Adult obesity prevalence in primary care users: An exploration using Canadian Primary Care Sentinel Surveillance Network (CPCSSN) data

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ABSTRACT

OBJECTIVES: This research examines the feasibility of using electronic medical records within the Canadian Primary Care Sentinel Surveillance Network (CPCSSN) for obesity surveillance in Canada by assessing obesity trends over time and comparing BMI distribution estimates from CPCSSN to those obtained from nationally representative surveys.

METHODS: Data from 2003–2012 on patients 18 years and older (n = 216,075) were extracted from the CPCSSN database. Patient information included demographics (age and sex) and anthropometric measures (height, weight, body mass index (BMI), waist circumference, and waist-to-hip ratio). Standard descriptive statistics were used to characterize the sample, including, as appropriate, means, proportions and medians. The BMI distribution of the CPCSSN population was compared to estimates from the Canadian Community Health Survey (CCHS) and the Canadian Health Measures Survey (CHMS) for the years: 2004, 2007–2009 and 2009–2011.

RESULTS: The estimated prevalence of obesity increased from 17.9% in 2003 to 30.8% in 2012. Obesity class I, II and III prevalence estimates from CPCSSN in 2009–2011 (18.0%, 95% CI: 17.8–18; 7.4%, 95% CI: 7.3–7.6; 4.2%, 95% CI: 4.1–4.3 respectively) were greater than those from the most recent (2009–2011) cycle of the CHMS (16.2%, 95% CI: 14–18.7; 6.3%, 95% CI: 4.6–8.5; 3.7%, 95% CI: 2.8–4.8 respectively), however these differences were not statistically significant.

CONCLUSION: The data from CPCSSN present a unique opportunity for longitudinal obesity surveillance among primary care users in Canada, and offer prevalence estimates similar to those obtained from nationally representative survey data.

KEY WORDS: BMI – body mass index; CPCSSN – Canadian Primary Care Sentinel Surveillance Network; EMR – Electronic Medical Record; obesity

La traduction du résumé se trouve à la fin de l'article.

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Obesity has reached epidemic proportions in Canada.[1] Based on nationally representative surveys that have obtained measured heights and weights, the prevalence of obesity in Canadian adults has risen from 10% in 1970–1972 to 26% in 2009–2011.[2,3] Obesity-related costs place a massive strain on the Canadian health care system, accounting for over $7 billion in direct and indirect health care costs annually.[4] This is no surprise considering obesity is a significant risk factor for the development of several chronic diseases, including cardiovascular disease, type II diabetes, osteoarthritis, liver disease, gall bladder disease, multiple types of cancer, and depression and other mental health problems.[5,6] Persons classified as severely obese also show an increased risk for premature mortality.[7]

Information on the prevalence of obesity represents a valuable resource for understanding trends and evaluating the utility of current prevention practices. Currently, estimates of the prevalence of obesity in Canada come from self-reported survey information or from objective measurements of BMI for small samples of the population. The Canadian Community Health Survey (CCHS) and the Canadian Health Measures Survey (CHMS) have provided the majority of recent estimates. Both are nationally representative cross-sectional surveys.[3,8] The CCHS collects mostly self-reported data, with directly measured heights and weights in three cycles: once for a large (~40,000 people) sample in 2004, and twice for smaller subsamples (~5000 people) in 2005 and 2008.[8] The CHMS employs direct physical measurements, and represents the only survey in Canada which continues to obtain measured height and weight data on an ongoing basis.[3]

The CCHS and CHMS have multiple limitations as the primary sources for obesity surveillance in Canada. The CCHS is based on mostly self-reported data, which has been shown to underestimate true BMI values.[9] The CHMS involves direct physical measurements, however, due to the high costs of this type of data collection, it is constrained to a small sample size (~5000 per cycle).[3] This leaves no valid data at the local/regional

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level, and makes it challenging to accurately capture the small sample of class III obese who are most at risk and typically the primary focus of surgical interventions.[10] The timeline of data collection for the CHMS (measurements obtained over an 18-month period and released more than a year later) is also inadequate for the surveillance of obesity, a condition which has shown a steady yet dramatic increase in prevalence over the past four decades.[2,3]

The Canadian Primary Care Sentinel Surveillance Network (CPCSSN) offers a unique and novel opportunity to study adult obesity by utilizing reliable and readily available primary care Electronic Medical Record (EMR) data obtained nationwide. This study explores the opportunity for using CPCSSN data for healthy weight surveillance in Canada by estimating the prevalence of adult obesity in primary care users, including trends over time, and comparing the BMI distribution of the CPCSSN population to estimates from Canadian health surveys, including the CCHS Cycle 2.2 and the CHMS Cycles 1 and 2.

METHODS

CPCSSN database

CPCSSN, established in 2008, is an EMR-based information system designed for chronic disease surveillance that extracts and merges EMR data from primary care practices in 10 practice-based research networks (PBRN) across Canada. PBRNs are located in: Alberta (2), British Columbia (1), Manitoba (1), Newfoundland and Labrador (1), Nova Scotia (1), Ontario (3) and Quebec (1). Every three months, anonymized longitudinal data are extracted from the EMRs of sentinel practices. The data are then cleaned, coded and stored in a highly secure facility in Kingston, Ontario.[11] As of December 2012, 444 physician sentinels were contributing anonymized health information on more than 440,000 patients. The CPCSSN database includes the following patient information: demographic details, comorbid diseases, risk factors, referrals, laboratory results and procedures, and prescribed medications.

Data collection and processing

Available demographic information (age and sex) and anthropomorphic measures (height, weight, BMI, waist circumference, and waist-to-hip ratio) were extracted as of December 31, 2012. Measurements were only included if the patient was at least 18 years old at the time of measurement. When multiple physical measurements were taken for a single patient within one year, only the last measurement in the year was kept.

To compare CPCSSN estimates with national survey data, the BMI distribution of Canadian adults, according to direct measures, by age and sex, was retrieved from Statistics Canada for the CCHS Cycle 2.2 (2004), the CHMS Cycle 1 (2007–2009) and the CHMS Cycle 2 (2009–2011).[3,12,13] BMI data and demographic information (age and sex) for the CPCSSN population collected during three time periods (2004, 2007–2009, 2009–2011) were extracted. Only patients who had complete BMI, age and sex records in a time period were included. When multiple physical measurements were taken for a single patient within a time period, only the most recent measure of age and BMI from the time period was kept.

All CPCSSN data were standardized into metric units using standard CPCSSN data cleaning algorithms. Extreme outliers were excluded for values outside the following plausible ranges: 15 kg/m^2 < BMI < 50 kg/m^2, 100 cm < height < 200 cm, and 27.2 kg < weight < 272.5 kg. In accordance with recommendations of the World Health Organization and Health Canada, BMI was classified as underweight (<18.5 kg/m^2), normal weight (18.5–24.99 kg/m^2), overweight (25–29.99 kg/m^2), or obese (≥30 kg/m^2).[14,15] Obesity was further subdivided into class I (30–34.99 kg/m^2), class II (35–39.99 kg/m^2) and class III (≥40 kg/m^2) categories.[14]

Accuracy of clinical measurements

There are concerns about the accuracy of height and weight measurements taken in primary care settings as data collection at physician offices is often hurried and not as vigorous as that in the research setting. Despite these criticisms, studies have shown that routine clinical measures of height and weight are accurate and valid when compared to those collected by specialists in research laboratories.[16,17]

Analysis

BMI Trends

Standard descriptive statistics were conducted using SAS 9.3.[18] Prevalence of obesity was calculated for the CPCSSN population each year from 2003 to 2012. Mean and median BMI with their associated dispersion measures (standard deviation and variance) were also calculated from 2003 to 2012.

Comparison to National Surveys

The proportion of patients and associated 95% confidence intervals were calculated for each BMI category of the CPCSSN population in 2004, 2007–2009 and 2009–2011. Results were stratified by age and sex. Age categories were chosen to match those used in the corresponding CCHS and CHMS surveys. Estimates were compared to the CCHS Cycle 2.2 and CHMS Cycles 1 and 2 and considered significantly different when confidence intervals did not overlap.

RESULTS

Available data

The CPCSSN database contained measured BMI information going back more than 10 years, with a significant number of measurements entered in the EMR from 2003 onwards. In adults over 18 years, there was a marked increase in the proportion of patients with their BMI recorded between 2003 (n = 3806 or 17.7% of patients) and 2012 (n = 89,746 or 42.2% of patients), as illustrated in Figure 1. Other relevant measures of obesity, such as waist circumference (n = 22,169 or 24.7% of patients in 2012) and waist-to-hip ratio (n = 127 or 0.14% of patients in 2012) were not routinely recorded in the EMRs that populate the CPCSSN database.

Longitudinal trends

In the population of patients with a valid BMI record, the estimated prevalence of obesity increased steadily from 17.9% in 2003 to 30.8% in 2012 (Figure 2), an increase of 1.7-fold (RR = 1.72;

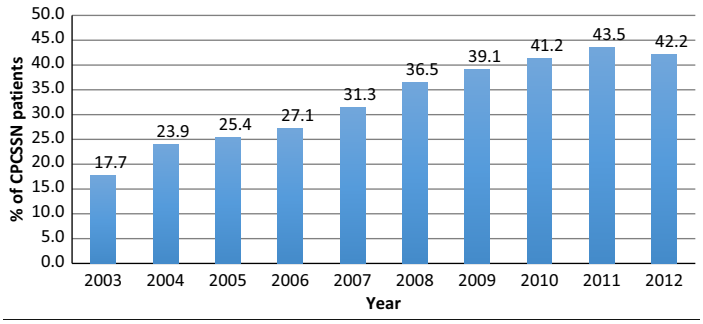

Figure 1. Percent of CPCSSN patients with a BMI record, 2003–2012

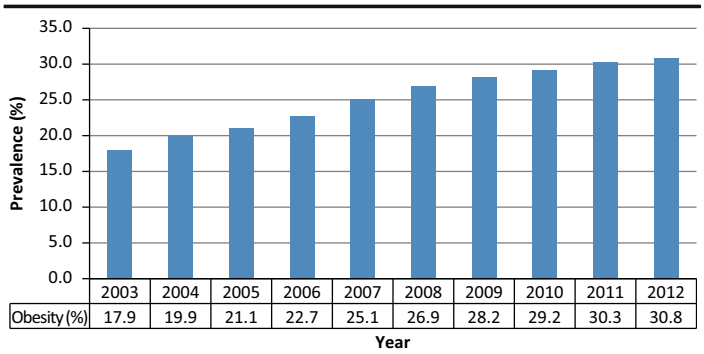

Figure 2. CPCSSN obesity prevalence among Canadian adults, 2003–2012

95% CI: 1.61–1.84; $p < 0.001$). The mean BMI increased from 24.8 ± 6.2 kg/m^2 (normal weight) in 2003 to 27.5 ± 6.2 kg/m^2 (overweight) in 2012, and the median BMI increased from 24.0 kg/m^2 (interquartile range [IQR] 20.3–28.1) (normal weight) to 26.9 kg/m^2 (IQR 23.0–31.0) (overweight) in the same time period.

Comparison to national surveys

CCHS Cycle 2.2 (2004)

CCHS underweight prevalence estimates were unavailable for most age and sex groups. For underweight males age 18–24 and females age 18–24 and 75+, for which there were available data, we saw a significantly greater proportion of underweight individuals in CPCSSN (14.1%, 95% CI: 8.0–20.1; 16.5%, 95% CI: 12.9–20.0; 14.3%, 95% CI: 11.0–17.6 respectively) than in the CCHS Cycle 2.2 (3.5%, 95% CI: 3.5–3.6; 5.5%, 95% CI: 5.5–5.6; 2.7%, 95% CI: 2.7–2.8 respectively). In the obese class I category, prevalence estimates were lower in CPCSSN across all age categories. These differences were statistically significant in all age groups except adults age 18–24 and 35–44 (Table 1). There was a lack of reliable data in the obese class II and III categories of the CCHS 2.2, making comparisons for these classes difficult.[13]

CHMS Cycle 1 (2007–2009)

In 2007–2009, there was a significantly greater prevalence of underweight adults in CPCSSN (6.1%, 95% CI: 6.0–6.3) as compared to the CHMS Cycle 1 (1.5%, 95% CI: 0.9–2.1). The proportion of normal weight individuals was significantly lower in CPCSSN for males and females age 18–39 and 40–59. Overall prevalence for class I, II and III adult obesity was greater in CPCSSN (17.0%, 95% CI: 16.8–17.3; 6.8%, 95% CI: 6.7–7.9; 3.7%, 95% CI: 3.6–3.8 respectively) than in the CHMS Cycle 2 (15.1%, 95% CI: 13.3–16.9; 5.8%, 95% CI: 4.7–7; 3% 95% CI: 2.7–3.7), however these differences were not statistically significant. When stratifying by age and sex, obese class I females age 18–39 and 40–59, obese class II males age 40–59 and obese class III males age 18–39 all had significantly greater prevalence estimates in CPCSSN than in the CHMS Cycle 1 (Table 2).[12]

CHMS Cycle 2 (2009–2011)

The proportion of underweight females was significantly greater in CPCSSN, while the proportion of normal weight females was significantly greater in the CHMS Cycle 2 (Table 3). Data on underweight males were unavailable in the CHMS. There were no significant differences in the proportion of overweight patients in CPCSSN and in the CHMS Cycle 2. Obesity class I, II and III prevalence estimates from CPCSSN (18%, 95% CI: 17.8–18; 7.4%, 95% CI: 7.3–7.6; 4.2%, 95% CI: 4.1–4.3 respectively) were greater than those from the CHMS Cycle 2 (16.2%, 95% CI: 14–18.7; 6.3%, 95% CI: 4.6–8.5; 3.7, 95% CI: 2.8–4.8 respectively), however these differences were not statistically significant. When stratifying by age and sex, females who were obese class I age 18–39 and obese class II age 60–79 demonstrated significantly greater prevalence estimates in CPCSSN (14.3%, 95% CI: 13.9–14.7%; 8.3%, 95% CI: 7.9–8.6) compared to in the CHMS Cycle 2 (9.2%, 95% CI: 6.2–13.5; 5.4%, 95% CI: 3.8–7.6) (Table 3).[3]

DISCUSSION

Data from CPCSSN present a unique opportunity for obesity surveillance among Canadian primary care users. With approximately 90,000 patient BMI records in 2012 alone, the yearly sample size of CPCSSN's BMI records outweighs the collective sum of all objectively measured BMIs obtained for Statistics Canada health surveys over the past 20 years (~75,000 measured BMIs).[1,312,19] The extensive volume of BMI data in CPCSSN allows for a thorough assessment of obesity in primary care users, who typically represent 80–90% of the general Canadian population.[20–22] The data illustrate an absolute increase of more than 10 percentage points in adult obesity prevalence over the past decade. Prevalence estimates were also comparable to the most recent cycles of the CHMS. However, while national survey data rely on cross-sectional designs, CPCSSN provides timely longitudinal data to monitor this ongoing obesity epidemic.

Since BMI is derived from heights and weights, it is an easy, inexpensive and non-invasive way to attain obesity measurements in a clinical setting. Consequently, it is the most frequently measured estimate of adiposity, and the foundation for population estimates of obesity prevalence in Canada.[5] Despite these advantages, BMI is limited in its ability to assess adiposity. BMI does not distinguish between fat mass and lean body mass, and as a result may overestimate adiposity among muscular persons, which for population-level estimates is counterbalanced by an underestimated adiposity in persons with a low muscle mass.[23] While these drawbacks exist, they are minimized when assessing obesity at the population level.

Table 1. Percentage distribution of CPCSSN adults, by age, sex and BMI category, 2004

	Age group (years)	Underweight		Normal weight		Overweight		Obese Class I		Obese Class II		Obese Class III	
		Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval
Both sexes	18–24	15.9*	12.8–19.0	50.1*	45.9–54.3	20.7*	17.3–24.1	7.20	5.0–9.4	3.7	2.1–5.3	2.4	1.1–3.7
	25–34	13.1	10.9–15.3	41.5	38.3–44.7	27.0*	24.1–29.9	11.6*	9.5–13.7	4.3	3.0–5.7	2.4	1.3–3.5
	35–44	13.6*	11.8–15.5	42.0	39.3–44.6	26.2*	23.9–28.6	11.5	9.8–13.2	4.2	3.1–5.3	2.5	1.7–3.4
	45–54	13.2*	11.6–14.8	37.1*	34.8–39.3	27.1*	25.0–29.1	14.8*	13.2–16.5	5.1*	4.1–6.1	2.7	2.0–3.5
	55–64	13.9*	12.1–15.6	35.8*	33.3–38.2	27.9*	25.6–30.2	13.9*	12.1–15.6	6.0	4.8–7.3	2.6*	1.7–3.4
	65–74	13.2*	11.2–15.3	37.1*	34.1–40.1	30.6*	27.8–33.4	11.7*	9.7–13.6	5.3	3.9–6.6	2.1	1.3–3.0
	75+	14.6	12.1–17.1	40.2*	36.8–43.6	25.5*	22.4–28.5	11.5*	9.3–13.8	4.9	3.4–6.4	3.3*	2.1–4.6
Males	18–24	14.1*	8.0–20.1	55.5	46.9–64.1	18.0*	11.3–24.6	7.0	2.6–11.5	3.9	0.5–7.3	1.6	0.0–3.7
	25–34	16.7	11.8–21.7	36.7	30.3–43.2	28.4*	22.3–34.4	12.6*	8.1–17.0	4.2	1.5–6.9	1.4	0.0–3.0
	35–44	16.9	13.4–20.5	35.6	31.0–40.1	27.0*	22.7–31.2	14.6	11.2–17.9	3.8*	2.0–5.7	2.1	0.8–3.5
	45–54	14.0	11.5–16.5	35.9*	32.5–39.3	27.9*	24.7–31.1	15.1*	12.5–17.6	4.6*	3.1–6.1	2.6	1.5–3.7
	55–64	15.0	12.3–17.7	33.6*	30.0–37.1	28.4*	25.0–31.8	13.7*	11.1–16.3	6.8	4.9–8.7	2.5	1.3–3.7
	65–74	12.9	9.9–15.9	37.2*	32.9–41.5	30.9*	26.8–35.0	10.4*	7.7–13.1	6.3	4.2–8.5	2.2	0.9–3.6
	75+	15.0	11.2–18.8	41.2*	35.9–46.4	25.3*	20.7–29.9	10.9*	7.6–14.2	5.3	2.9–7.7	2.4	0.7–4.0
Females	18–24	16.5*	12.9–20.0	48.4*	43.6–53.2	21.5	17.6–25.5	7.3	4.8–9.8	3.6	1.8–5.4	2.7	1.1–4.2
	25–34	12.0	9.6–14.4	43.0*	39.3–46.7	26.6	23.3–29.9	11.3	8.9–13.6	4.4	2.9–5.9	2.8	1.5–4.0
	35–44	12.1	9.9–14.2	45.0*	41.7–48.2	25.9	23.0–28.8	10.0	8.1–12.0	4.4	3.0–5.7	2.7*	1.6–3.7
	45–54	12.6	10.6–14.6	38.0	35.0–40.9	26.5*	23.8–29.2	14.7*	12.5–16.8	5.4*	4.1–6.8	2.8*	1.8–3.8
	55–64	12.9	10.5–15.2	37.7	34.2–41.1	27.5*	24.4–30.7	14.0*	11.6–16.5	5.3	3.7–6.9	2.6*	1.5–3.7
	65–74	13.6	10.7–16.5	37.0	32.9–41.1	30.3*	26.4–34.2	12.8*	10.0–15.7	4.3	2.6–6.0	2.0	0.8–3.2
	75+	14.3*	11.0–17.6	39.5*	34.9–44.0	25.6*	21.5–29.7	12.0*	9.0–15.1	4.5	2.6–6.5	4.1	2.2–5.9

* Indicates estimates that were significantly different from the CCHS Cycle 2.2, as determined by confidence intervals which did not overlap.

Table 2. Percentage distribution of CPCSSN adults, by age, sex and BMI category, 2007–2009

	Age group (years)	Underweight		Normal weight		Overweight		Obese Class I		Obese Class II		Obese Class III	
		Estimate (%)	95% Confidence interval	Estimate (%)	95% Confidence interval	Estimate (%)	95% Confidence interval	Estimate (%)	95% Confidence interval	Estimate (%)	95% Confidence interval	Estimate (%)	95% Confidence interval
Both sexes	18–39	8.0*	7.7–8.3	40.0*	39.4–40.5	28.4	27.9–28.9	13.1*	13.7–14.5	6.1	5.8–6.4	3.5	3.2–3.7
	40–59	5.6	5.3–5.8	33.3	32.9–33.8	32.7	32.3–33.2	17.5	17.2–17.9	7.0	6.7–7.2	3.9	3.7–4.1
	60–79	5.0	4.8–5.3	28.9	28.4–29.4	35.7*	35.1–36.2	19.4	19.0–19.9	7.4	7.1–7.7	3.6	3.4–3.8
	18–79	**6.1***	**6.0–6.3**	**34.0**	**33.7–34.3**	**32.3**	**32.0–32.6**	**17.0**	**16.8–17.3**	**6.8**	**6.7–7.0**	**3.7**	**3.6–3.8**
Males	18–39	8.3	7.7–8.8	35.5*	34.6–36.5	31.8	30.8–32.7	14.8	14.1–15.6	6.4	5.9–6.9	3.2*	2.8–3.6
	40–59	5.9	5.5–6.3	27.7*	27.0–28.4	36.3*	35.6–37	19.3	18.7–19.9	7.2*	6.8–7.6	3.6	3.3–3.9
	60–79	4.9	4.5–5.3	25.5	24.7–26.3	37.8*	37.0–38.7	21.2	20.4–21.9	7.2	6.8–7.7	3.4	3.1–3.7
	18–79	**6.2***	**5.9–6.4**	**28.9**	**28.4–29.4**	**35.7***	**35.2–36.2**	**18.8**	**18.4–19.2**	**7.0***	**6.7–7.2**	**3.5***	**3.3–3.6**
Females	18–39	7.9	7.5–8.3	42.0*	41.3–42.7	26.9	26.3–27.5	13.7*	13.2–14.2	6.0	5.6–6.3	3.6	3.3–3.8
	40–59	5.3	5.1–5.6	37.1*	36.5–37.7	30.3	29.8–30.9	16.3*	15.9–16.8	6.8	6.5–7.2	4.1	3.8–4.3
	60–79	5.1	4.8–5.5	31.5	30.8–32.3	34.0	33.2–34.7	18.1	17.5–18.7	7.5	7.1–7.9	3.7	3.4–4.0
	18–79	**6.1***	**5.9–6.3**	**37.3***	**36.9–37.7**	**30.1**	**29.8–30.5**	**15.9***	**15.6–16.2**	**6.7**	**6.5–6.9**	**3.8**	**3.7–4.0**

Bolded values represent prevalence estimates from all age subcategories combined (18–79 years).
* Indicates estimates that were significantly different from the CHMS Cycle 2, as determined by confidence intervals which did not overlap.

Table 3. Percentage distribution of CPCSSN adults by age, sex and BMI category, 2009–2011

	Age group (years)	Underweight		Normal weight		Overweight		Obese Class I		Obese Class II		Obese Class III	
		Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval	Estimate (%)	Confidence interval
Both sexes	18–39	6.5*	6.3–6.8	39.3*	38.8–39.8	28.8	28.4–29.3	15.1	14.8–15.5	6.3	6.1–6.6	3.9	3.7–4.1
	40–59	4.4*	4.3–4.6	31.7	31.3–32.1	33.4	33–33.8	18.5	18.1–18.8	7.7	7.5–7.9	4.3	4.1–4.5
	60–79	3.7	3.5–3.9	27.6	27.2–28	35.8	35.4–36.3	20.3	19.9–20.7	8.2*	7.9–8.5	4.3	4.1–4.5
	18–79	**4.9***	**4.7–5**	**32.8**	**32.6–33.1**	**32.7**	**32.5–33**	**18**	**17.8–18.2**	**7.4**	**7.3–7.6**	**4.2**	**4.1–4.3**
Males	18–39	6.4	6–6.8	34.8*	34–35.7	31.9	31.1–32.7	16.7	16.1–17.4	6.3	5.9–6.8	3.8	3.5–4.1
	40–59	4.7	4.4–5	25.6	25–26.2	37	36.4–37.6	20.8	20.3–21.3	8	7.7–8.4	3.9	3.6–4.2
	60–79	3.7	3.4–4	23.6	22.9–24.2	38.8	38.1–39.6	22	21.3–22.6	8.1	7.6–8.5	3.9	3.6–4.2
	18–79	**4.8**	**4.6–5**	**27.4**	**27–27.7**	**36.3**	**35.8–36.7**	**20.1**	**19.8–20.5**	**7.6**	**7.4–7.8**	**3.9**	**3.7–4**
Females	18–39	6.6*	6.3–6.9	41.6*	41–42.2	27.3	26.7–27.8	14.3*	13.9–14.7	6.3	6–6.6	3.9	3.7–4.2
	40–59	4.3*	4.1–4.5	35.7	35.2–36.2	31	30.5–31.5	16.9	16.5–17.3	7.5	7.2–7.8	4.6	4.4–4.8
	60–79	3.7	3.5–4	30.7	30.1–31.4	33.5	32.9–34.2	19.1	18.6–19.6	8.3*	7.9–8.6	4.7	4.4–5
	18–79	**4.9***	**4.7–5**	**36.3***	**36–36.7**	**30.4**	**30.1–30.8**	**16.6**	**16.4–16.9**	**7.3**	**7.1–7.5**	**4.4**	**4.3 = 4.5**

Bolded values represent prevalence estimates from all age subcategories combined (18–79 years).
* Indicates estimates that were significantly different from the CHMS Cycle 2, as determined by confidence intervals which did not overlap.

Comparison to national surveys

The BMI distribution of the CPCSSN population was least similar to national survey data in 2004, and increasingly more similar in 2007–2009 and 2009–2011. This trend suggests that the early BMI data from CPCSSN are less reliable, especially given the difference in the proportion of patients with their BMI recorded between 2003 (*n* = 3806 or 17.7% of patients) and 2012 (*n* = 89,746 or 42.2% of patients). Given the trend of increasing availability of BMI records over time, the more recent BMI data from CPCSSN may serve as a better comparison point. We expect that the number of available BMI records will continue to increase as EMRs become more populated with data and CPCSSN continues to expand and gain additional sites across Canada.

When examining obesity prevalence in the most recent survey comparison, the 2009–2011 CPCSSN estimates were greater than the CHMS Cycle 2 estimates across all three obesity classes (I, II, III), however differences were not statistically significant.[3] We suspect that this variation may be due to an over-representation of obesity prevalence in CPCSSN. Primary care users represent a convenience sample of the population who may be more likely to have obesity and related chronic conditions.[24] Physicians may also be more likely to measure weight in patients with health concerns such as obesity, contributing to the overestimation of CPCSSN obesity estimates.

Examining the individual obesity classes, there were no significant differences in the prevalence of obese class I persons between the CHMS Cycle 2 and CPCSSN in all age and sex categories except females age 18–39, who showed a greater prevalence in CPCSSN.[3] We suspect, however, that the prevalence of obesity may be over-estimated for women of childbearing age (18–39), as it was impossible to identify and exclude them from the study population. It was more difficult to draw the same extent of comparisons for the class II and III obese categories, as the Canadian surveys failed to provide reliable data for all age and sex groups. Nonetheless, prevalence estimates obtained in available age categories of the CHMS Cycle 2 were not significantly different than those in CPCSSN, with the exception of obese class II females age 60–79, who had a significantly greater prevalence in CPCSSN.[3] This notable difference can however be expected, given the increased tendency for women and elderly to visit their physician offices.[24,25]

Examining the proportion of underweight individuals (age 18–79) revealed a significantly greater prevalence in CPCSSN compared with Cycles 1 and 2 of the CHMS.[3,12] The difference in prevalence estimates also decreased over time, as the proportion of underweight individuals in CPCSSN continued to decrease and better approximate that of survey data, which stayed relatively constant over the years. We suspect that the significantly greater underweight prevalence estimates in CPCSSN were due to physicians' concerns with measuring weight for the assessment of malnutrition. It is possible that these concerns have decreased over time and physician use of weight as an assessment for obesity and related conditions has alternatively increased.

Biases

Utilizing EMR data limits the representativeness of study findings as it captures a convenience sample of people who visit their physician offices. Primary care users are more likely to be female and older compared with the general population.[24,25] Additionally, pregnant women were included in the study, as it was not possible to identify them in the CPCSSN database. It is therefore likely that obesity prevalence and mean BMI values may have been overestimated for women in younger age groups.

Not all patients within the CPCSSN database have their BMI recorded routinely. This could bias findings if there were systematic differences between patients with a recorded BMI and patients without a recorded BMI measurement. Physicians may be more likely to record BMI in relation to health concerns such as malnutrition or obesity. This suggests the possibility for individuals in the obese and underweight categories to be over-represented and those in the normal weight category to be under-represented in CPCSNN estimates. Our findings were consistent with this hypothesis.

Practice-based EMRs often experience problems with standardization across different platforms and within the same platform, and may be limited by the occurrence of missing measurements.[26] Previous studies have indicated that accuracy and completeness can vary across different systems, providers and sites, which in turn can affect the validity of the study.[27,28] In addition, unrecorded BMI, incorrect units, and improper data entry may further limit the accuracy of the study.

Strengths

The majority (80–90%) of Canadians attend a primary care physician, suggesting that obesity trends seen in primary care practice may reflect population values.[20–22] Findings from this study showed that estimates from the CPCSSN population closely approximated those of national survey data across the overweight and obesity classes. Estimates from the underweight and normal weight categories in CPCSSN have also demonstrated increasing similarity to survey data since 2004, as the database has become more populated. It can be suggested that CPCSSN's ability to accurately capture longitudinal BMI estimates in primary care users and reflect Canadian population estimates will likely continue to improve over time.

CONCLUSION

Obesity is a major public health concern, and CPCSSN BMI data represent a valuable source for healthy weight surveillance using a large sample of Canadians who receive primary care. CPCSSN offers the opportunity to obtain objective BMI measurements and assess longitudinal obesity trends. Measurements obtained reflect population estimates from national survey data. Additional work is needed to explore whether these data can be similarly used for surveillance of pediatric obesity.

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RÉSUMÉ

OBJECTIFS : Nous avons examiné la faisabilité d'utiliser les dossiers médicaux électroniques au sein du Réseau canadien de surveillance sentinelle en soins primaires (RCSSSP) pour la surveillance de l'obésité au Canada en évaluant la progression de l'obésité au fil du temps et en comparant les estimations de répartition de l'IMC du RCSSSP à celles obtenues dans des enquêtes nationales représentatives.

MÉTHODE : Nous avons extrait de la base de données du RCSSSP les données de 2003–2012 sur les patients de 18 ans et plus (n = 216 075). Les renseignements sur les patients étaient leur profil démographique (âge et sexe) et leurs mesures anthropométriques (taille, poids, indice de masse corporelle [IMC], périmètre ombilical et rapport taille-hanches). Des statistiques descriptives types ont servi à caractériser l'échantillon, notamment, le cas échéant, les moyennes, les proportions et les médianes. La répartition de l'IMC dans la population du RCSSSP a été comparée aux estimations de l'Enquête sur la santé dans les collectivités canadiennes (ESCC) et de l'Enquête canadienne sur les mesures de la santé (ECMS) pour les années 2004, 2007–2009 et 2009–2011.

RÉSULTATS : La prévalence estimative de l'obésité est passée de 17,9 % en 2003 à 30,8 % en 2012. Les estimations de la prévalence de l'obésité de classe I, II et III dans la population du RCSSSP en 2009–2011 (18 %, IC de 95 % : 17,8–18; 7,4 %, IC de 95 % : 7,3–7,6; 4,2 %, IC de 95 % : 4,1–4,3, respectivement) étaient supérieures à celles du cycle le plus récent (2009–2011) de l'ECMS (16,2 %, IC de 95 % : 14–18,7; 6,3 %, IC de 95 % : 4,6–8,5; 3,7 %, IC de 95 % : 2,8–4,8, respectivement), mais ces différences n'étaient pas significatives.

CONCLUSION : Les données du RCSSSP offrent une occasion unique de faire une surveillance longitudinale de l'obésité chez les utilisateurs de soins primaires au Canada, et elles donnent des estimations de prévalence semblables à celles obtenues par les données d'enquêtes nationales représentatives.

MOTS CLÉS : indice de masse corporelle (IMC); Réseau canadien de surveillance sentinelle en soins primaires (RCSSSP); dossier médical électronique (DME); obésité