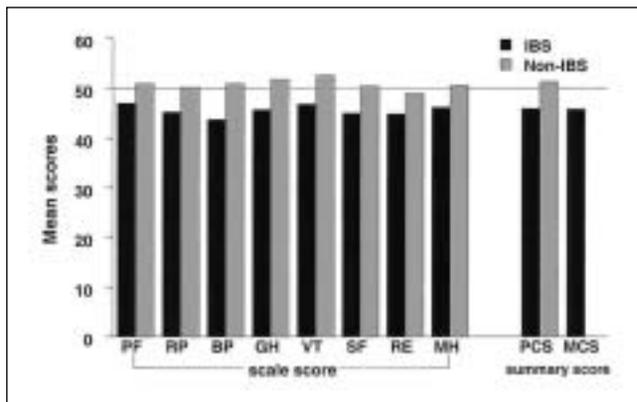


Figure 2 Comparison of mean Medical Outcomes Study Short-Form 12-Item Health Survey, version 2 scores for people with and without irritable bowel syndrome (IBS). BP Bodily pain; GH General health; MCS Mental component score; MH Mental health; PCS Physical component score; PF Physical functioning; RE Role–emotional; RP Role–physical; SF Social functioning; VT Vitality/energy

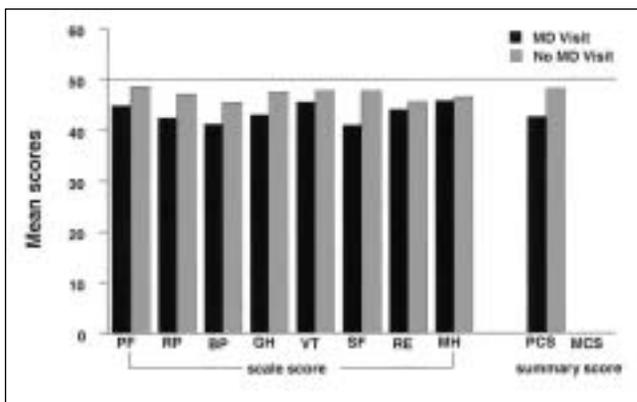


Figure 3 Comparison of mean Medical Outcomes Study Short-Form 12-Item Health Survey, version 2 scores for people with irritable bowel syndrome who did and did not visit a physician. BP Bodily pain; GH General health; MCS Mental component score; MD Medical doctor; MH Mental health; PCS Physical component score; PF Physical functioning; RE Role–emotional; RP Role–physical; SF Social functioning; VT Vitality/energy

care-seeking behaviour. Whitehead et al (13) reported that the SF-36 scores were significantly lower in IBS patients who sought medical help than in those who did not, on the general health, role physical, social functioning, vitality and bodily pain scales. Our study found that people with IBS who sought medical help had reduced scores on general health, role physical and social functioning, which are consistent with Whitehead’s findings. Although there is no significant difference on the scores of vitality/energy and bodily pain (between those who did and did not seek medical help) in our study, both studies indicated that the physical health components rather than the mental health components of HRQOL were associated with IBS patients’ health care-seeking behaviour. The increased prevalence of depression and anxiety in people with IBS has been hypothesized to play a role in health care seeking behavior (20-22). Our study, however, did not provide evidence that supports this hypothesis, but rather reinforced Whitehead’s findings.

To our knowledge, this is the first study of the HRQOL of people with IBS that used SF-12v2 as measurement tool. SF-12 is a shorter version of SF-36 that has been translated into 40 languages and has been used in many health outcome studies (23). Both instruments are generic measures of HRQOL and allow for the comparison of patients with healthy individuals. SF-12, rather than SF-36, was used in this study because its reduced administration time helps to improve the response rate for this pilot study. SF-12 is also a clinically-validated set of HRQOL measure (11). The two instruments have the same eight scale measures (ie, physical functioning, social functioning, role limitation–physical, role limitation–emotional, mental health, energy/vitality, bodily pain and general health perception) and two summary components (ie, physical component score and mental component score). As a result, the findings based on the two instruments can be directly compared with each other.

The use of the population-based IBS patients and control subjects is the major strength of this study. Studies that use hospital-based IBS patients are likely to over-sample the more severe cases. As a result, the reduced HRQOL based on such cases may not be generalizable to all IBS patients. Similarly, hospital-based or institutional controls may represent people

TABLE 4
Comparison of mean Medical Outcomes Study Short-Form 12-Item Health Survey, version 2 scores for people with irritable bowel syndrome (IBS) who did and did not visit a physician

Scale: Mean (SD)	Physician visit (n=44)	No physician visit (n=66)	Crude Difference* (95% CI)	Adjusted Difference† (95% CI‡)
Physical functioning	44.8 (12.6)	48.5 (9.4)	3.8 (-0.4-7.9)	3.1 (-0.9-7.1)
Role-physical	42.4 (9.9)	47.0 (9.1)	4.6 (0.9-8.2)	4.7 (1.1-8.2)
Bodily pain	41.2 (12.1)	45.4 (10.9)	4.2 (-0.2-8.6)	4.0 (-0.4-8.4)
General health	43.0 (12.4)	47.5 (10.4)	4.6 (0.2-8.9)	4.1 (0.1-8.0)
Vitality/Energy	45.5 (8.9)	47.8 (8.5)	2.3 (-1.0-5.6)	1.6 (-1.8-5.1)
Social functioning	41.0 (11.0)	47.7 (8.8)	6.7 (3.0-10.4)	7.0 (3.3-10.7)
Role-emotional	44.0 (11.7)	45.5 (8.9)	1.5 (-2.4-5.4)	1.3 (-2.6-5.2)
Mental health	45.7 (9.9)	46.5 (9.2)	0.8 (-2.9-4.5)	0.8 (-2.9-4.6)
Summary: Mean (SD)				
Physical component score	42.6 (13.3)	48.1 (9.6)	5.5 (1.2-9.8)	5.1 (1.0-9.3)
Mental component score	44.9 (10.9)	46.4 (9.3)	1.4 (-2.4-5.3)	1.4 (-2.6-5.4)

*Difference of mean scores between IBS cases who did and did not visit a physician, without adjusting for demographics; †Difference of mean scores between IBS cases who did and did not visit a physician, adjusting for age, sex, education and income; ‡95% CI that does not overlap zero suggests a statistical significance or $P < 0.05$

with certain health problems, with potentials of having reduced HRQOL. Unless specifically designed to compare IBS patients and other patients, using such controls will reduce the significance of difference in HRQOL (eg, at subscale level) between IBS patients and the controls. Our study, by using population-based IBS patients and controls, has overcome these potential problems. This study also has certain limitations. The response rate for this study (62% for the households and 74% for the individual household members) is suboptimal. The prevalence of IBS estimated based on the study sample (ie, 110 of 437 or 25.2%) doubled the previously reported Canadian prevalence estimate of 12.1% (24). Our response rate, however, tripled that of the previous study (19% for the

households and 57% for the individual household members). There are many possible explanations for the difference in the prevalence estimates between the two studies. For example, regional variation in IBS prevalence is one potential explanation (ie, the different prevalence estimates resulting from the differing target populations). The low response rate in the previous Canadian study may be another explanation. The 'worst case' scenario for our study, however, would be selected completion of the survey questionnaire by those who had IBS symptoms (ie, selection bias). Because the HRQOL of the control subjects is close to the US normal standard, selected completion, if it exists, should have minimal impact on the study results.

REFERENCE

- Camilleri M, Choi MG. Review article: Irritable bowel syndrome. *Aliment Pharmacol Ther* 1997;11:3-15.
- Krag E. Irritable bowel syndrome: Current concepts and future trends. *Scand J Gastroenterol Suppl* 1985;109:107-15.
- Drossman DA, Whitehead WE, Camilleri M. Irritable bowel syndrome: A technical review for practice guideline development. *Gastroenterology* 1997;112:2120-37.
- Maxwell PR, Mendall MA, Kumar D. Irritable bowel syndrome. *Lancet* 1997;350:1691-5.
- Talley NJ, Zinsmeister AR, Melton LJ 3rd. Irritable bowel syndrome in a community: Symptom subgroups, risk factors, and health care utilization. *Am J Epidemiol* 1995;142:76-83.
- Lavraskas PJ. Telephone Survey Methods. Sampling, Selection and Supervision. Beverly Hills, California: Sage Publications, 1987.
- Hartge P, Brinton LA, Rosenthal JF, Cahill JI, Hoover RN, Waksberg J. Random digit dialing in selecting a population-based control group. *Am J Epidemiol* 1984;120:825-33.
- Drossman DA, Corazziari E, Talley NJ, Thompson WG, Whitehead WE. The Functional Gastrointestinal Disorders. Mclean, Vermont: Degnon, 2000:669-88.
- Harris MS. Validity of the Rome criteria for predicting irritable bowel syndrome (IBS): A five year study of 104 patients in a community-based outpatient setting. *Gastroenterology* 2000;118: (Page number?). (Abst)
- Ware JE, Turner-Bowker D, Kosinski M, Gandek B. How to Score Version 2 of the SF-12TM Health Survey (With a Supplement Documenting Version 1). QualityMetric Incorporated, Lincoln, Rhode Island and Health Assessment Lab, Boston, Massachusetts, 2002.
- Ware J Jr, Kosinski M, Keller SD. A 12-Item Short-Form Health Survey: Construction of scales and preliminary tests of reliability and validity. *Med Care* 1996;34:220-33.
- Watson EK, Firman DW, Heywood A, Hauquitz AC, Ring I. Conducting regional health surveys using a computer-assisted telephone interviewing method. *Aust J Public Health* 1995;19:508-11.
- Whitehead WE, Burnett CK, Cook EW 3rd, Taub E. Impact of irritable bowel syndrome on quality of life. *Dig Dis Sci* 1996;41:2248-53.
- Gralnek IM, Hays RD, Kilbourne A, Naliboff B, Mayer EA. The impact of irritable bowel syndrome on health-related quality of life. *Gastroenterology* 2000;119:654-60.
- Frank L, Kleinman L, Rentz A, Ciesla G, Kim JJ, Zacker C. Health-related quality of life associated with irritable bowel syndrome: Comparison with other chronic diseases. *Clin Ther* 2002;24:675-89.
- Hahn BA, Kirchoefer LJ, Fullerton S, Mayer E. Patient-perceived severity of irritable bowel syndrome in relation to symptoms, health resource utilization and quality of life. *Aliment Pharmacol Ther* 1997;11:553-9.
- Glia A, Lindberg G. Quality of life in patients with different types of functional constipation. *Scand J Gastroenterol* 1997;32:1083-9.
- Chassany O, Bergmann JF. Quality of life in irritable bowel syndrome: Effect of therapy. *Eur J Surg Suppl* 1998;583:81-6.
- Hahn BA, Yan S, Strassels S. Impact of irritable bowel syndrome on quality of life and resource use in the United States and United Kingdom. *Digestion* 1999;60:77-81.
- Drossman DA, McKee DC, Sandler RS, et al. Psychosocial factors in the irritable bowel syndrome. A multivariate study of patients and nonpatients with irritable bowel syndrome. *Gastroenterology* 1988;95:701-8.
- Naliboff BD, Balice G, Mayer EA. Psychosocial moderators of quality of life in irritable bowel syndrome. *Eur J Surg Suppl* 1998;583:57-9.
- Dimenas E, Glise H, Hallerback B, Hernqvist H, Svedlund J, Wiklund I. Well-being and gastrointestinal symptoms among patients referred to endoscopy owing to suspected duodenal ulcer. *Scand J Gastroenterol* 1995;30:1046-52.
- Garratt AM, Ruta DA, Abdalla MI, Buckingham JK, Russell IT. The SF36 health survey questionnaire: an outcome measure suitable for routine use within the NHS? *BMJ* 1993;306:1440-4.
- Thompson WG, Irvine EJ, Pare P, Ferrazzi S, Rance L. Functional gastrointestinal disorders in Canada: First population-based survey using Rome II criteria with suggestions for improving the questionnaire. *Dig Dis Sci* 2002;47:225-35.



Hindawi
Submit your manuscripts at
<http://www.hindawi.com>

