

The Relationship Among Body Mass Index, Subjective Reporting of Chronic Disease, and the Use of Health Care Services in Newfoundland and Labrador, Canada

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Abstract

The purpose of the study was to examine the association of body mass index (BMI) with the prevalence of chronic disease and health services use in adults living in Newfoundland and Labrador (NL). A cross-sectional analysis of 2345 adult respondents to the 2001 Canadian Community Health Survey was performed. Outcome measures included the prevalence of chronic disease and health services use. The sample comprised normal (37%), overweight (39%), obese (17%), and morbidly obese (6%) individuals. Obese and morbidly obese individuals were more likely to report the presence of a chronic disease. Adjusting for age and sex, increasing BMI category was significantly associated with a greater likelihood of cardiovascular, endocrine, and pulmonary diseases (excluding asthma). The majority of survey respondents in each category reported having a regular doctor (>75%), and there were no significant differences across categories. Compared to those with a normal BMI, obese and morbidly obese individuals reported a significantly higher number of visits to a family physician. There were no differences across BMI categories and the use of specialist or hospital services. Almost a quarter of the study sample in NL was classified as morbidly obese or obese. These individuals reported more chronic conditions and more visits to a family physician than the normal-weight group. The greater morbidity and the increased frequency of visits to family physicians suggests greater consideration should be given to channeling financial and human resources to the primary health care of this high-risk population. (*Population Health Management* 2010;13:47–53)

Introduction

IN 1998, THE WORLD HEALTH ORGANIZATION (WHO) described obesity as an “epidemic” because of its increasing prevalence in a relatively short time period and its significant contribution to ill health.¹ Second only to smoking in magnitude, obesity is a preventable cause of mortality for adults in developed countries² and is associated with cardiovascular diseases, hypertension, and type II diabetes.

In Canada, there has been a dramatic increase in the prevalence of obesity (body mass index [BMI] ≥ 30 kg/m²) over the past 2 decades. In 1985, the prevalence of adult obesity in Canada, based on self-reported heights and weights, was 5.6%. A decade later (1995), it had increased to 12.7%,³ while the corresponding prevalence of obesity in Newfoundland and Labrador (NL) was reported to be 16.5%.⁴

More recently, the 2005 Canadian Community Health Survey (CCHS) reported that the prevalence of self-reported obesity in Canada had increased to 15.5% and 24% in Canada and NL, respectively.⁵ According to Statistics Canada, NL reports one of the highest provincial prevalence rates of obesity. In NL, approximately 3 of every 10 adults are obese (BMI ≥ 30), 4 of every 10 are overweight (BMI 25–29.9), and only 3 of 10 have a BMI in the normal range (BMI 18.5–24.9), which is associated with the least risk of ill health.³

Although Canada reports one of the highest prevalence rates of obesity in the world,⁶ limited research has been conducted in Canada on the problem of obesity and its impact on the utilization of the health care system, with even less research conducted on provincial or territorial populations.^{7,8} Recognizing the high prevalence of obesity in NL and the very limited number of studies conducted on obesity

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and its relationship with health care resource utilization in the province, the current study was conducted to examine the relationship between BMI, the prevalence of chronic disease, and the utilization of health care services in NL.

Methods

Study population

This was a cross-sectional analysis of a provincial sample of individuals who responded to the 2001 CCHS administered by Statistics Canada. The survey was conducted either through face-to-face or telephone interviews. The CCHS uses a multistage cluster sampling design to collect information related to the health of individuals aged 12 years and older in all provinces and territories, excluding long-term residents of hospitals or long-term care facilities and residents of First Nations Reserves or Canadian Armed Forces bases. The sample was representative of the population of NL. The response rate was 84.7%. The CCHS collects data on health status, health care utilization, comorbidities, and demographic, economic, and social correlates of health. Further, it provides timely cross-sectional estimates across all provinces on health determinants, health status, and health system utilization.⁹ Included in the current study were individuals 20–64 years of age with a documented BMI. Individuals were excluded if they were outside this age range, pregnant, did not have a height or weight measurement, did not provide a valid health insurance number, or did not agree to share their survey responses with a provincial health agency.

Variables of interest

The main independent variable in this study was BMI (kg/m^2). Survey participants were classified using the BMI system endorsed by the WHO and Health Canada.^{10,11} Using this system, individuals are classified as: normal weight (BMI 18.5–24.9), overweight (BMI 25–29.9), obesity class I (BMI 30–34.9), obesity class II (BMI 35–39.9), and obesity class III or morbid obesity (BMI ≥ 40). However in the current study, this definition was modified due to the small number of individuals classified as class III/morbid obesity. As a result,

obesity classes II and III were combined and described as morbid obesity (BMI ≥ 35) and those individuals with a BMI between 30–34.9 were described as obese.

The two major outcomes in the study were self-reported prevalence of chronic disease and self-reported health services utilization. The survey interviewers asked respondents if a physician had diagnosed them with any of a list of 25 chronic conditions (Table 1); due to small numbers in some categories, this list was consequently collapsed into categories of chronic conditions (eg, cardiovascular disease) by a medical doctor for analysis purposes. In addition, survey respondents were asked about their health services utilization in the previous 12 months. Questions were asked about “access to a regular doctor,” the number of visits to a regular doctor and “other doctor,” and whether they had an overnight stay in a hospital/nursing home/convalescent home, and, if so, the associated number of days spent in the facility.

Other descriptive variables of interest included: 1) socio-demographic variables such as age, sex, place of residence, level of education, level of income (a derived variable that combines total household income with number of household members), and marital status (partnered versus unpartnered, which included widowed, separated, divorced, or single); 2) lifestyle variables such as smoking behavior, level of physical activity, and the consumption of fruits and vegetables; 3) variables representative of an individual’s health status such as self-rated health (a 5-point scale from excellent to poor) and health utility index (HUI). The HUI consisted of questions about 8 health attributes: vision, hearing, speech, mobility, dexterity, cognition, emotion, and pain/discomfort. A utility score of 0.0 was assigned to death and a score of 1.0 was assigned to perfect health. Other health status variables included an individual’s number of disability days taken in the previous 2 weeks, the presence of a chronic condition, and the total number of diagnosed chronic conditions.

Statistical analysis

Descriptive statistics were calculated for outcomes and other descriptive variables referred to earlier by level of BMI. Bivariate comparisons were used to compare differences

TABLE 1. SELF-REPORTED PREVALENCE OF CHRONIC CONDITIONS BY BODY MASS INDEX CATEGORY

| Characteristic | Morbidly Obese (<i>n</i> = 141) | | Obese (<i>n</i> = 407) | | Overweight (<i>n</i> = 916) | | Normal (<i>n</i> = 881) | |
|---|----------------------------------|------|-------------------------|------|------------------------------|------|--------------------------|------|
| | <i>n</i> | % | <i>n</i> | % | <i>n</i> | % | <i>n</i> | % |
| Cerebro/cardiovascular ^{1***} | 39 | 27.7 | 107 | 26.3 | 163 | 17.8 | 82 | 9.2 |
| High blood pressure*** | 37 | 26.2 | 97 | 23.8 | 133 | 14.5 | 60 | 6.7 |
| Endocrine diseases ^{2**} | 24 | 17.0 | 50 | 12.3 | 83 | 9.1 | 66 | 7.5 |
| Diabetes mellitus*** | 16 | 11.3 | 32 | 7.8 | 41 | 4.5 | 24 | 2.7 |
| Gastrointestinal diseases ^{3*} | 9 | 6.4 | 23 | 5.6 | 24 | 2.6 | 39 | 4.4 |
| Pulmonary diseases ⁴ | 15 | 10.6 | 33 | 8.1 | 56 | 6.1 | 70 | 7.9 |
| Asthma | 12 | 8.5 | 24 | 5.9 | 44 | 4.8 | 54 | 6.2 |
| Neurological diseases ^{5**} | 24 | 17.0 | 46 | 11.3 | 79 | 8.6 | 117 | 13.3 |

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$.

¹Includes high blood pressure, heart disease (including heart attack, angina, and congestive heart failure) and effects of stroke.

²Includes thyroid condition, diabetes mellitus.

³Includes bowel disorders (Crohn’s or colitis) and stomach or intestinal ulcers.

⁴Includes chronic bronchitis, emphysema, or chronic obstructive pulmonary disease, asthma.

⁵Includes migraine headaches, epilepsy, Alzheimer’s disease or dementia, Parkinson’s disease, multiple sclerosis, and chronic fatigue syndrome.

TABLE 2. SOCIODEMOGRAPHIC CHARACTERISTICS BY BODY MASS INDEX CATEGORY

| Characteristic | Morbidly Obese (n = 141) | | Obese (n = 407) | | Overweight (n = 916) | | Normal (n = 881) | |
|-------------------------------------|--------------------------|-----------|-----------------|-----------|----------------------|-----------|------------------|-----------|
| | n | (%) | n | (%) | n | (%) | n | (%) |
| Age in years*** | | | | | | | | |
| 20–29 | 25 | (18) | 53 | (13) | 103 | (11) | 171 | (20) |
| 30–39 | 33 | (23) | 100 | (25) | 234 | (26) | 237 | (27) |
| 40–49 | 43 | (31) | 120 | (30) | 252 | (28) | 211 | (24) |
| 50–64 | 40 | (28) | 134 | (33) | 327 | (36) | 262 | (30) |
| Sex*** | | | | | | | | |
| Male | 48 | (34) | 204 | (50) | 505 | (55) | 353 | (40) |
| Female | 93 | (66) | 203 | (50) | 411 | (45) | 528 | (60) |
| Place of residence** | | | | | | | | |
| Urban (≥5000) | 96 | (68) | 241 | (60) | 567 | (62) | 599 | (68) |
| Rural (<5000) | 45 | (32) | 166 | (41) | 349 | (38) | 282 | (32) |
| Education | | | | | | | | |
| <Secondary | 25 | (18) | 72 | (18) | 148 | (16) | 145 | (17) |
| Secondary | 33 | (24) | 87 | (22) | 174 | (19) | 168 | (19) |
| Trade school | 69 | (50) | 200 | (50) | 437 | (48) | 415 | (47) |
| University graduate | 12 | (9) | 43 | (11) | 149 | (16) | 148 | (17) |
| Income*** | | | | | | | | |
| Low | 7 | (5) | 28 | (7) | 42 | (5) | 75 | (9) |
| Middle | 120 | (88) | 301 | (77) | 666 | (75) | 617 | (75) |
| High | 9 | (7) | 64 | (16) | 175 | (20) | 128 | (16) |
| Marital status*** | | | | | | | | |
| Married/common-law | 94 | (67) | 304 | (75) | 708 | (77) | 562 | (63) |
| Unpartnered | 47 | (33) | 103 | (25) | 208 | (23) | 317 | (36) |
| Smoking | | | | | | | | |
| Daily/former | 80 | (57) | 240 | (59) | 556 | (61) | 506 | (57) |
| Never smoked | 33 | (23) | 99 | (24) | 212 | (23) | 213 | (38) |
| Physical activity** | | | | | | | | |
| Active/moderate | 38 | (27) | 141 | (36) | 355 | (40) | 366 | (43) |
| Inactive | 95 | (72) | 254 | (64) | 532 | (60) | 492 | (57) |
| Consumption of fruits/vegetables*** | | | | | | | | |
| <5 servings/day | 115 | (83) | 300 | (74) | 684 | (75) | 597 | (68) |
| ≥5 servings/day | 24 | (17) | 105 | (26) | 226 | (25) | 278 | (32) |
| Self-rated health** | | | | | | | | |
| Excellent/very good/good | 111 | (79) | 355 | (87) | 816 | (89) | 769 | (87) |
| Fair/poor | 30 | (21) | 52 | (13) | 100 | (11) | 112 | (13) |
| Health Utility Index | | | | | | | | |
| n, mean (SD)** | 139 | .84 (.23) | 404 | .89 (.19) | 908 | .90 (.17) | 873 | .89 (.19) |
| Number of disability days | | | | | | | | |
| n, mean (SD) | 141 | 1.5 (3.8) | 407 | 1.0 (3.1) | 916 | .77 (2.6) | 881 | .93 (2.9) |
| Presence of a chronic condition** | 107 | (76) | 260 | (64) | 545 | (60) | 530 | (60) |
| Number chronic conditions*** | | | | | | | | |
| 0 | 34 | (24) | 147 | (36) | 371 | (41) | 349 | (40) |
| 1–3 | 93 | (66) | 208 | (51) | 480 | (53) | 465 | (53) |
| ≥4 | 14 | (10) | 52 | (13) | 64 | (7) | 67 | (7) |

*P < 0.05, **P < 0.01, ***P < 0.001.

across BMI categories. Chi-square tests were used for categorical variables, Kruskal–Wallis tests for ordinal variables, and analysis of variance for normally distributed continuous variables. Median tests were run to compare the non-normally distributed data on health care utilization (eg, number of visits with a family physician, number of visits with “another doctor,” number of nights spent in hospital/nursing home/convalescent home). A value of $P < 0.05$ was selected as the level of significance for tests of difference.

Logistic regression modeling was used to examine the utility of BMI to predict self-reported prevalence of chronic conditions while controlling for age and sex. Adjusted odds ratios (OR) and confidence intervals (CIs) were derived from

the logistic regression models when the dependent variable was the presence or absence of a chronic condition (eg, cerebro/cardiovascular disease, hypertension, endocrine disease, diabetes mellitus) and the main independent variable of interest was category of BMI (morbidly obese, obese, overweight, referent category: normal).

The study was approved by the Human Investigation Committee at Memorial University. Permission to access and use the 2001 CCHS “share file” was received from the Newfoundland and Labrador Centre for Health Information (NLCHI) and the Department of Health and Community Services, Government of Newfoundland and Labrador. NLCHI staff ensured that there were no personal identifiers

(name, address, telephone number, health insurance number) available in the data set before it was provided to the researcher.

Results

Of the 3734 initial respondents to the 2001 CCHS, 1389 individuals were excluded from the study for the following reasons: age <20 or >64, pregnant, missing heights/weights, no valid health insurance number, or not consenting to share their survey responses with provincial health agencies. The average age of the sample was 41 years (SD = 11.7); 52.8% were female. The mean BMI was 27.0 kg/m² (range: 18.0–60.4 kg/m²) [data not shown]. The breakdown of the sample based on BMI category was as follows: normal weight (37%), overweight (39%), obese (17%), and morbidly obese (6%). Table 2 displays the characteristics of the final study population (n = 2345).

Significant differences were found in the sample population in all sociodemographic variables with the exception of education across BMI categories (see Table 2). Morbidly obese (BMI ≥35) individuals were more likely to be female, 40–49 years of age, residents of urban areas, to have a middle income level, and to be partnered (eg, married, common-law). Obese (BMI 30–34.9) individuals were similar to the morbidly obese (BMI ≥35) individuals, with the exception that there were no differences related to sex and that they were more likely to be slightly older (between 50 and 64 years of age). In terms of lifestyle variables, morbidly obese individuals (BMI ≥35) were more likely to be inactive, and consume <5 servings of fruits and vegetables per day. There were no significant differences in smoking behaviors across BMI categories. The majority of individuals in all BMI categories reported good, very good, or excellent self-rated health; however, the morbidly obese group (BMI ≥35) was more likely to report being in poor or fair health and having a lower HUI. There were no significant differences in the number of disability days across BMI groups. The morbidly obese (BMI ≥35) were more likely to report having been diagnosed with at least 1 chronic condition. Both the obese (BMI 30–34.9) and morbidly obese groups (BMI ≥35) were more likely to report having been diagnosed with ≥4 chronic conditions.

BMI and chronic disease

There were significant differences in the prevalence of some chronic diseases across categories of BMI. The morbidly obese (BMI ≥35) and obese (BMI 30–34.9) groups were more likely than the normal weight group (BMI 18.5–24.9) to report having been diagnosed with cerebro/cardiovascular diseases (eg, hypertension), endocrine diseases (eg, diabetes), and gastrointestinal or neurological diseases. There were no significant differences in the prevalence of pulmonary diseases such as asthma (Table 1). After analysis with logistic regression modeling and adjusting for age and sex, there was an increased likelihood of reporting many chronic diseases as shown by the ORs that were greater than 1 (Table 3). Additionally, the likelihood of having reported being diagnosed with cerebro/cardiovascular disease, hypertension, endocrine conditions, and diabetes increased significantly with each category of BMI, as evidenced by the increasing strength of the ORs and the nonoverlapping CIs, which

signify significant differences between groups. This relationship was not demonstrated between BMI and the gastrointestinal, pulmonary, and neurological diseases as evidenced by the CIs that included 1 and by the overlapping CIs, which signify that the groups are not significantly different.

Health services access and utilization

Data on health services utilization is presented in Table 4. Within the BMI categories, the majority of survey respondents (morbidly obese 80.1%, obese 77.9%, overweight 79.3%, and normal weight 80.6%) reported having access to a “regular doctor” and there were no differences across categories of BMI. The morbidly obese (BMI ≥35) and the obese (BMI 30–34.9) groups had a median of 4 and 3 visits to their general practitioner (GP), respectively, in the previous 12 months compared to both the overweight and normal groups who made only 2 visits; this difference was significant ($P < 0.001$). The median number of visits to “another doctor” or specialist was 0 for all groups. There were no

TABLE 3. LOGISTIC REGRESSION ANALYSIS OF BODY MASS INDEX (BMI) CATEGORY AS A PREDICTOR OF SELF-REPORTED CHRONIC DISEASE, ADJUSTED FOR AGE AND SEX (REFERENCE GROUP NORMAL WEIGHT)

| Chronic comorbidity | BMI category | Odds Ratio | 95% CI |
|---|--------------|------------|-------------|
| Cerebro/ cardiovascular ¹ | overweight | 2.63 | 2.56–2.71 |
| | obese | 4.24 | 4.10–4.38 |
| | morbid | 6.10 | 5.84–6.38 |
| High blood pressure | overweight | 2.91 | 2.82–3.00 |
| | obese | 5.39 | 5.20–5.58 |
| | morbid | 8.24 | 7.86–8.63 |
| Endocrine diseases ² | overweight | 1.11 | 1.07–1.14 |
| | obese | 1.44 | 1.39–1.50 |
| | morbid | 2.45 | 2.39–2.51 |
| Diabetes mellitus | overweight | 1.44 | 1.37–1.50 |
| | obese | 2.44 | 2.32–2.56 |
| | morbid | 5.41 | 5.09–5.76 |
| Gastrointestinal diseases ³ | overweight | 0.549 | 0.326–0.926 |
| | obese | 1.25 | 0.732–2.12 |
| | morbid | 1.47 | 0.696–3.12 |
| Pulmonary diseases ⁴ | overweight | 0.924 | 0.894–0.955 |
| | obese | 1.23 | 1.18–1.28 |
| | morbid | 1.72 | 1.64–1.81 |
| Asthma | overweight | 0.879 | 0.580–1.33 |
| | obese | 1.05 | 0.635–1.17 |
| | morbid | 1.36 | 0.708–2.63 |
| Neurological diseases ⁵ | overweight | 0.710 | 0.521–0.966 |
| | obese | 0.916 | 0.633–1.33 |
| | morbid | 1.28 | 0.784–2.08 |

¹Includes high blood pressure, heart disease (including heart attack, angina, and congestive heart failure) and effects of stroke.

²Includes thyroid condition, diabetes mellitus.

³Includes bowel disorders (Crohn’s or colitis), and stomach or intestinal ulcers.

⁴Includes chronic bronchitis, emphysema or chronic obstructive pulmonary disease, asthma.

⁵Includes migraine headaches, epilepsy, Alzheimer’s disease or dementia, Parkinson’s disease, multiple sclerosis, and chronic fatigue syndrome.

CI = confidence interval.

TABLE 4. SELF-REPORT OF ACCESS TO AND USE OF HEALTH CARE SERVICES IN PREVIOUS 12 MONTHS BY BODY MASS INDEX CATEGORY

| Measure of health services use | Morbidly obese n = 141 | | Obese n = 407 | | Overweight n = 916 | | Normal n = 881 | |
|--|---------------------------|------------|------------------|-----------|-----------------------|-----------|-------------------|-----------|
| | n | % | n | % | n | % | n | % |
| Have a regular doctor ¹ | 113 | 80.1 | 317 | 77.9 | 726 | 79.3 | 710 | 80.6 |
| # of visits with a general practitioner*** median ² | 4.0 | [2.0,6.0] | 3.0 | [1.0,5.0] | 2.0 | [1.0,4.0] | 2.0 | [1.0,4.0] |
| # of visits with "other medical doctor" median ² | 0.0 | [0,0] | 0.0 | [0,0] | 0.0 | [0,0] | 0.0 | [0,1.0] |
| Hospitalized overnight ¹ | 14 | 9.9 | 39 | 9.6 | 65 | 7.1 | 81 | 9.2 |
| # of nights spent in hospital/nursing or convalescent home median ² | 4.0 | [2.0,14.0] | 4.0 | [1.0,7.0] | 4.0 | [2.0,7.0] | 4.0 | [2.0,7.5] |

¹Yes or no response.

²Median shown with [25th, 75th percentiles].

***P < 0.001.

significant differences across BMI categories in the percentage of those hospitalized overnight (<10%), or in the number of associated nights spent in a hospital/nursing/convalescent home (median 4).

Discussion

There is a high prevalence of all categories of obesity among adults living in NL. The current study's findings suggest that adults classified with a BMI ≥30 reported lower levels of self-rated health, lower levels of HUI, as well as an increased prevalence of the number of chronic diseases, the likelihood of which increased with increasing levels of BMI. Although increasing BMI categories were associated with an increased likelihood of specific chronic conditions (eg, cardiovascular, endocrine, and pulmonary diseases), the high level of morbidity in this population did not translate into increased use of all health care services under study. A higher number of visits to a family physician by both the obese and morbidly obese groups compared to the normal and overweight groups were observed; however, there were no significant differences in the use of specialist care, number of hospital discharges, or associated length of hospital stay across categories of BMI.

The association found in the current study between all categories of obesity and chronic disease is supported by extensive literature. Obesity or a BMI ≥30 has been shown to be related causally to serious medical illnesses because excess body weight increases the risk of the development of several chronic conditions such as cardiovascular diseases, hypertension, coronary heart disease, cerebrovascular disease, certain types of cancer, and type II diabetes.^{12,13} Obesity also is associated with the metabolic syndrome, endocrine disturbances, and other debilitating conditions.¹² Although many of these chronic illnesses may not be fatal, they are often debilitating in nature and have an adverse effect on an individual's quality of life.¹²

Our findings on health care use are generally consistent with the findings of other researchers. A number of studies have reported a significant relationship between obesity and the increased numbers of visits to a GP.^{7,14-18} Although the current study did not find obese individuals (BMI ≥30) more likely to report having visited "another medical doctor," very

few studies have examined the relationship between obesity and its impact on services provided by a "specialist." For those studies referring to outpatient services, the services provided by a specialist often are not described. In a review of the few studies published, the relationship between obesity and specialist services was found to be inconsistent.^{7,14,19,20}

In an analysis of the Canadian 1994 National Population Health Survey, researchers found that a BMI ≥27 kg/m² was associated with increased physician visits after controlling for age, sex, marital status, income, level of physical activity, and smoking status. In addition, obese respondents were more likely than nonobese respondents to report suffering from a number of chronic comorbidities (eg, diabetes and cardiovascular disorders), and more likely to have been prescribed medications (eg, heart medication, antihypertensive pills, diuretics, pain relievers for arthritis and back pain), and to have sought out mental health services. In contrast, obese respondents had fewer hospital admissions than nonobese respondents in the previous year.⁷

In a European study of the German population, the authors analyzed responses to the KORA-survey 1999/2001, a health survey administered to the adult population 25 to 74 years of age in the Augsburg region. The study included 947 respondents. The association between BMI and the number of visits to a GP was analyzed. Controlling for sex, age, place of residence, social class, and sickness fund (a type of health insurance fund for employed individuals), obese individuals (BMI ≥35) reported more frequent utilization of GP services compared to normal weight individuals.¹⁶

Other findings do not support the relationship between obesity and use of primary care services. In a cross-sectional analysis of data from the Health Survey for England, the authors reported that for an adult population (50 to 69 years of age), a BMI ≥30 was associated with an increased use of outpatient services such as surgical day care; however, no significant relationship between obesity and physician visits or the use of inpatient services over the previous 12-month period was found.¹⁸

The current study did not find an association between obesity and the number of hospital admissions or associated lengths of stay in hospital. In this study, hospitalization in the previous 12 months was a relatively rare event; fewer

than 25% of the study sample reported having been admitted overnight to a hospital, institution, or nursing home. A review of published studies demonstrated that the relationship between increasing BMI and increased utilization of hospital services, such as inpatient admissions and length of stay in hospital, was found to be inconsistent. Although many authors have reported a statistically insignificant relationship between obesity and increased hospitalization,^{7,14,16,18,21–23} others have reported that obesity was significantly associated with an increase in the use of hospital services compared with nonobese populations.^{8,15,19,24} Upon review, many of the positive studies had large sample sizes, examined elderly populations, and had long periods of follow-up.

This is the first study to examine the relationship between BMI, chronic disease, and health services use in NL. Its main strength is that the study is population-based and the sample is representative and generalizable to the entire population of NL in this age group. The study provides a profile of the sociodemographics, lifestyle, and health status characteristics of the NL population stratified by BMI as well the self-reported prevalence of chronic disease and physician and hospital health services use.

The study was limited in that it used cross-sectional survey data, which reduces our ability to draw causal inferences about the relationship between obesity, chronic disease, and health services use. BMI was used to assess health risk because it is a reliable screening tool that is easy to calculate and inexpensive to use for large populations.¹⁰ In addition, it correlates highly with excess body fat.²⁵ However, in the current study, BMI was based on self-reported heights and weights and the usual problems with self-reported data apply here. Finally, the power of the study may have been low to examine specialist visits and hospital admissions as outcomes given that both are rare events in the general population.

In conclusion, the study findings suggest that in the NL population, increasing categories of BMI are associated with an increased likelihood of chronic diseases, especially those known to be associated with excess weight. However, the high level of morbidity in this population does not appear to translate into an increased use of services within the health system, other than for visits to a family physician. This finding has been reported elsewhere.²⁶ Due to the nature of the obesity-associated chronic conditions, this is not totally unexpected because many of these conditions are managed and treated in the primary health care environment. At a population level, the burden on family physicians of managing and treating obesity-associated chronic conditions is substantial. From a treatment and management perspective, more resources should be channeled into primary health care services, especially for those high-risk individuals who are morbidly obese. Future research in this area should examine prospective studies using longitudinal data to determine if there is an independent causal relationship between excess body weight, chronic comorbidity, and the use of health care services.

However, given the large percentage of individuals classified as obese (ie, 23%), and the large percentage classified as overweight (ie, 39%), it is important to strengthen the focus of policy and resource allocation decisions on population disease prevention and health promotion. This approach is appropriate not only because of the large number

of individuals who are affected by excessive weight in the population, but because there is a general consensus among researchers that increased body weight has been largely influenced by environmental change.^{27–30}

Disclosure Statement

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