



Monitoring Weight Status among Adults in Québec

PORTRAIT AND EVOLUTION FROM 1987 TO 2010

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Monitoring Weight Status among Adults in Québec

PORTRAIT AND EVOLUTION FROM 1987 TO 2010

Direction de l'analyse et de l'évaluation
des systèmes de soins et services

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SUMMARY

Reducing the prevalence of excess weight in the population in the short-term is one of Québec's public health objectives. The first part of this report provides a portrait of the current weight status situation based on the most recent data, and the second part presents weight trends since 1987.

The data collected in 2009–2010 revealed a prevalence of excess weight estimated at 50.5% for adults aged 18 and over. More specifically, 34.1% were overweight and 16.4% were obese. Between 1987 and 2010, the proportion of excess weight in Québec increased from one in three adults (34.6%) to one in two (50.5%).

Proportions of overweight and obesity rose significantly over these 23 years, but increases in both weight categories have slowed slightly since the early 2000s compared to the period from 1987 to 1998. Only severe obesity (class III) increased proportionately faster among adults in Québec between 2000 and 2010.

The average body mass index increased by 1.76 kg/m² for the population as a whole, from 24.0 kg/m² in 1987 to 25.8 kg/m² in 2010.

Also, the prevalence of obesity increased for all adults over the last decade, regardless of their individual characteristics or environment. This suggests that the environment in Québec is conducive to weight gain. However, in 2009–2010, there was a greater prevalence of obesity in some population subgroups, such as adults living in rural areas, those with very low incomes or those with low levels of education.

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INTRODUCTION

Several Québec public health objectives seek to reduce the incidence, mortality and morbidity of some chronic diseases. These objectives include a 2% reduction in the prevalence of obesity and a 5% decrease in the prevalence of overweight by 2012 (MSSS, 2008). The Institut national de santé publique du Québec's (INSPQ) mandate requires it to monitor the Québec population's health status, including body weight. This statistical report therefore draw updated data on the weight status of adults in Québec. The first part provides a portrait of the situation in 2009–2010, based on the most recent data currently available. The second part discusses how weight categories have changed since 1987 and a subsection presents trends in excess weight between 2000 and 2010 relative to certain health determinants.

1 METHODOLOGY

1.1 DATA SOURCES

The data used to monitor weight status are largely from cycles 1.1, 2.1, 3.1, 2007–2008 and 2009–2010 of the Canadian Community Health Survey (CCHS) conducted by Statistics Canada. The CCHS is a cross-sectional survey and since 2007 is ongoing and annual. It collects information on health status (including height and weight), health determinants and the use of health services in Canada. It relies upon a large sample of respondents (about 132,000 people) aged 12 and over, and is designed to provide representative estimates at the provincial, territorial and regional levels. Excluded from the survey's coverage are: persons living on reserves and other Aboriginal settlements in the provinces; full-time members of the Canadian Forces; and in Québec, the inhabitants of Nunavik and Terres-Cries-de-la-Baie-James (Statistics Canada, 2010). Computer-assisted, face-to-face or telephone interviews were used to collect data for this survey.

Data from three cross-sectional surveys in Québec were also used for this study: the *Enquête Santé Québec 1987* (ESQ) and the 1992–1993 and 1998 Social and Health surveys (*Enquêtes sociales et de santé* or ESS). Each survey involved more than 30,000 people living in private households. However, the Terres-Cries-de-la-Baie-James and Nunavik regions and Aboriginal reserves were excluded. The method used to collect data for the three surveys was a face-to-face interview with a person in the household along with a questionnaire completed by the interviewer, and a self-administered questionnaire for all people aged 15 and over in the household.

The data from the general CCHS master files were accessed through Statistics Canada's remote access service. An agreement was signed with the Institut de la statistique du Québec (ISQ) to use Santé Québec survey data and analyze the data at the research data access centre, Centre d'accès aux données de recherche de l'Institut de la statistique du Québec (CADRISQ).

1.2 STUDY POPULATION

The report's target population is representative of all adults living in all regions of Québec, except for the Terres-Cries-de-la-Baie-James and Nunavik regions. All people 18 and over who reported their height and weight were included in the study, except for pregnant women and women who did not answer the question "Are you pregnant?" Data on the population of other provinces and territories of Canada were used for comparison purposes.

1.3 VARIABLES

1.3.1 Body mass index (BMI)

The body mass index (BMI) is a measure used to estimate body fat. It is calculated by dividing weight in kilograms by height in metres squared (kg/m^2). The BMI is then classified according to the level of risk it poses to health. The classification system that Health Canada recommends for adults is presented in Table 1. For the purposes of this study, the term

“excess weight” means combined overweight and obesity (BMI ≥ 25). The data analyzed in this report were self-reported; respondents were not measured directly.

Table 1 Body weight categories based on the level of health risk

Weight Catégorie	BMI (kg/m ²)	Level of Health Risk
Underweight	< 18.5	Increased
Normal weight	18.5 – 24.99	Least
Overweight ¹	25.0 – 29.99	Increased
Obese class I	30.0 – 34.99	High
Obese class II	35.0 – 39.99	Very high
Obese class III	≥ 40.0	Extremely high
Global obesity	≥ 30.0	High

Source: Adapted from Health Canada (2003).

¹ The term “overweight” corresponds to the term “pre-obese” used by the World Health Organization (WHO, 2003).

1.3.2 Crossed variables

The *age groups* selected for the study were adults aged 18–19, 20–24, 25–34, 35–49, 50–64, 65–79 and 80+.

The *provinces and territories* are the nine other Canadian provinces and the three territories.

The *health regions* were Québec regions 01 to 16.

The *geographic area* is described as the urban or rural area, based on the statistical area classification of the last census available to the survey.

The *occupation* variable covers the type of activity that adults up to age 75 engaged in during the week preceding the survey. Four categories of activity are defined: had a job and worked; had a job but was absent; did not have a job; had a permanent disability.

Two variables were used for *household income*. Since cycle 3.1 (2005), Statistics Canada has produced a measurement of household income distribution in deciles. This variable is based on the adjusted ratio between total household income and the low income cut-off corresponding to the number of people in the household and the size of the community. For the 2009–2010 portrait, we selected this indicator for the provincial level (Statistics Canada, 2011). It is presented in quintiles in this report. Each quintile contains approximately 20% of the total population of Québec. Q1 corresponds to the lowest income and Q5 to the highest.

The other measure is much simpler. It links the total household income from all sources in the 12 months preceding the interview to the number of people living in the household. It is structured as follows:

- Lowest income: less than \$15,000 if there are 1 or 2 people in the household; less than \$20,000 if there are 3 or 4 people; and less than \$30,000 if there are 5 or more people.
- Low-medium income: \$15,000 to \$29,999 if there are 1 or 2 people in the household; \$20,000 to \$39,999 if there are 3 or 4 people; and \$30,000 to \$59,999 if there are 5 or more people.
- Medium-high income: \$30,000 to \$59,999 if there are 1 or 2 people in the household; \$40,000 to \$79,999 if there are 3 or 4 people; and \$60,000 to \$79,999 if there are 5 or more people.
- Highest income: \$60,000 if there are 1 or 2 people in the household, and \$80,000 and over if there are 3 or more people in the household.

This second measure was used to calculate the change in the relationship between BMI and household income over time from 2000–2001 to 2009–2010, because no measure of household income distribution was produced in cycles 1 and 2 of the CCHS.

Education is the highest level of education achieved by the respondent. It includes four categories: no high school diploma, high school diploma only, some post-secondary education and a post-secondary diploma.

The *immigration* variable contains two categories: whether the respondent was born in Canada or not, and the *length of residence* among immigrants, which is divided into less than 10 years and 10 years or more.

The area deprivation index is a population ecology variable that represents the deprivation of people in a small census area (dissemination area) covering 400 to 700 people (Pampalon et al., 2008). The index reflects two dimensions: material and social. Material deprivation refers to deprivation of the goods and conveniences of everyday life. It includes three main indicators: the percentage of people aged 15 and over who do not have a high school diploma, the employment/population ratio among those aged 15 and over, and the average income of those aged 15 and over. Social deprivation refers to the fragility of social networks, also understanding the family and the community. It essentially includes three indicators: the proportion of people aged 15 and over who live alone; the proportion of people aged 15 and over who are separated, divorced or widowed; and the proportion of single-parent families (Pampalon et al., 2004). The deprivation index is presented in quintiles. Q1 and Q5 are respectively quintiles of the population in the most advantaged and most disadvantaged areas. Each quintile contains approximately 20% of the total population of Québec. When the material and social dimensions are combined, the “Most advantaged” quintile contains 20% of the population from very privileged areas in material and social terms, and the “Most disadvantaged” quintile contains the population from very disadvantaged areas in material and social terms (see diagram in Appendix 1).

1.4 SURVEY WEIGHTS AND MEASURES OF STATISTICAL PRECISION

The sampling plans used in the health surveys are quite complex and involve unequal probabilities of respondent selection.

The use of survey weights helps restore the sample's representativeness so that the results can be extrapolated to the target population, i.e. adult population living in private households in Québec. All the results presented in this paper have therefore been weighted in accordance with recommendations from the data producers: Statistics Canada and the Institut de la statistique du Québec.

Furthermore, because the estimates are based on samples and not the entire population, they are affected by sampling error, which must be measured. Many measures of sampling error are available. The one considered here is the coefficient of variation (CV), which is the ratio of the standard error of the estimate to the estimate itself. Calculating the standard error in surveys with complex plans is far from simple and requires more than the use of standard formulas provided by commonly used software. More sophisticated estimation techniques are required, such as resampling techniques or Taylor linearization. With the data from the CCHS master files, we had access to a set of bootstrap weights for correctly calculating these standard errors using specially designed SAS macros (Statistics Canada, 2010b). SUDAAN software was used to calculate the desired measures of standard error for the ISQ survey data, which involved specifying the sampling plan and using the Taylor linearization method.

Estimates must meet minimum accuracy requirements to be released and interpreted. The release criteria used here are the same as those proposed by Statistics Canada:

- Coefficient of variation (CV) 0 to 16.6%: unrestricted release.
- Coefficient of variation (CV) 16.6% to 33.3%: marginal release with an ^E note: to be interpreted with caution.
- Coefficient of variation (CV) greater than 33.3%: not sufficiently accurate, with an ^F note: estimate not released.

It is important to note that the results presented in this report are based on self-reported anthropometric data, i.e. with no direct measurement of respondents. Because few surveys contained measured data, we had to use self-reported weights and heights. However, we know that people tend to overestimate their height and underestimate their weight, which reduces the estimated prevalence of obesity and overweight (Shields et al., 2009). Readers must keep this self-reporting bias in mind. More details are presented in the “Limitations of the study” section of this document.

1.5 STATISTICAL ANALYSES

The analyses performed were primarily descriptive. Raw percentages are presented in the portrait of the 2009–2010 weight status. To make the percentage comparisons valid, they were calculated using the adjusted estimates based on the age structure for Québec in 2001 (ages 18–24, 25–44, 45–64, 65–74 and 75+). Comparison tests of two percentages were

performed using bootstrap weights and the normal approximation. A threshold of 5% (significance level) was used to make these comparisons.

The percentages for each health region and each province or territory were compared respectively to those of the rest of Québec (without the region in question) and Canada (excluding the province or territory in question). Classical percentage comparison tests were performed using the estimated standard errors obtained by the bootstrap technique. Although a series of multiple comparisons was performed, for the sake of simplicity, the significance level of these tests was not corrected in order to maintain the overall 5% test threshold.

Raw estimates (proportions and averages) were used to calculate trends in weight status over time based on various crossed variables. However, the comparisons were performed using the adjusted estimates based on the age structure of Québec in 2001, with 95% confidence intervals and, in the case of overlaps, we always used a test with a 5% threshold to compare estimates.

Raw averages for BMI were also presented for the weight status portrait while averages adjusted to the age structure of Québec in 2001 were used to make valid comparisons between sub-populations that could be influenced by age. Although conservative, the non-overlapping confidence interval test showed that there was a significant difference between the two averages.

2 RESULTS

2.1 PORTRAIT OF WEIGHT STATUS AMONG ADULTS IN QUÉBEC IN 2009–2010

In 2009-2010, just over half of the adults in Québec were excess weight. More specifically, 34.1% were overweight and 16.4% were obese (Table 2). Underweight was reported by 2.5% of the adult population. Women were proportionately more likely than men to be underweight or have a normal weight, and less likely to be overweight or obese. More severe obesity (classes II and III) was comparable in both sexes. Finally, the average BMI and the median BMI of women were lower than those of men.

Table 2 Prevalence of body weight categories, average BMI and median BMI by sex in population aged 18 and over, Québec 2009–2010

	Total	Men	Women
	%		
Underweight (BMI < 18.5)	2.5	1.3	3.8*
Normal weight (BMI 18.5–24.9)	47.0	40.2	53.8*
Overweight (BMI 25.0–29.9)	34.1	41.0	27.1*
Obese (BMI ≥ 30)	16.4	17.5	15.4*
Obese I (BMI 30.0–34.9)	12.1	13.4	10.7*
Obese II (BMI 35.0–39.9)	3.0	3.0	3.0
Obese III (BMI ≥ 40)	1.4	1.1	1.7
Excess weight (BMI ≥ 25)	50.5	58.5	42.5*
	Kg/m²	Kg/m²	Kg/m²
Average BMI	25.8	26.4	25.1*
Median BMI	25.2	25.8	24.0*

Data source: The 2009–2010 CCHS master file with INSPQ computations made through Statistics Canada's remote access service.

* Value differs significantly from estimate for men.

2.2 PORTRAIT OF OTHER CANADIANS' WEIGHT STATUS IN 2009–2010

Figure 1 compares the weight status of adults in Québec with that of other Canadians in 2009–2010. Québec differed from the rest of Canada¹ by a relatively lower prevalence of obesity. British Columbia was the only other province whose prevalence of obesity was significantly lower than the Canadian average. The percentages of Québécois who were overweight and underweight were comparable to the national average.

¹ Defined as Canada without the province or territory in question.

The prevalence of excess weight was 51.9% in Canada (data not shown). Québec (50.5%) and British Columbia (44.7%) were the two provinces with a lower prevalence.

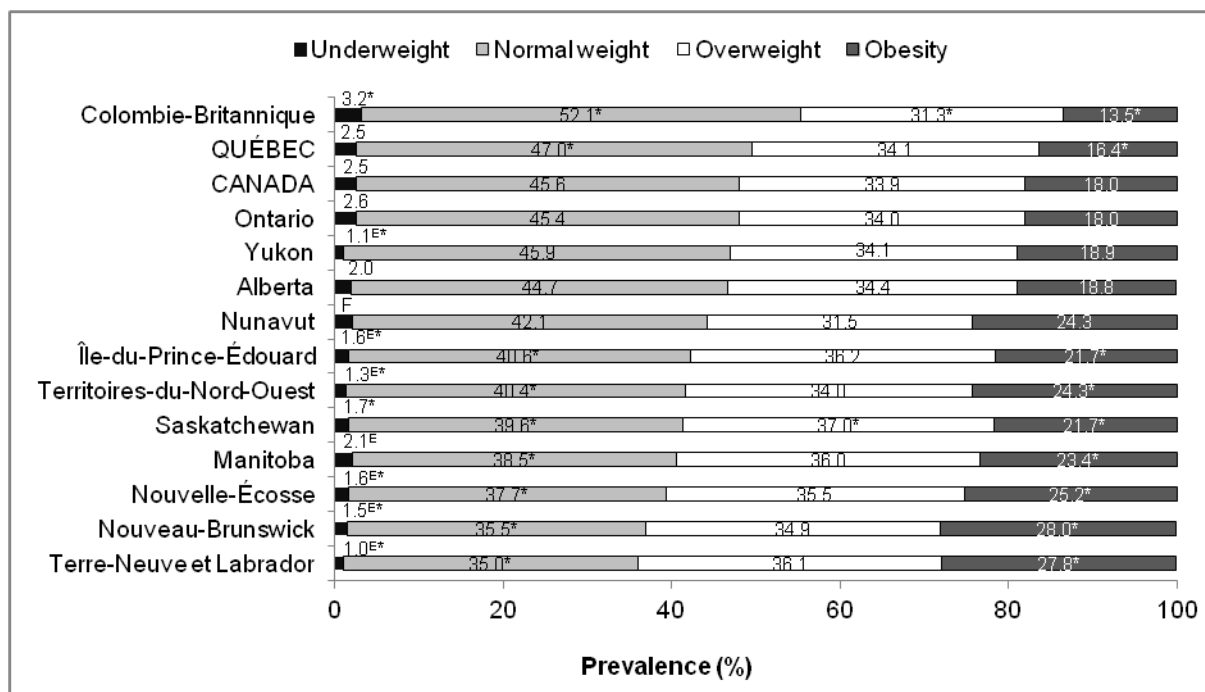


Figure 1 Prevalence of body weight categories by province, territory and for Canada in population aged 18 and over, Canada, 2009–2010

^E CV 16.6% to 33.3% (interpret with caution).

^F CV greater than 33.3% (estimate not released).

* Differs significantly from the estimate for the rest of Canada (calculation excludes the province or territory in question) at an uncorrected threshold of 5%.

Note: The partial non-response rate was 9% in Nunavut and 12% in the Northwest Territories.

2.3 PORTRAIT OF WEIGHT STATUS AMONG ADULTS IN QUÉBEC BY AGE IN 2009–2010

Table 3 presents the weight status of Quebecers according to age group. In 2009–2010, there was a higher prevalence of underweight and normal weight among young adults aged 18 and 19. The proportion of underweight decreases until age 50 and then increases. The proportion of people of normal weight decreases until age 65 and rises significantly from age 80. In contrast, the proportions of overweight and obesity appear lower for people aged 18 and 19. However, they rise significantly from age 20–24 to 65 and then decrease significantly from age 80. A particularly significant difference is noted between the 20–24 and the 25–34 age groups for obesity (5.2%).

Table 3 Prevalence of body weight categories by age group in population aged 18 and over, Québec, 2009–2010

	Underweight	Normal weight	Overweight	Obesity	Excess weight
	%				
Age 18–19	10.8 ^E	68.1	15.2 ^E	5.8 ^E	21.1
Age 20–24	4.2 ^E	65.8	21.1	8.9	30.0
Age 25–34	3.3	55.1	27.5	14.1	41.6
Age 35–49	1.9	45.2	35.7	17.2	52.9
Age 50–64	1.5 ^E	39.2	39.2	20.1	59.3
Age 65–79	2.0 ^E	39.9	39.9	18.2	58.1
Age 80+ ¹	3.4 ^E	50.3	34.2	12.2	46.4
Age 18+	2.5	47.0	34.1	16.4	50.5

^E CV 16.6% to 33.3% (interpret with caution).

¹ The partial non-response rate for people aged 80 or more was 15%. A more thorough examination of non-response rates should be considered for this age group. Proxy interviews were not allowed during this survey, which may have influenced the partial response rate. Estimates are presented for information purposes only because they are not necessarily representative for this age group.

2.4 PORTRAIT OF OVERWEIGHT, OBESITY AND EXCESS WEIGHT AMONG ADULTS IN QUÉBEC UNDER CERTAIN GEOGRAPHIC, DEMOGRAPHIC AND SOCIOECONOMIC CONDITIONS IN 2009–2010

Weight status cannot be monitored without relating weight to certain social determinants of health (MSSS, 2012). These determinants are analyzed to identify health disparities among population subgroups, which is essential information for planning public health actions. The factors used include the following characteristics: geographic (health region and geographic area: urban and rural), demographic (immigration) and socioeconomic (education, income, occupation and deprivation index). The analysis of the determinants in the next section is related to overweight and obesity separated and grouped.

Health region

Figure 2 presents overweight, obesity and excess weight by health region in Québec. The prevalence of overweight in each region did not differ significantly from that of the rest of Québec.² Percentages of obesity were below the Québec average (excluding the region compared) in the regions of Québec (13.2%) and Saguenay–Lac-St-Jean (12.5%), and above average in regions of Abitibi-Témiscamingue (20.2%) and Côte-Nord (22.9%).

The prevalence of excess weight ranged from 46.4% to 57.6% depending on the region. The capital region is the only outlier, with a prevalence of excess weight (46.4%) lower than the provincial average, while the Abitibi-Témiscamingue (54.9%), Gaspésie-Îles-de-la-Madeleine

² Defined as Québec without the region in question.

(55.5%), Nord-du-Québec (57.4%) and Côte-Nord (57.6%) regions feature higher percentages compared to the rest of Québec.

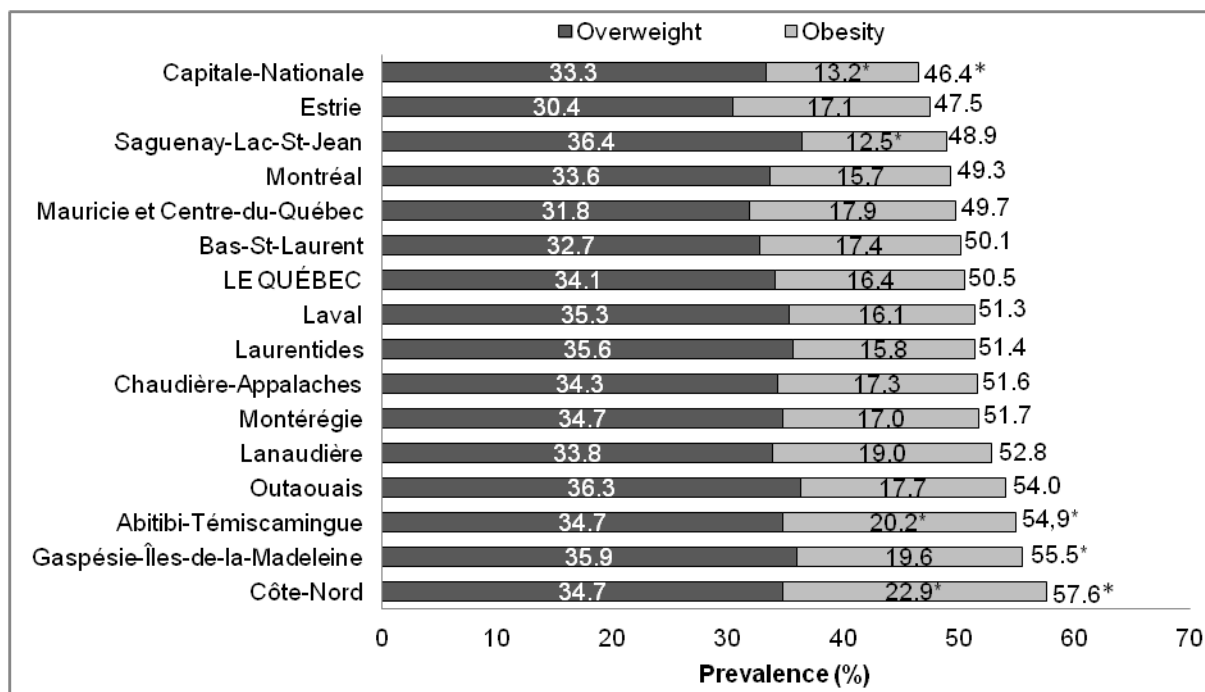


Figure 2 Prevalence of overweight, obesity and excess weight by health region and for Québec in population aged 18 and over, Québec, 2009–2010

* Value differs significantly from the estimate for the rest of Québec (calculation excludes the region in question) at an uncorrected threshold of 5%.

Geographic area

Table 4 presents weight analyses according to geographic area. The prevalence of excess weight appears higher in rural areas than urban areas. The difference is partly attributable to a higher percentage of obesity in rural areas. Analysis by sex reveals a similar prevalence of excess weight among men and women in both geographic areas (data not shown), but a higher percentage of obesity among men living in rural areas than among those in urban areas (20.5% vs. 16.7%, $p = 0.01$). The difference among women is not significant (17.7% vs. 14.9% $p = 0.055$).

Table 4 Prevalence of overweight, obesity and excess weight by geographic area in population aged 18 and over, Québec, 2009–2010

	Urban	Rural
	%	
Overweight	33.8	35.1
Obesity	15.8	19.2*
Excess weight	49.6	54.3*

* Value differs significantly from the estimate for the urban area in this weight category.

Immigration

Whether individuals were born in Canada and the length of immigrants' residence in Canada (Table 5) did not seem to affect the weight status of adults in Québec and no significant difference was noted in overweight, obesity and excess weight. Despite the result for the total population, a difference is noted among women. The prevalence of overweight among female immigrants residing in Canada for at least 10 years is higher than among women who arrived more recently (29.4% vs. 18.0%^E p = 0.01) (data not presented). This prevalence is in line with that of Québec women born in Canada (26.2% in 2009–2010).

Table 5 Prevalence of overweight, obesity and excess weight based on whether individuals were born in Canada and the length of immigrants' residence in Canada in population aged 18 and over, Québec, 2009–2010

	Born in Canada	Immigrant	Immigrant for less than 10 years	Immigrant for more than 10 years
	%			
Overweight	34.0	35.2	29.6	37.9
Obesity	16.9	14.9	12.3 ^E	16.2
Excess weight	50.8	50.0	41.9	54.1

^E CV 16.6% to 33.3% (interpret with caution).

Income

Figure 3 presents the prevalence of overweight and obesity separated and grouped by household income distribution. When overweight and obesity are combined, there is little variation among the overall population. However, when the prevalence of obesity is analyzed separately, adults with very low incomes (Q1) are found to be more affected by obesity than those with higher incomes (Q3, Q4 and Q5). The trend was a little different for overweight, where the prevalence among adults in the lowest income quintile (Q1) was below the prevalence among individuals in the third quintile (Q3). However, it decreases between quintiles 3 and 4.

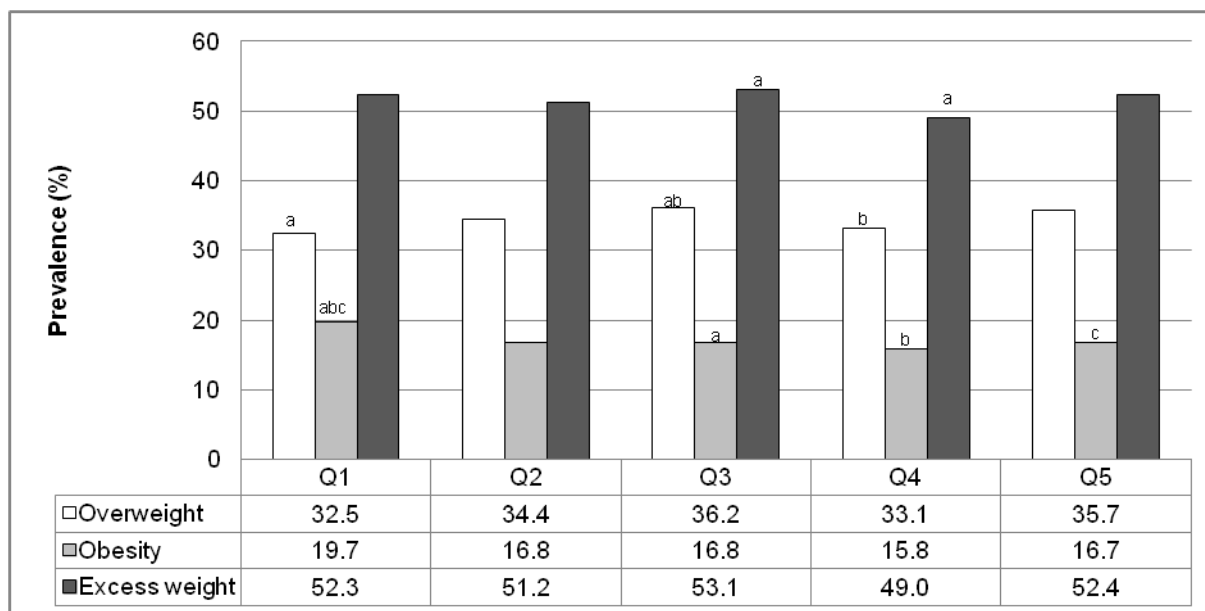


Figure 3 Prevalence of overweight, obesity and excess weight by household income distribution in population aged 18 and over, Québec, 2009–2010

^{abc} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

On the other hand, income and gender analysis reveals significant differences between men and women (Figures 2A and 2B in the appendix). The prevalence of excess weight in men tends to increase with income levels. Men with lower incomes (Q1 and Q2) appear proportionately less likely to have excess weight than those with moderately high incomes (Q3 and Q4). The prevalence of overweight is also lower in men with lower incomes (Q1 and Q2) compared to those with moderately high incomes (Q3). Obesity does not vary with income among men.

Contrary to the prevalence among men, the prevalence of excess weight among women decreases with income levels. Obesity also follows this trend with a higher prevalence among women with very low incomes (Q1) compared to others with higher incomes (Q2, Q3, Q4 and Q5). The proportion of overweight women is also greater at lower income levels than at higher levels.

Education

Figure 4 presents body weight by level of education. It shows that the prevalence of excess weight tends to decrease with higher levels of education. Proportionately, adults without a high school diploma are likelier to report excess weight (57.7%) than those with a post-secondary diploma (48.9%). This trend becomes somewhat clearer when the raw data presented is adjusted by age. This standardization (Figure 4.1) reverses the relationship between the two higher levels of education so that more adults with some post-secondary education report excess weight (53.7% adjusted estimate) than those who obtained a post-secondary diploma (48.3% adjusted estimate). The lower raw estimate for individuals with some post-secondary education (44.8%) compared to the adjusted value (53.7%) may be attributable to a higher percentage of young adults who have not completed their post-

secondary studies. This trend of decreasing excess weight can largely be explained by a higher prevalence of obesity in the first three levels of education compared to the higher level.

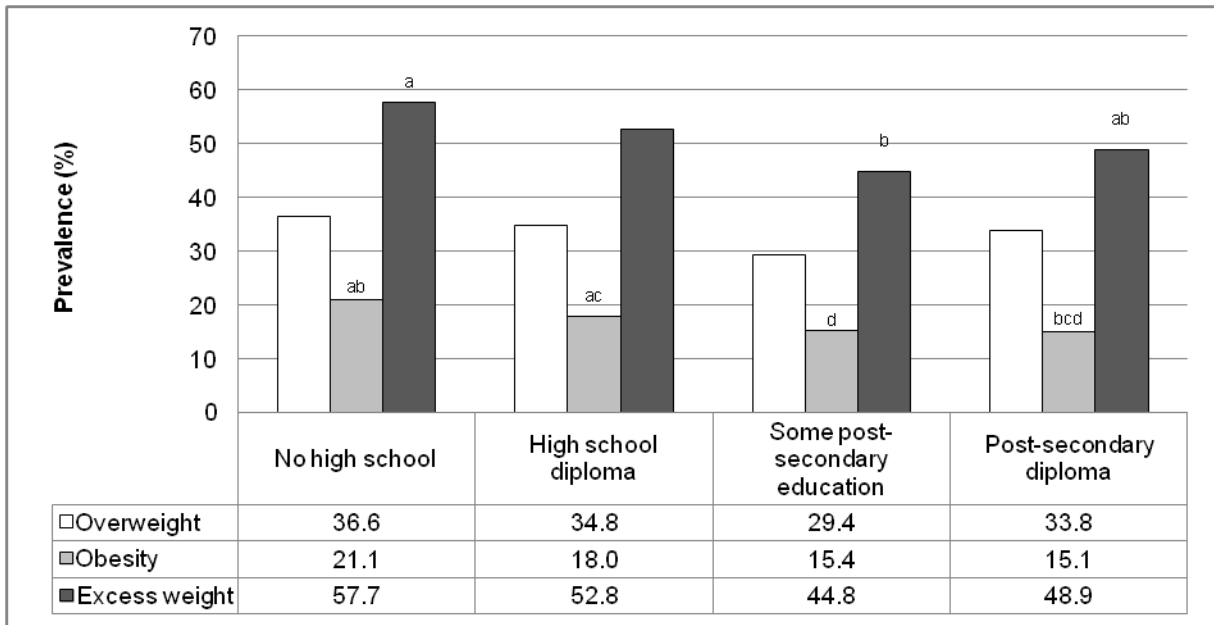


Figure 4 Prevalence of overweight, obesity and excess weight by level of education in population aged 18 and over, Québec, 2009–2010

^{abcd} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

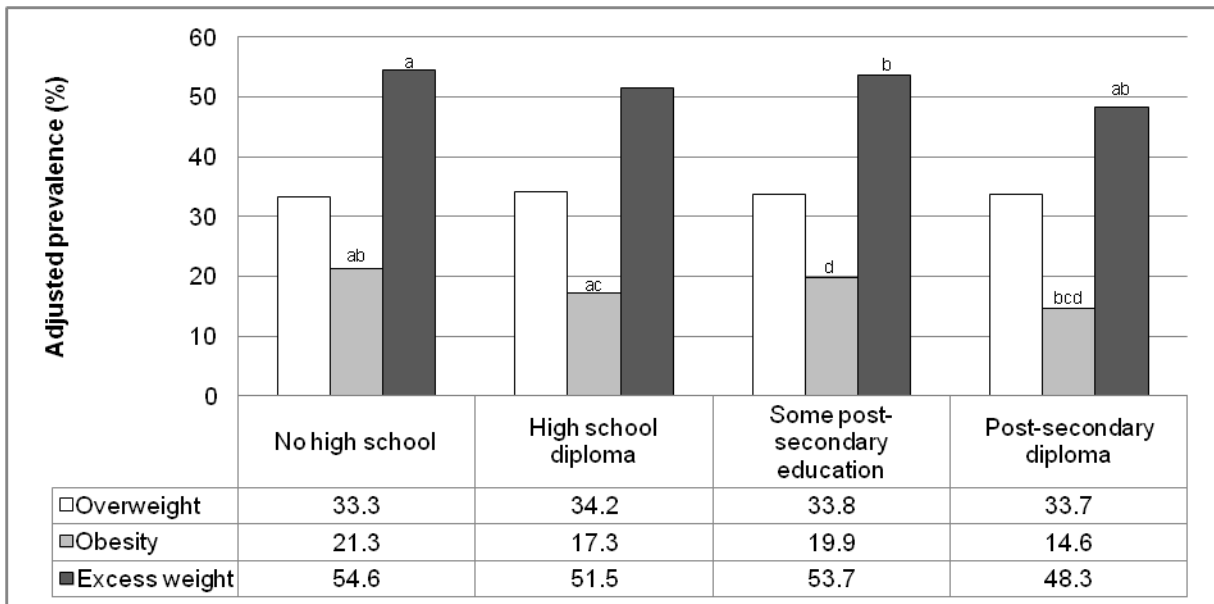


Figure 4.1 Adjusted prevalence of overweight, obesity and excess weight by level of education in population aged 18 and over, Québec, 2009–2010

^{abcd} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

An analysis by sex for this determinant reveals significant differences between men and women (Figures 3A and 3B in the appendix). In men, no significant variation appears in the proportions of excess weight and obesity by level of education, but there is a slightly higher prevalence of overweight among highly educated men than among men with lower levels of education ($p = 0.045$).

Greater variations appear among women. Figure 3B shows a prevalence of excess weight which tends to decrease with higher levels of education. Proportionately, more women without a high school diploma report excess weight than women with higher levels of education (high school diploma or post-secondary diploma). As with the finding concerning the population as a whole, adjusting for age (Figure 3C in the appendix) reverses the relationship between the two categories with higher levels of education, so that the adjusted prevalence of excess weight is higher among women with some post-secondary education than among women who obtained a post-secondary diploma.

Obesity also follows this trend: proportionately, more women with low levels of education (without a high school diploma) are affected by obesity than women with a high school or post-secondary diploma.

Occupation

Table 6 shows the distribution of weight categories according to respondents' occupation during the week preceding the survey. The prevalence of excess weight appears significantly higher for adults who reported being absent from work than for those who were at work. However, adjusting for age (Table 6.1) reverses the proportions so that people who were at work during the week before the survey are likelier to have excess weight than those who were absent. It is likely that women absent from work due to maternity leave are younger and therefore less affected by excess weight.

Table 6 also shows that the prevalence of excess weight is higher among people who reported being permanently unable to perform paid work compared to people who were employed or unemployed. However, it should be noted that the partial non-response rate for BMI in the permanent disability category was high and this relationship may not be representative of this subgroup. There was no relationship between occupation and overweight, but the prevalence of obesity was higher among people who reported being unemployed than among those who were absent from work during the seven days preceding the survey. There were also more obese adults who were permanently disabled than unemployed or absent from work, but caution should be used in interpreting this finding given the high partial non-response rate for BMI among people with permanent disabilities.

Table 6 Prevalence of overweight, obesity and excess weight by occupation during the preceding seven days in population aged 18 and over, Québec, 2009–2010

	Employed and Working	Employed and Absent	Unemployed	Permanent Disability ¹
	%			
Overweight	34.1	33.7	33.4	41.0
Obesity	15.2	16.6 ^{ab}	19.3 ^{ac}	27.3 ^{bc}
Excess weight	49.3 ^{ab}	50.3 ^{ac}	52.7 ^d	68.3 ^{bcd}

^{abcd} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

¹ The partial non-response rate for the “Permanent Disability” category was 18%. A more thorough examination of the non-response rate should be considered for this category of occupation. Estimates and significant relationships are presented for information purposes only, because they are not necessarily representative of this category of occupation.

Table 6.1 Adjusted prevalence of overweight, obesity and excess weight by occupation during the preceding seven days in population aged 18 and over, Québec, 2009–2010

	Employed and Working	Employed and Absent	Unemployed	Permanent Disability ¹
	%			
Overweight	34.0	32.4	30.9	34.2
Obesity	18.8	14.1 ^{ab}	18.6 ^{ac}	28.5 ^{bc}
Excess weight	52.9 ^{ab}	46.5 ^{ac}	49.5 ^d	62.7 ^{bcd}

^{abcd} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

¹ The partial non-response rate for the “Permanent Disability” category was 18%. A more thorough examination of the non-response rate should be considered for this category. Estimates and significant relationships are presented for information purposes only, because they are not necessarily representative of this category of occupation.

Area deprivation index

Figure 5 illustrates the relationship between deprivation and body weight among adults in Québec. The prevalence of excess weight tends to rise with increasing material deprivation. Proportionately, fewer people in the very affluent areas (Q1) report excess weight than people in more disadvantaged areas (Q4 and Q5), and the same appears to be the case with adults in Q3 when compared with those in Q5. When analyzed separately, overweight does not vary with material deprivation, while obesity follows the excess weight trend. The proportion of obese adults in very affluent areas (Q1) was lower than in the four other areas.

Analysis by sex reveals that the relationship between weight and material deprivation differs between men and women (Figures 4A and 4B in the appendix). The prevalence of excess

weight among women and the adult population as a whole increases with deprivation, whereas prevalence is not affected among men. The gradient for women is largely attributable to the increasing trend of obesity. The prevalence of obesity is also lower among affluent men (Q1) compared to very disadvantaged men (Q5) only. In contrast, men in very affluent areas (Q1) report more overweight than men in less affluent areas (Q4).

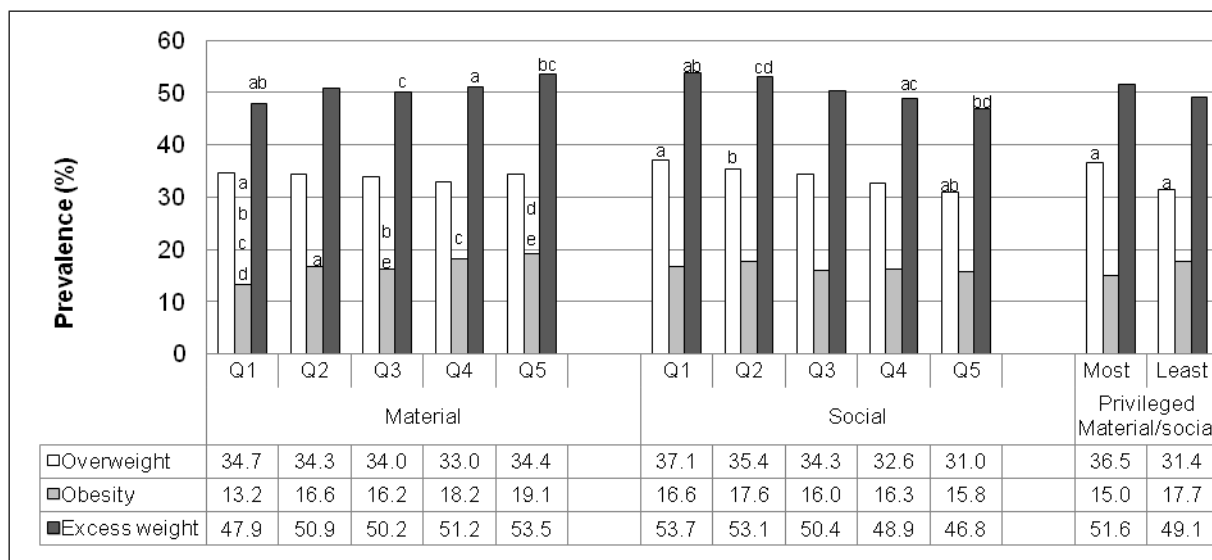


Figure 5 Prevalence of overweight, obesity and excess weight by quintiles of material and social deprivation in population aged 18 and over, Québec, 2009–2010

^{abcde} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

The middle graph in Figure 5 presents body weight according to social dimension of the deprivation index. It reveals a higher prevalence of excess weight among more affluent individuals (Q1 and Q2) than among the most socially deprived ones (Q4 and Q5). Obesity is not influenced by social deprivation, but the prevalence of overweight is higher among people in the first two quintiles (Q1 and Q2) than among those in the most deprived quintile (Q5).

An analysis by sex of the social dimension shows significant variations in weight among men only (Figures 4A and 4B in the appendix). The proportions of excess weight and overweight tend to decrease with deepening social deprivation. Higher prevalence of these two weight categories is found in the very socially privileged quintile (Q1) than in the less advantaged quintiles: Q3, Q4 and Q5.

Combining the material and social components provides a more comprehensive picture of deprivation. The right side of Figure 5 shows the weight categories of the adult population at both ends of the spectrum of material and social deprivation. The proportion of overweight people is greater among the very affluent than among the materially and socially deprived. Although a difference in obesity levels is noted, the difference does not reach the threshold of significance ($p = 0.06$).

An analysis by sex (Figures 4A and 4B in the appendix) shows that overall deprivation has a different influence on the weight status of men and women. Privileged men in both dimensions have a higher prevalence of excess weight compared to more disadvantaged men. This may be partially attributable to the similar trend in overweight. Unlike men, more privileged women have a lower prevalence of excess weight than more disadvantaged women. This is due to a lower prevalence of obesity among the very privileged.

2.5 TRENDS IN WEIGHT STATUS AMONG ADULTS IN QUÉBEC FROM 1987 TO 2010

The following figures (6, 7 and 8) show the changes in weight status among adults in Québec between 1987 and 2010. Figure 6 shows a decrease in the prevalence of normal weight and underweight, and conversely, an increase in overweight and obesity during this period. Significant differences are observable in each weight category from 1987 to 1998 and 2000 to 2010.

More specifically, the prevalence of overweight rose from 26.9% to 34.1%, a relative increase of 27% in 23 years. Obesity doubled during this period from 7.7% in 1987 to 16.4% in 2009–2010. This increase was 4.7% between 1987 and 1998 (a relative increase of 61%) and 3.8% between 2000 and 2010 (a relative increase of 30%).

Finally, between 1987 and 2010, the prevalence of excess weight (BMI \geq 25) increased from 34.6% to 50.5% among adults in Québec (data not shown).

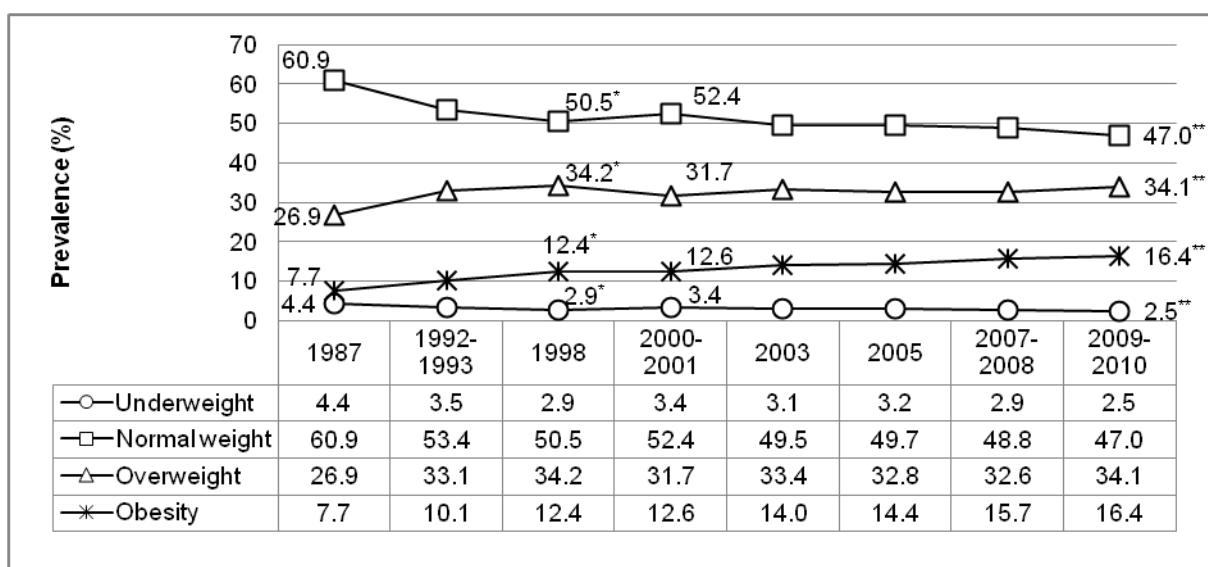


Figure 6 Trends in weight status in population aged 18 and over, Québec, 1987 to 2010

* 1998 value differs significantly from that of 1987.

** 2009–2010 value differs significantly from that of 2000–2001.

Note: Santé Québec's survey data collection method (1987, 1992–1993 and 1998) was different from the CCHS's (2000–2001, 2003, 2005, 2007–2008, 2009–2010). We therefore recommend that direct comparisons not be made between Santé Québec and CCHS survey results (see the "Limitations of the Study" section).

Trends by sex

The trends for men (Figure 7) are the same as those for the adult population as a whole, except for the prevalence of underweight, which did not change significantly between 2000 and 2010.

Women (Figure 8) match the adult population trends in terms of underweight, normal weight and obesity, whereas the prevalence of overweight did not increase significantly between 2000 and 2010.

As with the adult population as a whole, the prevalence of obesity increased faster among men and women between 1987 and 1998 (a relative difference of 74% in men and 48% women) than between 2000 and 2010 (a relative difference of 35% in men and 27% women).

If overweight and obesity are combined, this yields a 42.3% prevalence of excess weight among men in 1987 and 58.5% in 2009–2010. For women, it increased from 26.9% to 42.5% during the same period (data not shown).

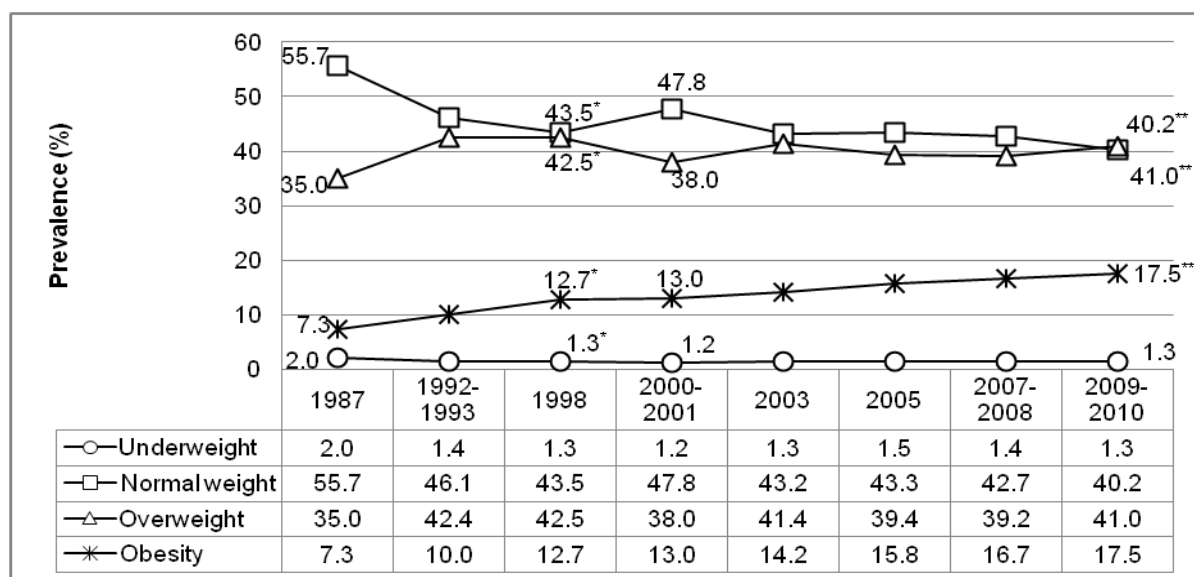


Figure 7 Trends in weight status in male population aged 18 and over, Québec, 1987 to 2010

* 1998 value differs significantly from that of 1987.

** 2009–2010 value differs significantly from that of 2000–2010.

Note: Santé Québec's survey data collection method (1987, 1992–1993 and 1998) was different from the CCHS's (2000–2010, 2003, 2005, 2007–2008, 2009–2010). We therefore recommend that direct comparisons not be made between Santé Québec and CCHS survey results (see the "Limitations of the Study" section).

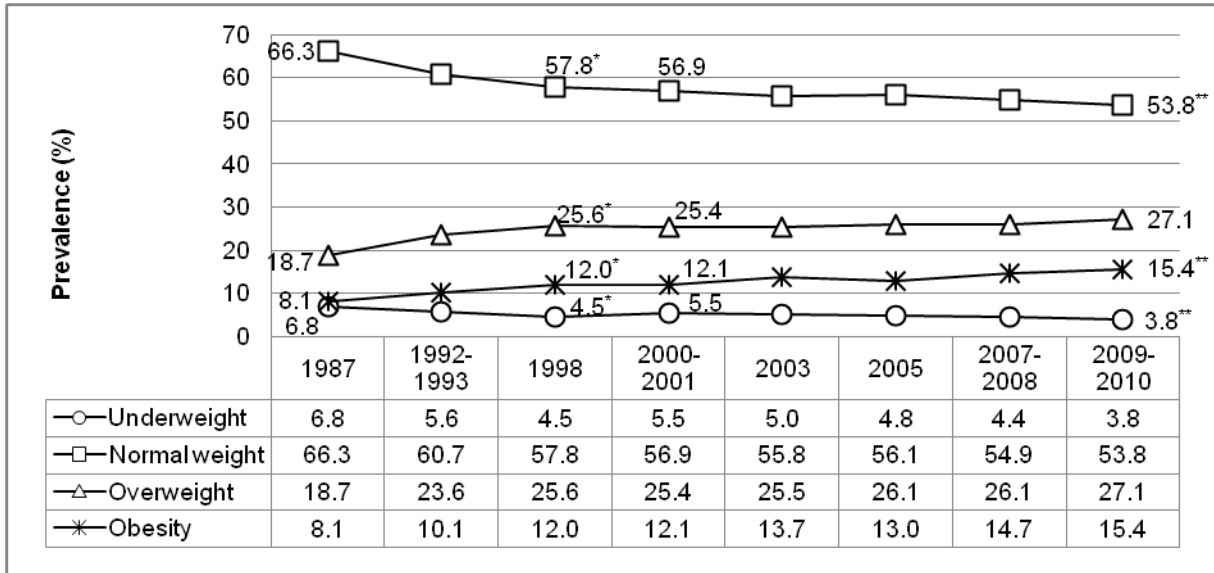


Figure 8 Trends in weight status in female population aged 18 and over, Québec, 1987 to 2010

* 1998 value differs significantly from that of 1987.

** 2009–2010 value differs significantly from that of 2000–2001.

Note: Santé Québec's survey data collection method (1987, 1992–1993 and 1998) was different from the CCHS's (2000–2001, 2003, 2005, 2007–2008, 2009–2010). We therefore recommend that direct comparisons not be made between Santé Québec and CCHS survey results (see the "Limitations of the Study" section).

Trends in average body mass index

Figure 9 shows the trends in the average BMI of the adult population in Québec since 1987. Note that the BMI increased by 1.76 kg/m² for the population as a whole, 1.8 kg/m² for men, and 1.72 kg/m² for women in 23 years. There are significant increases in both periods 1987–1998 and 2000–2010.

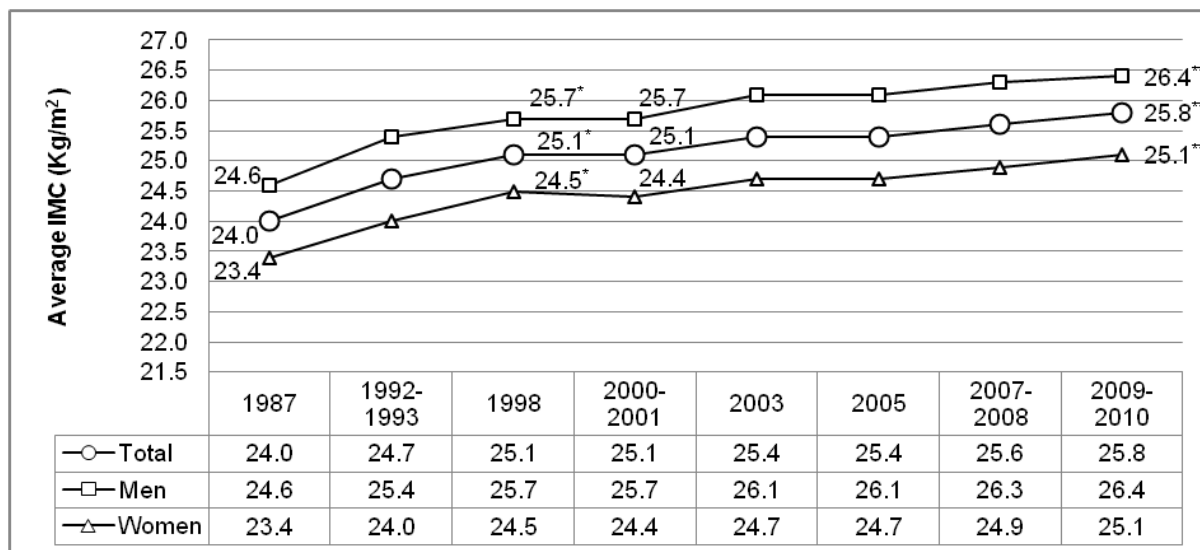


Figure 9 Trends in average body mass index (kg/m²) in population aged 18 and over, Québec, 1987 to 2010

* 1998 value differs significantly from that of 1987.

** 2009–2010 value differs significantly from that of 2000–2001.

Note: Santé Québec's survey data collection method (1987, 1992–1993 and 1998) was different from the CCHS's (2000–2001, 2003, 2005, 2007–2008, 2009–2010). We therefore recommend that direct comparisons not be made between Santé Québec and CCHS survey results (see the "Limitations of the study" section).

Comparison of weight status among adults in Québec in 2009–2010 with that of the previous survey in 2007–2008

A comparison of the 2009–2010 results with those of the previous survey in 2007–2008 indicates that for the total adult population and among men, there was a decrease in the proportion of people of normal weight in 2009–2010. The proportions of overweight and obesity did not increase significantly between the two surveys. However, if overweight and obesity are combined, there was an increase in excess weight in the adult population, especially in men. The average BMI increased significantly in two years for the total population, but more specifically for women.

Trends in obesity classes I, II and III

This increase in average BMI between 1987 and 2010 reflects an increasing prevalence of more severe obesity in the adult population. Table 7 shows that for the total population, there was a 6.1% increase in class I obesity (a relative increase of 102%), a 1.9% and a 0.9% increase for classes II and III respectively (relative increases of 173% and 180%) over the 23 years.

Between 1987 and 1998, the differences are all significant except for the total population and women with class III obesity. Between 2000 and 2010, all differences are also significant except for women in class II. The prevalence of obesity in classes I and II follows the same trend as for overall obesity with a slower progression between 2000 and 2010. However, the situation is different for class III. The prevalence of class III obesity increased more between 2000 and 2010 than between 1987 and 1998. Indeed, the increase in the total adult

population was 0.6% (a relative increase of 75%) between 2000 and 2010 ($p = 0.001$) compared to 0.3% (a relative increase of 60%) between 1987 and 1998 ($p = 0.18$). The trend among women was similar to the trend for the total population, with a 0.8% increase in the prevalence of class III obesity (relative increase of 89%) between 2000 and 2010 ($p = 0.01$) and 0.2% (relative increase of 25%) between 1987 and 1998 ($p = 0.78$). The prevalence of men with class III obesity appears to be similar, with a slightly faster progression between 2000 and 2010 (a difference of 0.5% compared to 0.4% between 1987 and 1998). We should take into account, however, that several reported estimates for men in this category are lacking in precision.

Table 7 Trends in obesity by sex in population aged 18 and over, Québec, 1987 to 2010

		1987	1992-93	1998	2000-2001	2003	2005	2007-2008	2009-2010
		%							
Obese I	Total	6.0	7.9	9.5*	9.5	10.4	10.9	11.5	12.1**
	Men	6.3	8.2	10.3*	10.4	11.0	12.8	12.8	13.4**
	Women	5.8	7.5	8.7*	8.5	9.8	8.9	10.1	10.7**
Obese II	Total	1.1	1.6	2.1*	2.3	2.3	2.6	3.0	3.0**
	Men	0.7 ^E	1.3	1.9*	2.0	2.2	2.3	2.9	3.0**
	Women	1.5	1.9	2.3*	2.7	2.4	2.9	3.1	3.0
Obese III	Total	0.5 ^E	0.6	0.8	0.8	1.2	0.9	1.2	1.4**
	Men	0.25 ^E	0.5 ^E	0.6 ^{E*}	0.6 ^E	1.0 ^E	0.7	1.0	1.1**
	Femmes	0.8 ^E	0.8	1.0	0.9	1.5	1.1	1.5	1.7**

^E CV 16.6% to 33.3% (interpret with caution).

* 1998 value differs significantly from that of 1987.

** 2009–2010 value differs significantly from that of 2000–2001.

Note: Santé Québec's survey data collection method (1987, 1992–1993 and 1998) was different from the CCHS's (2000–2001, 2003, 2005, 2007–2008, 2009–2010). We therefore recommend that direct comparisons not be made between Santé Québec and CCHS survey results (see the "Limitations of the Study" section).

2.6 TRENDS IN EXCESS WEIGHT, OVERWEIGHT AND OBESITY AMONG ADULTS IN QUÉBEC BETWEEN 2000 AND 2010, RELATED TO VARIOUS DETERMINANTS

The following section examines the trends in excess weight, overweight and obesity between 2000 and 2010 related to various determinants of health such as age group, income, education, geographic area, and material and social deprivation.

Trends by age

Figure 10 shows the temporal evolution of excess weight in adults in Québec by age group. The prevalence of excess weight increased significantly in most age groups between 2000 and 2010, except for people aged 18–19 and 25–34. The highest relative increase (28%) occurred among young adults aged 20–24.

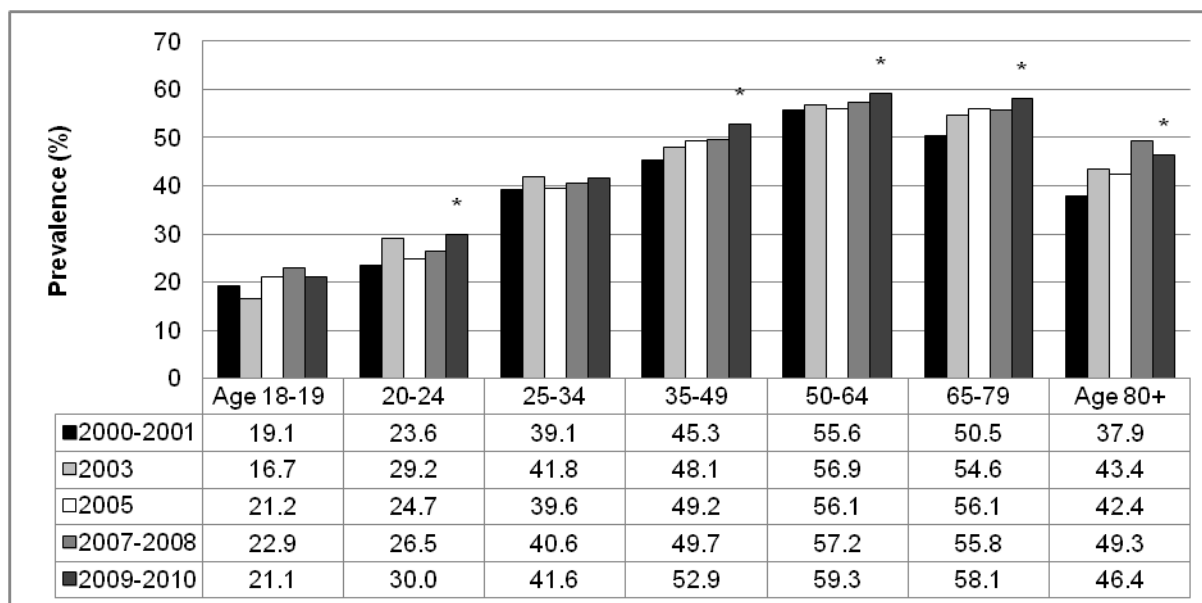


Figure 10 Trends in the prevalence of excess weight by age group in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 for this age group.

Note: The partial non-response rate for people aged 80 and over was 16% in 2007–2008 and 15% in 2009–2010. During the both surveys, interviews by proxy were not authorized and may have influenced the response rate. Estimates are presented for information purposes only, because they are not necessarily representative of this age group.

More specifically, the prevalence of overweight (Figure 5A in the appendix) increased significantly, with a relative increase of 29% among Quebecers aged 20–24 and to a lesser extent, by 11% among people aged 35–49 and 65–79. Obesity (Figure 5B in the appendix) increased significantly among people aged 25–80 during this decade. There was a strong 33% increase among adults aged 50–64. In addition, the significant difference in obesity recorded in 2009–2010, between young adults aged 20–24 and 25–34, persisted between 2000 and 2010.

Trends by geographic area

The following figure (Figure 11) shows the trends in excess weight by geographic area. The prevalence of excess weight among adults increased in both urban and rural areas between 2000 and 2010, with respective relative increases of 15% and 12%. These increases may be partly attributable to obesity. The prevalence of overweight (Figure 5C in the appendix) increased by 9% in urban areas, while the prevalence of obesity (Figure 5D in the appendix) increased significantly by 30% in urban areas and 36% in rural areas during the study period.

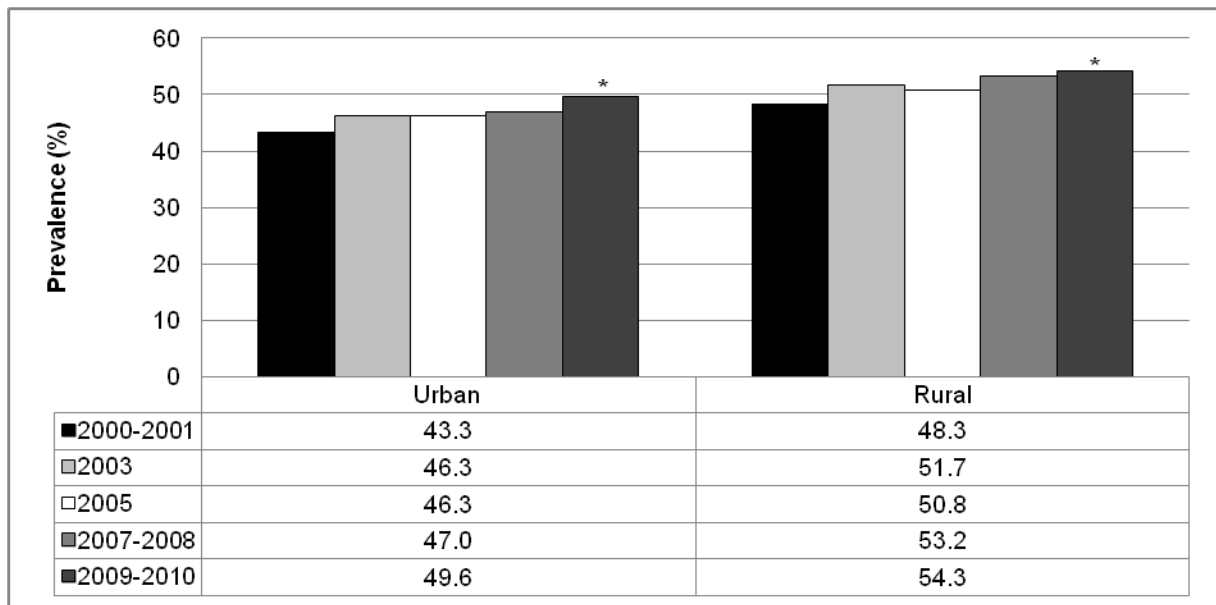


Figure 11 Trends in the prevalence of excess weight by geographic area in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this area.

Trends by income

Figure 12 shows the trends in excess weight among adults in Québec by household income. It shows that this prevalence increased at all levels of income between 2000 and 2010, with the highest increase in the lowest income category (relative increase of 19%). A more detailed analysis reveals a relatively stable prevalence of overweight (Figure 5E in the appendix) in each income category, except medium–high income in which there was a notable 12% increase. The prevalence of obesity (Figure 5F in the appendix) increased significantly at all income levels. The most significant relative increase occurred in the highest income category where it increased by 51% in 10 years, followed by a 46% increase in the lowest income category.

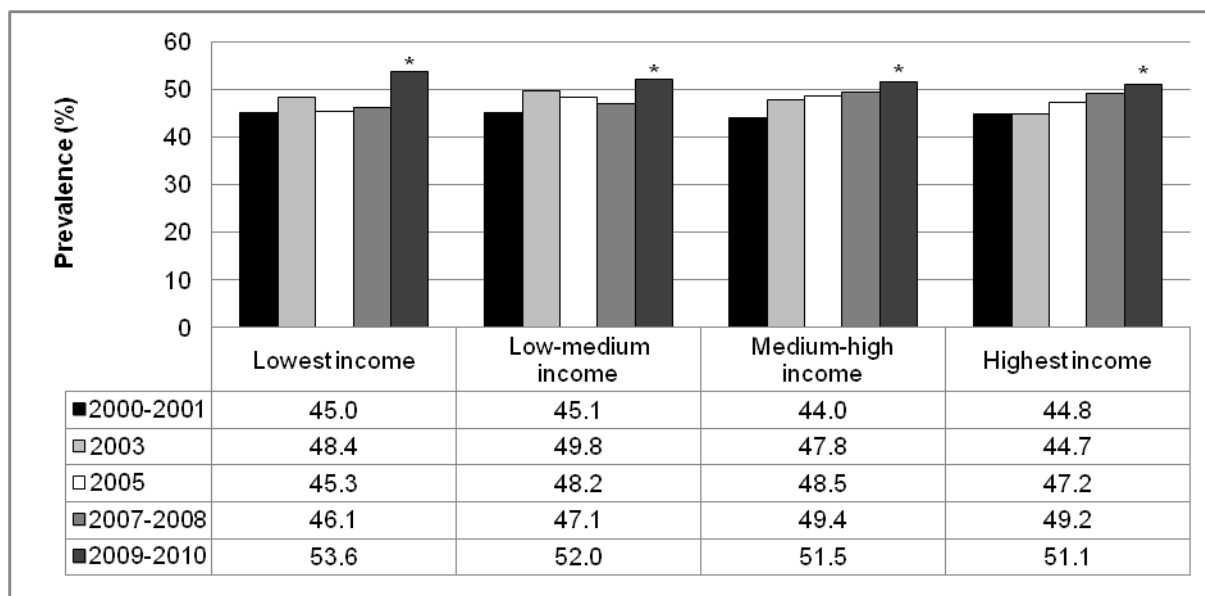


Figure 12 Trends in the prevalence of excess weight by household income in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this income category.

However, we must keep in mind the limitation of the measure used to examine the trends in income by BMI because it does not take into account increases in income over time. As we move forward in time, there are fewer households in the first group (lowest income) and more in the last category (highest income).

Trends in weight by level of education

Figure 13 shows the trends in excess weight by level of education of adults in Québec. The prevalence increased at all levels of education between 2000 and 2010, largely due to obesity. Post-secondary graduates experienced the greatest relative increase in excess weight (22%) and adults without a high school diploma experienced the lowest increase (11%).

More specifically, the prevalence of overweight (Figure 5G in the appendix) remained relatively stable, except for the “Post-secondary diploma” category in which there was a significant 44% relative increase between 2000 and 2010. The prevalence of obesity (Figure 5H in the appendix) increased at all levels of education between 2000 and 2010. It increased more rapidly with a 44% relative increase among those with some or completed post-secondary education, and more slowly with a 29% increase among those without a high school diploma.

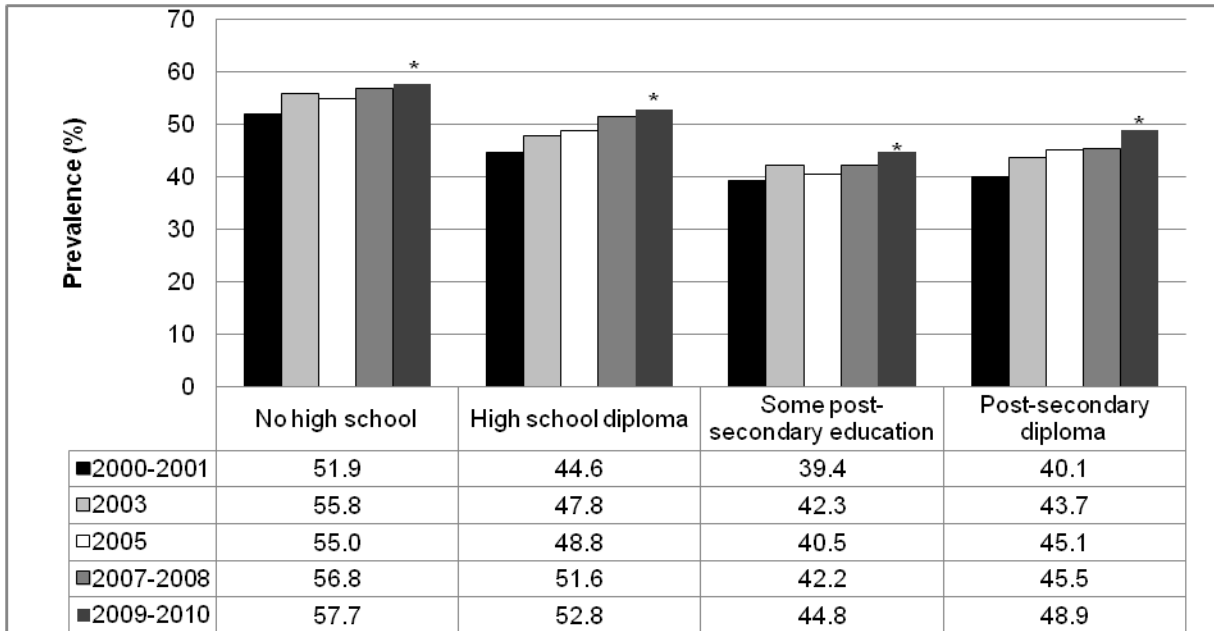


Figure 13 Trends in the prevalence of excess weight by level of education in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this level of education.

Changes by material and social deprivation

Figure 14 below presents the excess weight among adults in Québec, over a period of 10 years, by highest (Q1) and lowest (Q5) quintiles of material and social deprivation. It shows a 21% relative increase in prevalence among people in the most materially and socially privileged environment, while there is no significant increase among people in highly disadvantaged environments ($p = 0.07$). Specifically, the results for overweight (Figure 5I in the appendix) indicate stable prevalence in both environments, but a significant increase in obesity (Figure 5J in the appendix) at both ends of the spectrum, i.e. 55% for the most privileged and 23% for the most disadvantaged.

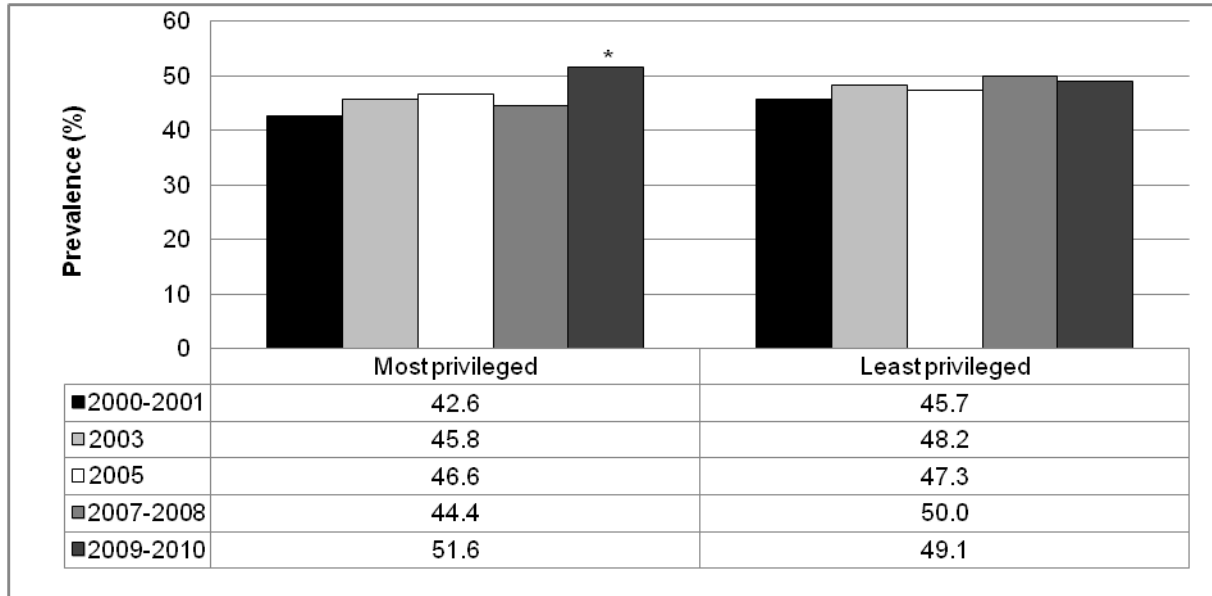


Figure 14 Trends in the prevalence of excess weight by most privileged and most materially and socially disadvantaged environments in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this deprivation category.

3 DISCUSSION

3.1 WEIGHT STATUS

According to recent data from the 2009–2010 CCHS, the self-reported prevalence of excess weight (overweight and obesity combined) among adults in Québec is estimated at 50.5%, which represents approximately 3,083,000 people aged 18 and over. More specifically, about 2,079,000 adults were overweight (34.1%) and nearly 1,004,000 were obese (16.4%). Men are more likely than women to be overweight or obese, but fewer men were underweight or at a normal weight than women. When compared to the other countries of the Organisation for Economic Co-operation and Development (OECD), the obesity situation in Québec is far from stellar (INSPQ, 2009). However, compared to the rest of Canada, Québec is doing fairly well, with the second-lowest prevalence of obesity and excess weight, just behind British Columbia.

The median BMI, representing the BMI of half of the adult population of Québec, was estimated at 25.2 kg/m² in 2009–2010, compared to 23.5 kg/m² in 1987. This result is far from the optimal target suggested by the World Health Organization, namely a median BMI between 21 kg/m² and 23 kg/m² for the adult population (WHO, 2003).

This increase is troubling, as is the continued increase in the prevalence of obesity among adults in Québec since 1987, although they seem to follow the same trend observed elsewhere in the world (OECD, 2012a and WHO, 2003). However, since the early 2000s, the increase in the prevalence of obesity seems to have been slowing down somewhat in Québec. The increase was estimated at 3.8% between 2000 and 2010 (a relative difference of 30%) compared to 4.7% between 1987 and 1998 (a relative difference of 61%).

The OECD also reported a slowdown in the obesity epidemic in some countries over the past three years (OECD, 2012). In a systematic review of the literature, Rokholm et al., (2010) also found that the prevalence of obesity among adults was stabilizing or levelling in some countries, including the United States, England and France. A Canadian study (Orpana et al., 2007) which used longitudinal data from the National Population Health Survey for the period from 1996 to 2005 revealed that weight gain in adults in Canada slowed between 2002–2003 and 2004–2005.

However, the current study results show that severe obesity has increased significantly since 1987. Furthermore, despite a slower increase in the prevalence of classes I (BMI 30–34.9) and II (BMI 35–39.9) between 2000 and 2010, very severe obesity (BMI ≥40) increased more rapidly during this decade among the adult population as a whole.

Weight status data for the United States seems to follow the same trends. Although there was no significant change in the prevalence of obesity in the United States from 2003–2004, the global increase in weight status is attributable to the increase in the prevalence of severe obesity (BMI ≥40) in the last 25 years (Ogden et al., 2007). Projections for both proportions were also estimated for the next 20 years among American adults (Finkelstein et al., 2012) and are particularly alarming in terms of public health. Considering the higher risk of morbidity (Andreyeva et al., 2007) and mortality associated with severe obesity (Orpana

et al., 2009), and based on our observations, this category of obesity in Québec should be monitored continuously.

3.2 WEIGHT STATUS ACCORDING TO VARIOUS DEMOGRAPHIC, GEOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS

Examining social determinants makes it possible to identify health inequalities that may exist within subgroups of the population. In this study, the analysis focused on the demographic, geographic and socioeconomic characteristics of adults in Québec.

Age

Age is a major determinant of body weight. Our observations from 2009–2010 show increases in overweight and obesity until age 65, after which prevalence decreases. More than one in two people aged 35–79 in Québec has excess weight, and obesity affects one in five people aged 50–64.

The decrease in the prevalence of excess weight after age 65 may be surprising. Caution should be exercised when interpreting the results for older adults. A U.S. study involving more than 16,000 adults, which compared self-reported weight and height with measured weight and height, showed significant differences according to age groups. In particular, older age groups tended to significantly overestimate their height, which resulted in underestimated BMI values (Kuczmarski et al., 2001).

A lower prevalence of obesity does not mean that older people are automatically less likely to have health problems (Seidell and Visscher, 2000). Adiposity does not necessarily diminish with age. Rather, it is redistributed toward more abdominal fat. The body mass index is therefore not necessarily the most appropriate indicator for measuring adiposity and related risks among older people.

Between 2000 and 2010, only adults aged 18 to 19 reported stable weight (overweight, obesity and excess weight). Weight varied in all other age groups during this period. There was an increase in excess weight among Quebecers of age 20 or older, except among individuals aged 25–34. However, the prevalence of obesity among those aged 25–34 increased between 2000 and 2010. Also, the important gap in obesity in 2009–2010 between those aged 20–24 and 25–34 persisted between 2000 and 2010. At these ages, many adults complete their student life and join the labour force, what appears to be a critical period for weight gain.

Although the prevalence of excess weight among young people aged 20–24 is one of the lowest in the adult population, the relative increase of 28% in 10 years remains troubling. It is recognized that once weight is gained, it can be difficult to lose (Le Petit and Berthelot, 2005).

Geographic area

Geographic area is a risk factor associated with overweight and obesity in Canada (PHAC and the Canadian Institute for Health Information (CIHI), 2011). Our results for Québec show a higher prevalence of obesity and excess weight in rural areas than urban areas for the

period 2009–2010, even adjusting for age. In a U.S. study involving 30,000 adults, Patterson et al., (2004) made a similar finding. The prevalence of obesity was higher in rural areas (20.4%) than urban areas (17.8%).

Although the proportion of obesity and excess weight in Québec is higher in rural areas than urban areas since 2000, there was a significant increase in both areas between 2000 and 2010. Obesity is present regardless of the level of urbanization in an area. However, obesity appears to be associated with distinct characteristics depending on the community (Joshua et al., 2008).

Socioeconomic status

Individuals' socioeconomic status is based on factors such as income, education and occupation, which are known to be related to body weight (Ball and Crawford, 2010).

In 2009–2010, adults in Québec with low incomes and lower levels of education were more affected by obesity than those more affluent and with higher levels of education. These results are consistent with those reported in previous publications (Mongeau et al., 2005 and Lamontagne and Hamel, 2008). The prevalence of excess weight is also higher in adults without a high school diploma than among those with a post-secondary diploma, but does not vary significantly by income group due to opposite trends in men and women.

When looking at weight status trends based on these two socioeconomic factors, we find that the proportions of obesity and excess weight increased significantly in all income groups and levels of education between 2000 and 2010. This indicates that the increase in weight is not limited to less affluent Quebecers or with lower levels of education. The 51% relative increase in obesity in 10 years among the most affluent individuals and the 44% relative increase among individuals with the highest level of education confirm this finding.

Occupation is another component of individuals' socioeconomic status that appears to be an important predictor of obesity (Ball and Crawford, 2010). The proportions of obesity and excess weight among adults with permanent disabilities were higher than among those who were at work or not working during the week preceding the interview. Although the rate of BMI partial non-response was higher among people with a permanent disability, there is no indication that there would be a different result without a high partial non-response rate. Given the cross-sectional nature of our analyses, we cannot establish a causal relationship between disability and body weight. Disability may have a negative impact on weight just as weight may aggravate a disability. In this regard, a recent German study involving workers found a positive relationship between weight and the risk of occupational disability. Notably, it found that obesity increased the risk of disability due to osteoarthritis and cardiovascular disease (Claessen et al., 2009).

Area deprivation index

The individual socioeconomic factors of education, income and occupation are generally studied because they have a great influence on the health of the population. These factors now include people's local environment, which is also recognized as a factor that can influence the health status of the population (MSSS, 2012). The deprivation index, which is

more of an ecological than individual measure, makes it possible to study an aspect of health based on the deprivation in the immediate living environment before identifying health-related social inequalities. The index includes material and social deprivation, which can be analyzed separately or together.

Area deprivation is related to body weight in the Québec population, but in different ways depending on the component. Increases in material deprivation tend to increase the proportions of obesity and excess weight, while increases in social deprivation are related to decreases in overweight and excess weight. Overall, when the two components are combined, there is a higher prevalence of overweight in very affluent areas than in very materially and socially disadvantaged areas.

As with individual determinants, the deprivation index varies greatly according to sex. Fluctuations in men's body weight are more closely related to social deprivation, while trends in women's body weight are related to material deprivation. When the two components are combined, there is a higher prevalence of overweight and excess weight in men living in very affluent areas. In contrast, both proportions are lower among women from very affluent areas compared to those of women living in very materially and socially disadvantaged areas.

In sum, obesity has increased in both very disadvantaged and very affluent areas in Québec since 2000. Obesity and excess weight do not occur exclusively in disadvantaged areas. Proportions have increased more quickly in affluent areas. This suggests that an obesogenic environment very likely contributes to increases in excess weight in all areas.

4 LIMITATIONS OF THE STUDY

4.1 BODY MASS INDEX

BMI classification may include limitations for certain subgroups of the population such as young adults who are still growing, naturally thin adults, adults with strong bone structure, seniors over 65, and some ethnic or racial groups.

More specifically in the case of people aged 65 and over, the “normal weight” BMI interval can range from a value greater than 18.5 to a value in the “overweight” interval. Risks associated with underweight among these people may begin to occur at a BMI slightly greater than 18.5 (Health Canada, 2003). However, at the population level, this classification can be used for all Canadian adults of all ages (Health Canada, 2003).

4.2 SELF-REPORTING BIAS

A major limitation of current body weight monitoring is data from health surveys are more often based on self-reported data than measured data. It is known that self-reported weight and height by health survey respondents results in underestimating the actual prevalence of obesity and excess weight (Shields et al., 2009).

Measured anthropometric data from a 2008 subsample of 1,088 Quebecers aged 18 and over taken during the 2007–2008 CCHS was used to estimate the bias that may exist between self-reported and measured estimations. Figure 15 shows that the prevalence of overweight adults in 2007–2008 based on self-reported data was underestimated by 4.1% compared to the prevalence in 2008 based on measured data. The prevalence of obesity was underestimated even more, with a difference of 8.8% (prevalence of 15.7% vs. 24.5%), resulting in a difference of 12.9% in the prevalence of excess weight. Note that when the survey respondents reported their weight and height, they did not know that they would be weighed and measured afterward. However, the bias might be lower if respondents knew that they would be weighed and measured afterward (Shields et al., 2011).

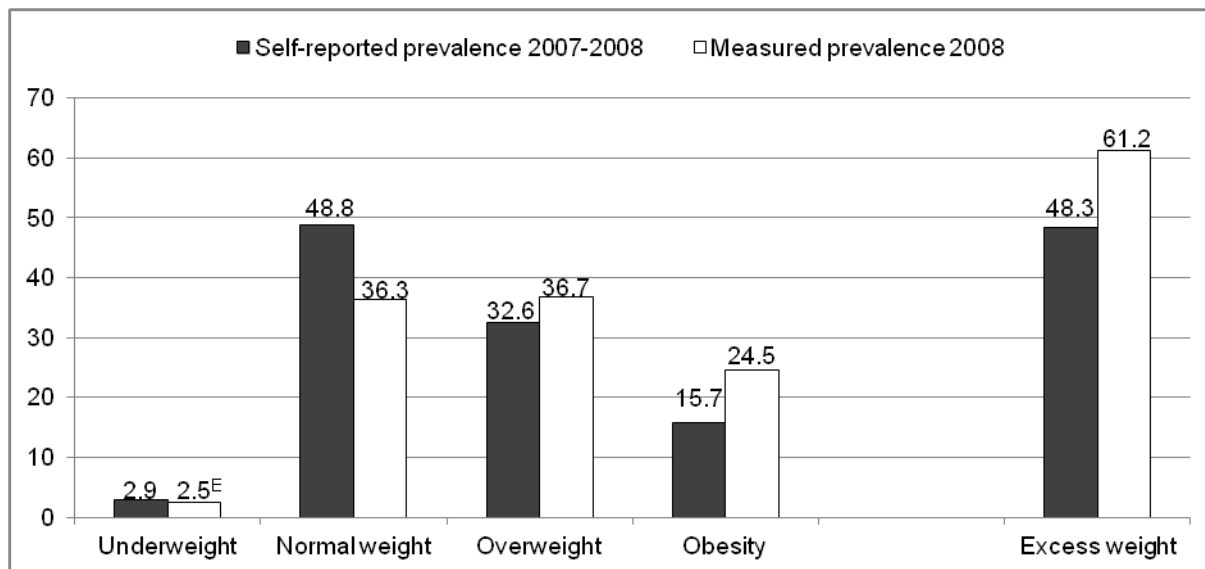


Figure 15 Prevalence of self-reported and measured categories of body weight in population aged 18 and over, Québec, 2007–2008 and 2008

^E CV 16.6% to 33.3% (interpret with caution).

Based on the 2007–2008 CCHS data, Figure 16 presents self-reporting bias by sex. Among both women and men, there is underestimation of prevalence of overweight and obesity. The differences were smaller for men than women. Men underestimated overweight by 3.9% and women underestimated it by 4.4%. The difference in the prevalence of obesity was 7.2% for men (prevalence of 16.7% vs. 23.9%) and 10.3% for women (prevalence of 14.7% vs. 25.0%). Women underestimated the prevalence of excess weight more than men did.

This figure highlights the difference between the self-reported and measured prevalence of obesity among men and women. The self-reported prevalence of obesity was lower among women than men (14.7% vs. 16.7%, $p = 0.003$), while the measured prevalence was comparable (25.0% among women vs. 23.9% among men, $p = 0.91$). Self-reporting bias results in a lower proportion of obesity among women compared to men, whereas the measured prevalence appears comparable. Other surveys based on measured anthropometric data are needed to confirm this trend.

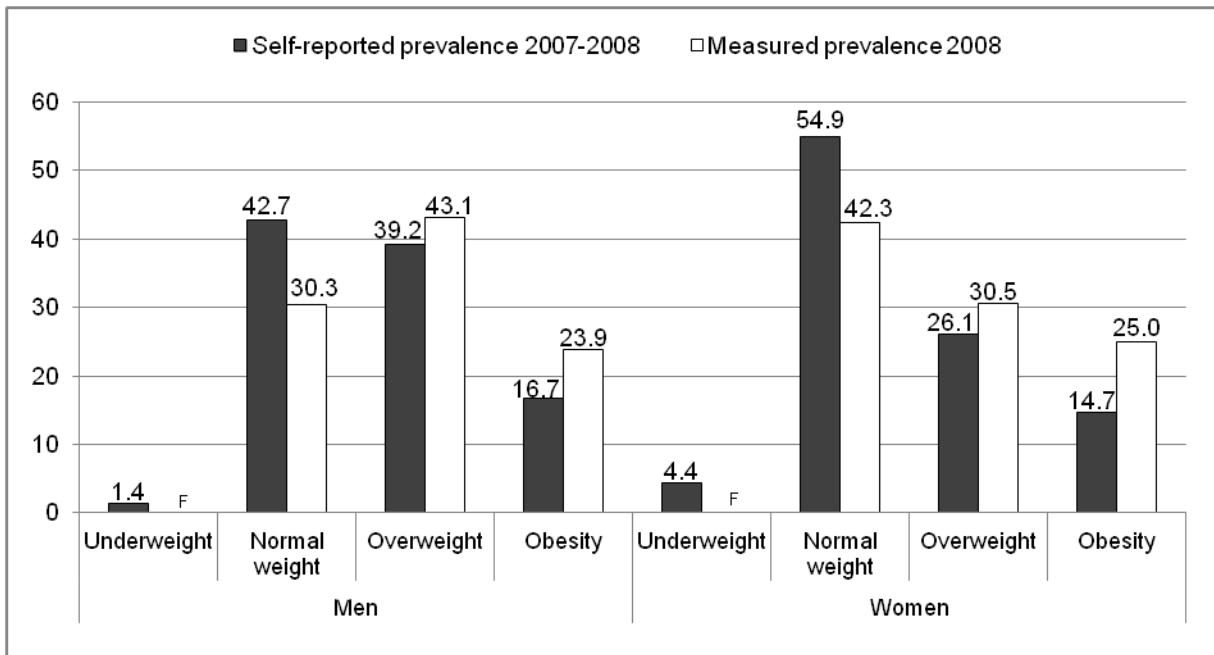


Figure 16 Prevalence of self-reported and measured categories of body weight by sex in population aged 18 and over, Québec, 2007–2008 and 2008

^F CV greater than 33.3% (estimate not released).

In conclusion, caution must be exercised when interpreting the results presented in this document because there is a bias in the self-reported data, and they do not always represent the actual burden of obesity in Québec for a given year. Extra caution must be exercised when interpreting trends in the self-reported prevalence of obesity in Québec, because the bias may have changed over time, as demonstrated by a Canadian study that reported a 4% increase in bias in adults between the late 1980s / early 1990s and 2005 (Gorber and Tremblay, 2010).

4.3 COLLECTION METHOD

This limitation is compounded by the method that surveys use to collect self-reported data (telephone interviews, face-to-face interviews and self-administered questionnaires). The CCHS uses telephone and face-to-face interviews to collect data, and their percentages vary from one cycle to another (Table 8). In Canada, it was shown that the data collection method influenced people's responses, especially for weight status or BMI (St-Pierre and Béland 2004; ISQ, 2011). According to St-Pierre and Béland (2004), data collected by telephone appear to underestimate the prevalence of obesity by 4.7% compared to data collected in face-to-face interviews. The Québec sample of the 2000–2001 CCHS included a lower percentage of telephone interviews than the four other cycles. The prevalence of obesity may therefore have been less underestimated in 2000–2001 than in the other surveys. We must keep this limitation in mind when examining trends over time.

In all three Santé Québec surveys, a self-administered questionnaire was used to collect the respondents' anthropometric data. However, because the collection methods were different, direct comparisons cannot be made between the results of these surveys and those of the

CCHS. Caution must therefore be exercised when interpreting the results for the entire period covered by this study (1987 to 2010).

Finally, it should be noted that cross-sectional data in this report does not establish a causal link between the various characteristics and weight status.

Table 8 **Collection method in the cycles of the CCHS**

	Face-to-face	Telephone
CCHS cycle 1.1 (2000–2001)	70%	30%
CCHS cycle 2.1 (2003)	27%	73%
CCHS cycle 3.1 (2005)	33%	67%
CCHS 2007–2008	45%	55%
CCHS 2009–2010	39%	61%

Data source: http://www.stat.gouv.qc.ca/publications/sante/doc_technique/comparabilite_2009_2010_Final.pdf.

CONCLUSION

Based on the recent data analyzed in this study, we find that the prevalence of overweight and obesity are particularly high in Québec. Weight has increased since 1987, although the increase seems to have slowed down since the last decade or so. Additional data has to be collected in the future to confirm or deny this trend among Québec adults. What is more troubling, based on the results, is the significant increase in more severe obesity (classes II and III) over time, because this type of obesity is associated with a very high risk of developing health problems.

The proportions of obesity and excess weight have increased in recent years regardless of the demographic, geographic or socioeconomic characteristics of adults in Québec. Significant increases among both economically and socially privileged and disadvantaged adults suggest that the environment in Québec is particularly conducive to weight gain.

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APPENDIX 1

MATERIAL AND SOCIAL DEPRIVATION INDEX

MATERIAL AND SOCIAL DEPRIVATION INDEX

	Q1 Social	Q2 Social	Q3 Social	Q4 Social	Q5 Social
Q1 Material	1	1	1	2	3
Q2 Material	1	2	2	3	4
Q3 Material	1	2	3	4	5
Q4 Material	2	3	4	4	5
Q5 Material	3	4	5	5	5

Note: Q1 represents a low level of deprivation and Q5 a high level of deprivation for each dimension of the index. Quintile 1 in grey represents a low level of material and social deprivation, and Quintile 5 in grey represents a high level of material and social deprivation.

APPENDIX 2

**PREVALENCE OF OVERWEIGHT, OBESITY AND EXCESS
WEIGHT BY SEX AND HOUSEHOLD INCOME DISTRIBUTION IN
POPULATION AGED 18 AND OVER, QUÉBEC, 2009–2010**

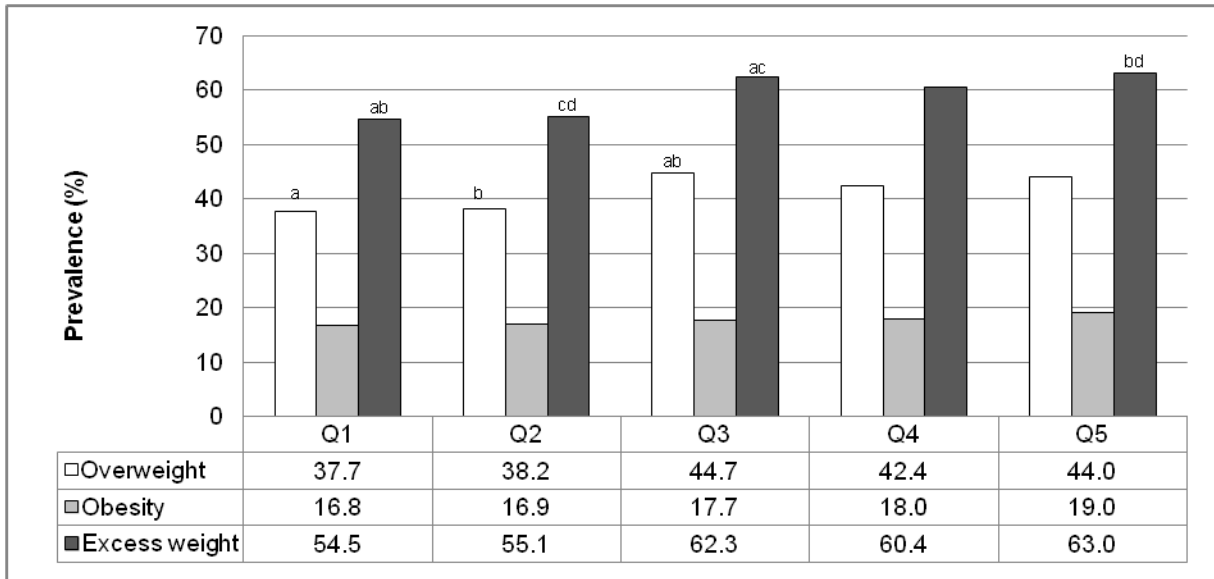


Figure 2A Prevalence of overweight, obesity and excess weight by household income distribution in male population aged 18 and over, Québec, 2009–2010

^{abcd} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

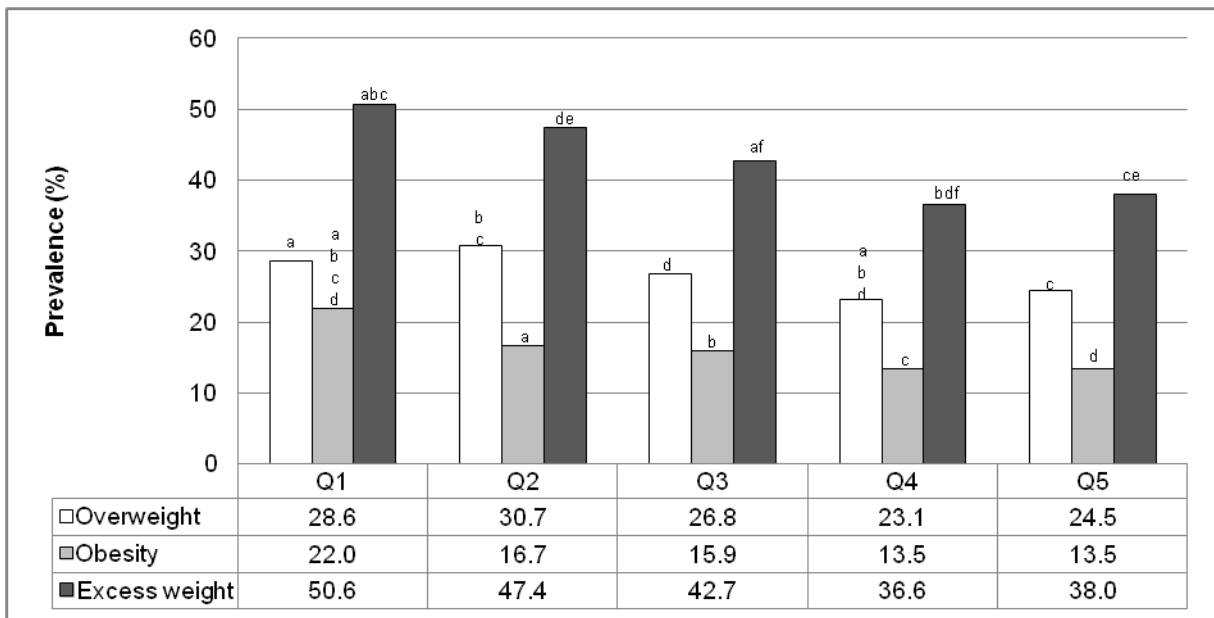


Figure 2B Prevalence of overweight, obesity and excess weight by household income distribution in female population aged 18 and over, Québec, 2009–2010

^{abdef} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

APPENDIX 3

PREVALENCE OF OVERWEIGHT, OBESITY AND EXCESS WEIGHT BY SEX AND LEVEL OF EDUCATION IN POPULATION AGED 18 AND OVER, QUÉBEC, 2009–2010

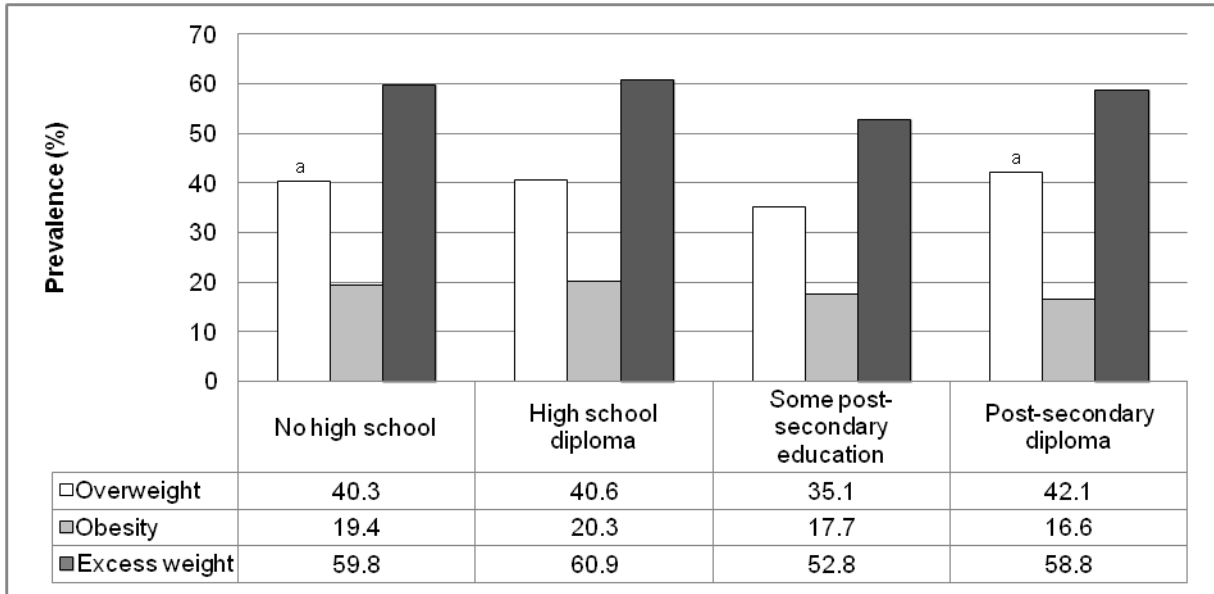


Figure 3A Prevalence of overweight, obesity and excess weight by level of education in male population aged 18 and over, Québec, 2009–2010

^a A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

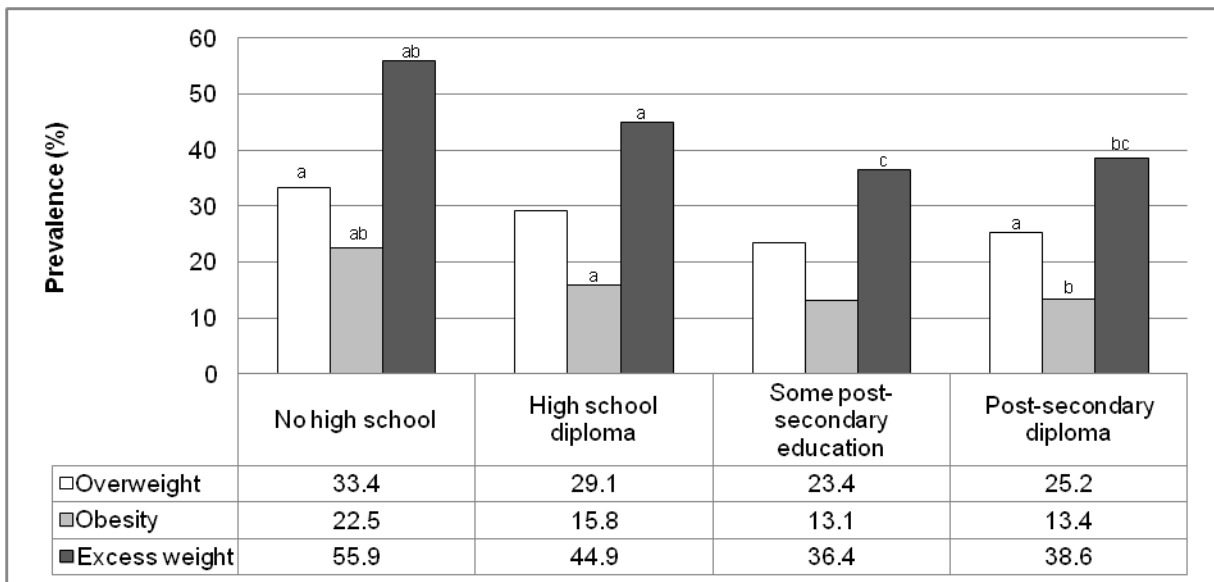


Figure 3B Prevalence of overweight, obesity and excess weight by level of education in female population aged 18 and over, Québec, 2009–2010

^{abc} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

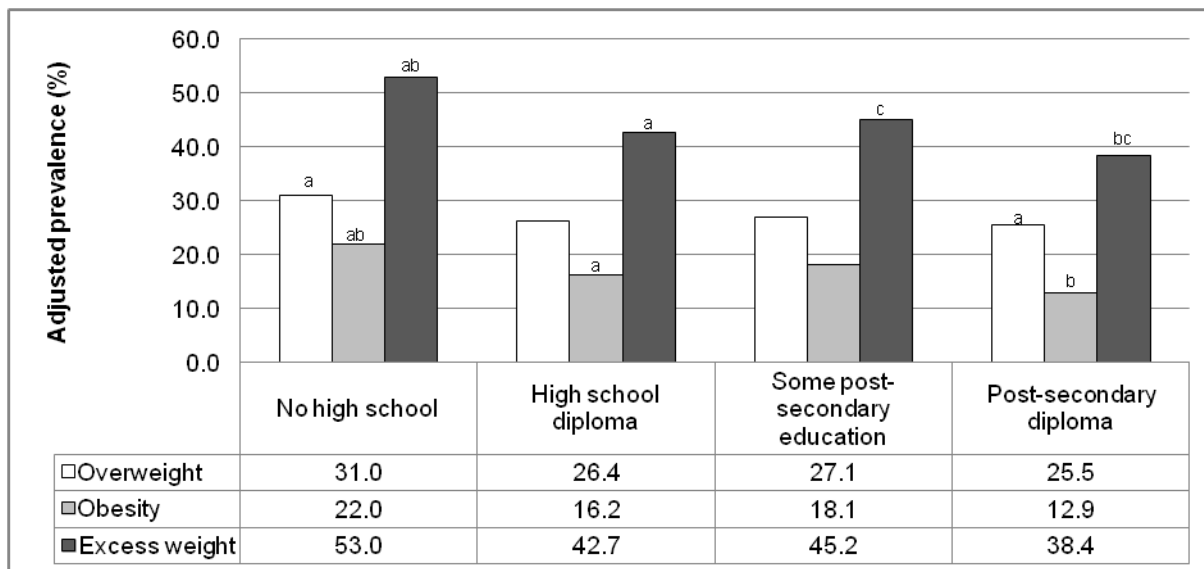


Figure 3C Adjusted prevalence of overweight, obesity and excess weight by level of education in female population aged 18 and over, Québec, 2009–2010

^{abc} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

APPENDIX 4

PREVALENCE OF OVERWEIGHT, OBESITY AND EXCESS WEIGHT BY SEX AND DEPRIVATION INDEX IN POPULATION AGED 18 AND OVER, QUÉBEC, 2009–2010

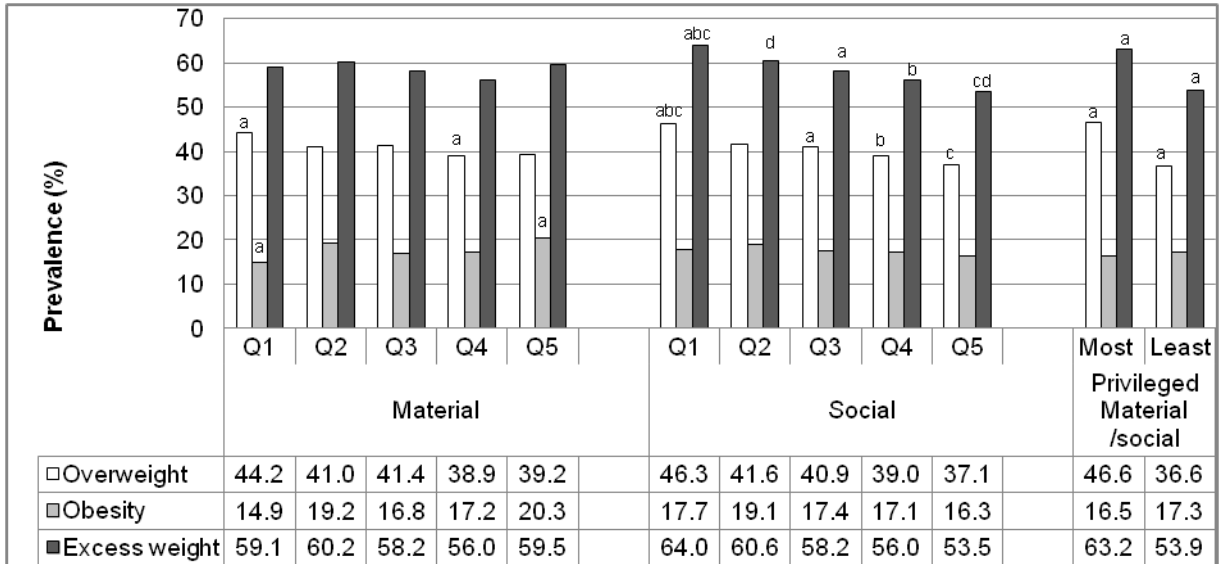


Figure 4A Prevalence of overweight, obesity and excess weight by quintiles of material and social deprivation¹ in male population aged 18 and over, Québec, 2009–2010

^{abcd} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

¹ The deprivation index is presented in quintiles. Q1 and Q5 are, respectively, quintiles of the most affluent and most disadvantaged population. Each quintile contains approximately 20% of the population of Québec.

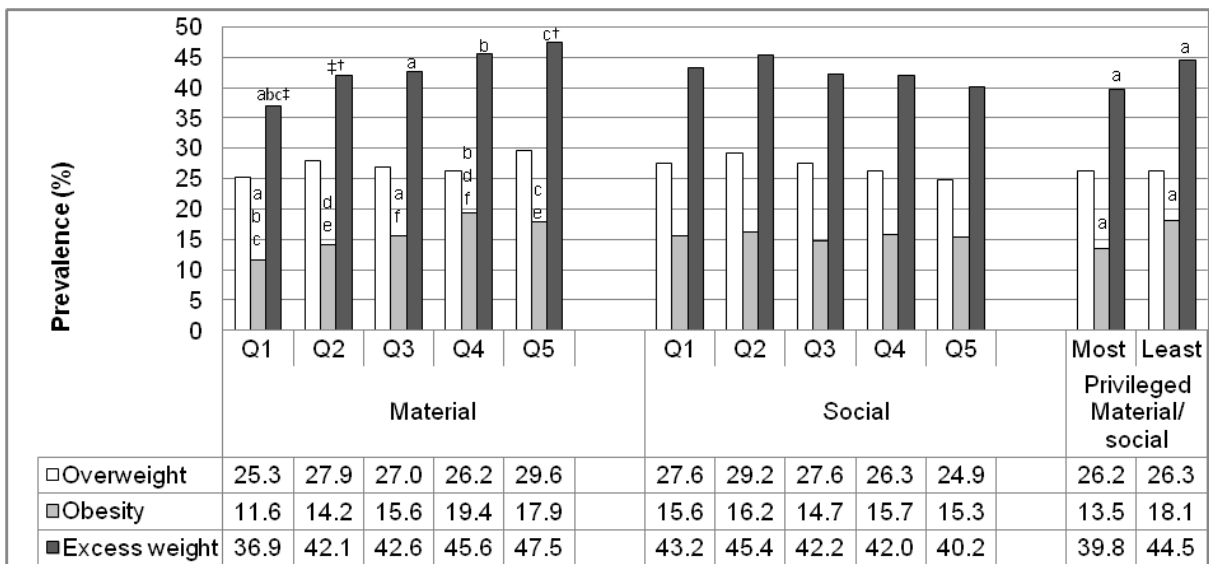


Figure 4B Prevalence of overweight, obesity and excess weight by quintiles of material and social deprivation¹ in female population aged 18 and over, Québec, 2009–2010

^{abcde} A lowercase letter indicates a significant difference between this percentage and the percentage with the same letter in this weight category.

^{††} Value differs significantly from the estimate with the same symbol in this weight category ($p = 0.05$).

¹ The deprivation index is presented in quintiles. Q1 and Q5 are, respectively, quintiles of the most affluent and most disadvantaged population. Each quintile contains approximately 20% of the population of Québec.

APPENDIX 5

TRENDS IN THE PREVALENCE OF OVERWEIGHT AND OBESITY BETWEEN 2000 AND 2010 AMONG ADULTS IN QUÉBEC RELATIVE TO VARIOUS DETERMINANTS

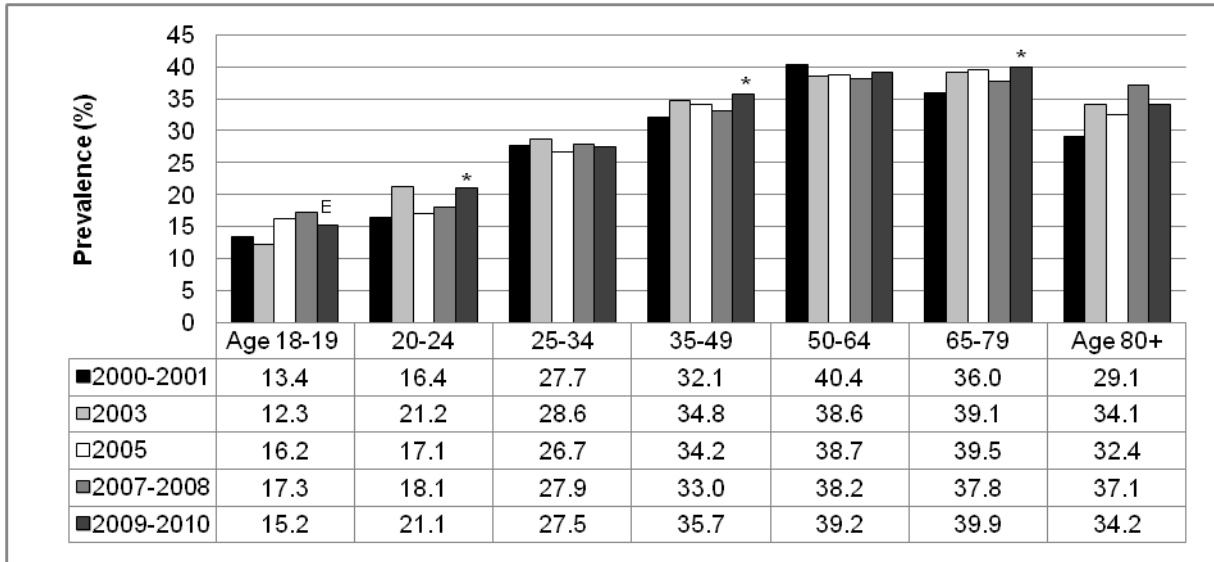


Figure 5A Trends in the prevalence of overweight by age group in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this age group.

^E CV 16.6% to 33.3% (interpret with caution).

Note: The partial non-response rate for people aged 80 and over was 16% in 2007–2008 and 15% in 2009–2010. During these survey years, interviews by proxy were not authorized and may have influenced the response rate. Estimates are presented for information purposes only, because they are not necessarily representative of this age group.

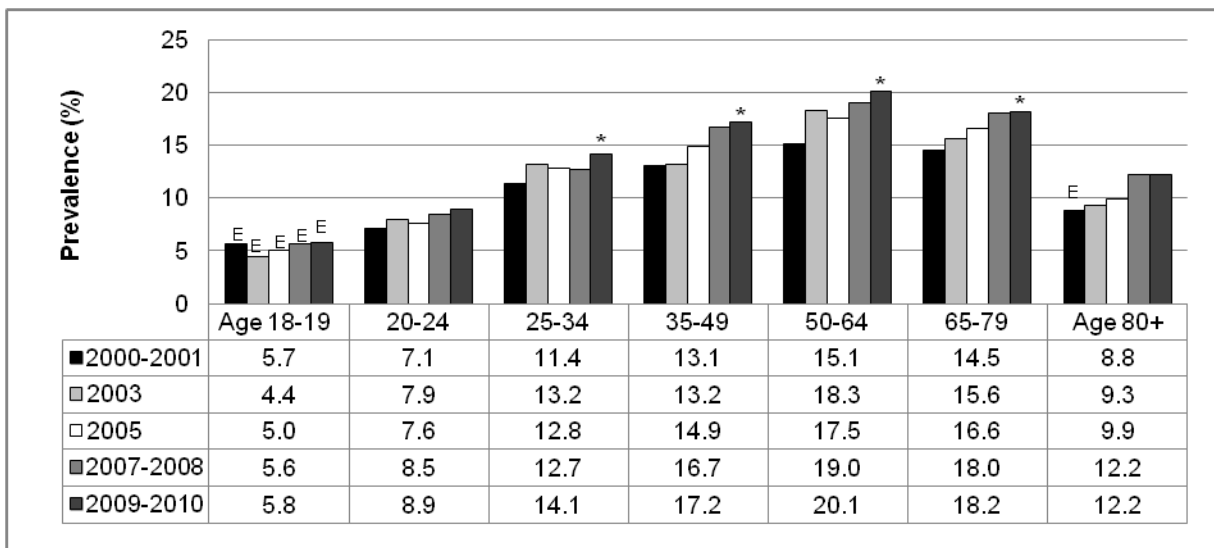


Figure 5B Trends in the prevalence of obesity by age group in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this age group ($p < 0.05$).

^E CV 16.6% to 33.3% (interpret with caution).

Note: The partial non-response rate for people aged 80 and over was 16% in 2007–2008 and 15% in 2009–2010. During these survey years, interviews by proxy were not authorized and may have influenced the response rate. Estimates are presented for information purposes only, because they are not necessarily representative of this age group.

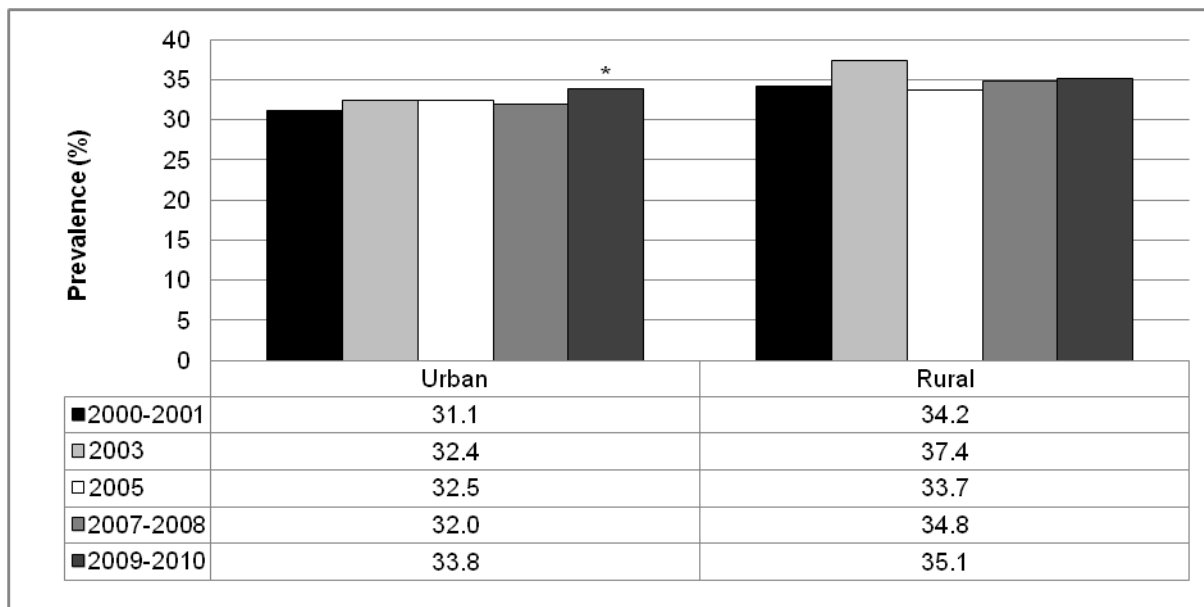


Figure 5C Trends in the prevalence of overweight by geographic area in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000-2001 in this area.

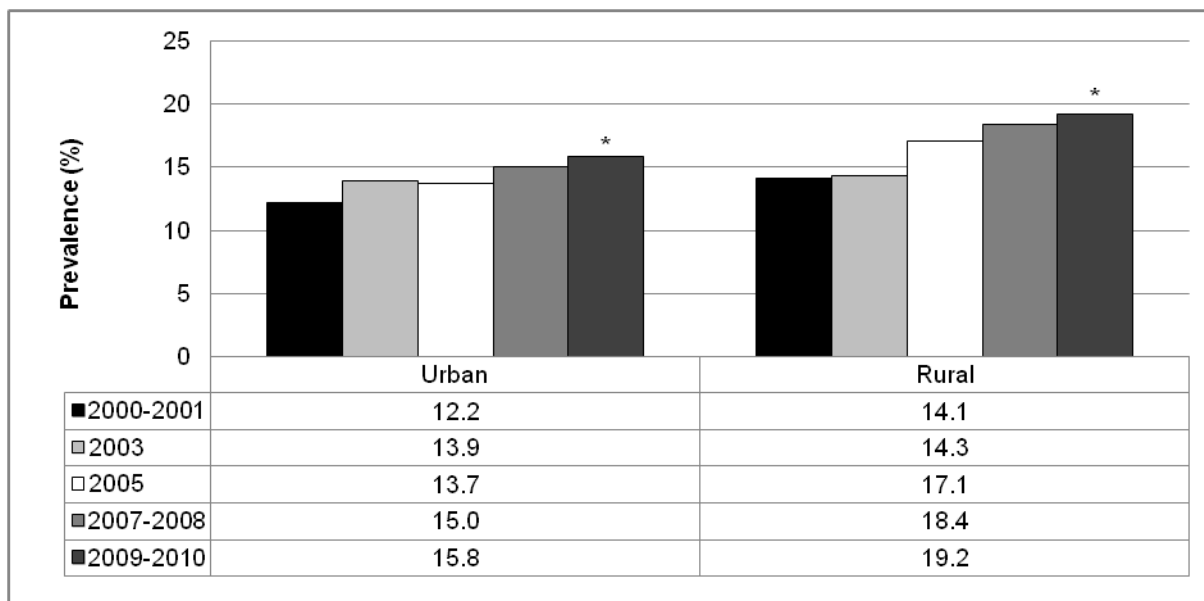


Figure 5D Trends in the prevalence of obesity by geographic area in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000-2001 in this area.

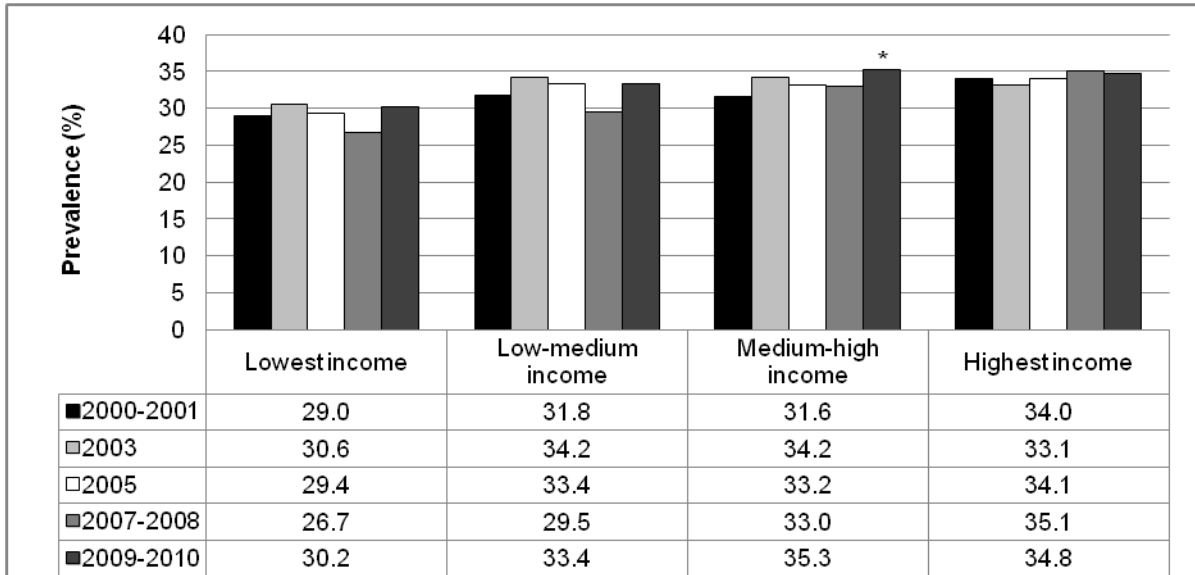


Figure 5E Trends in the prevalence of overweight by household income in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this income level.

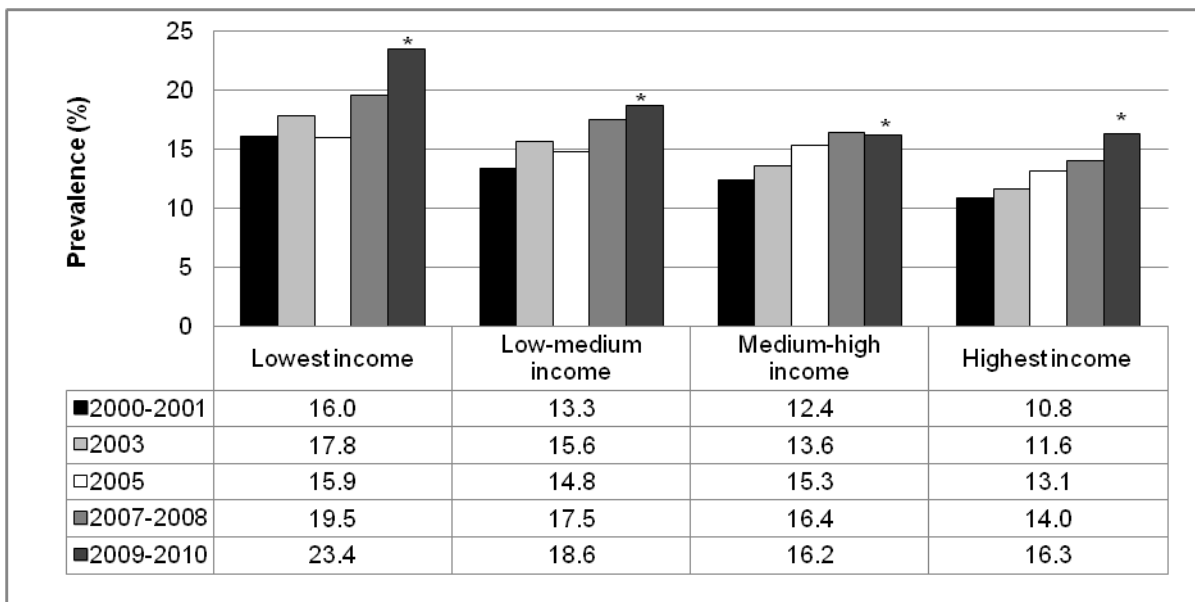


Figure 5F Trends in the prevalence of obesity by household income in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this income level.

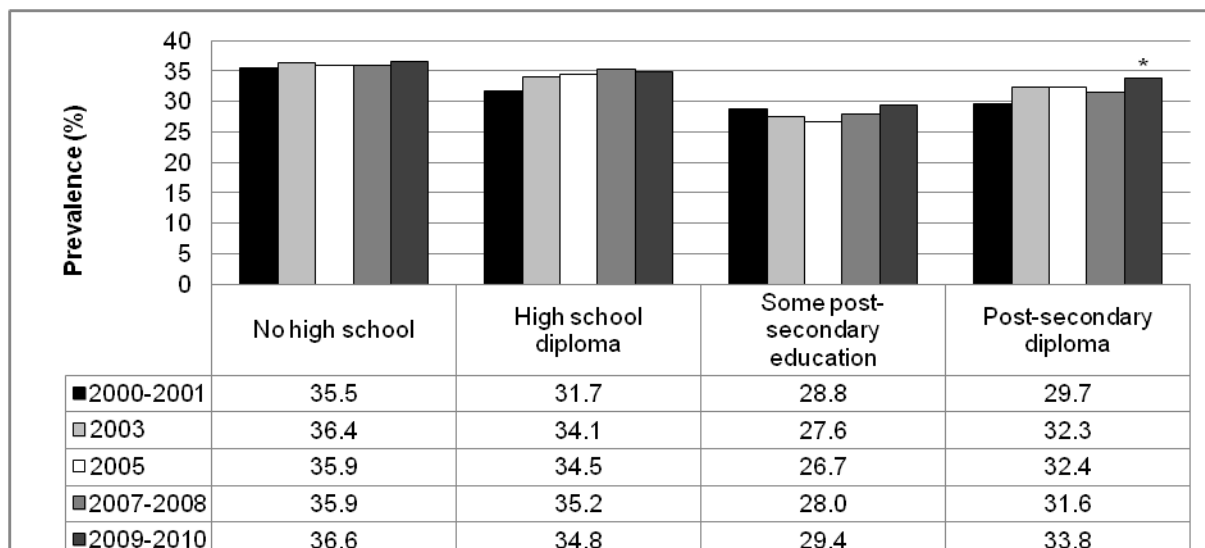


Figure 5G Trends in the prevalence of overweight by level of education in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this level of education.

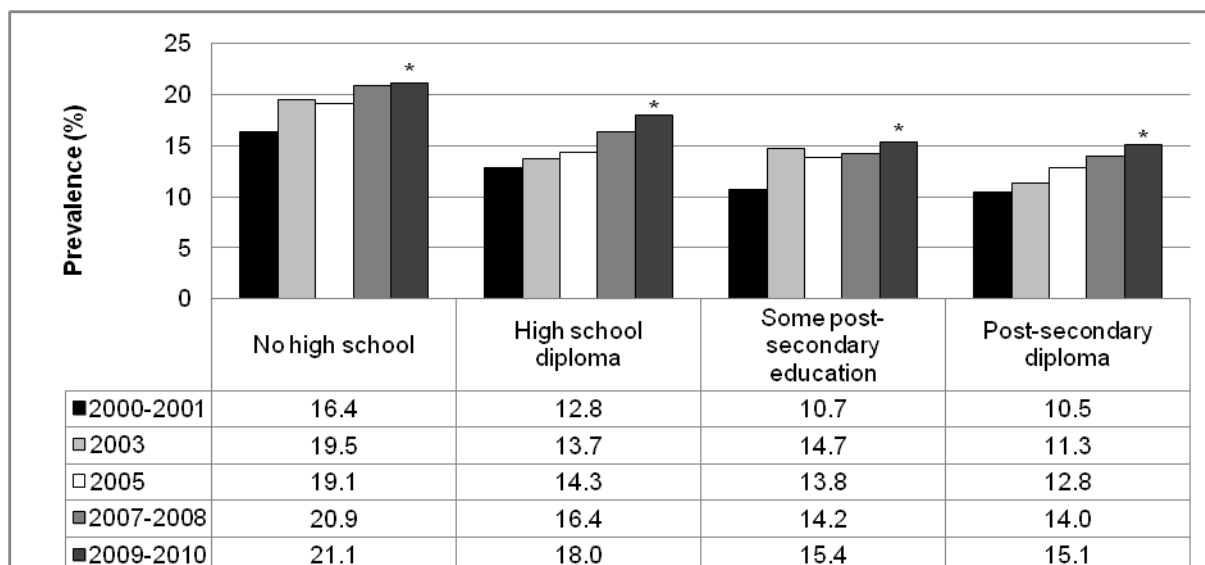


Figure 5H Trends in the prevalence of obesity by level of education in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this level of education.

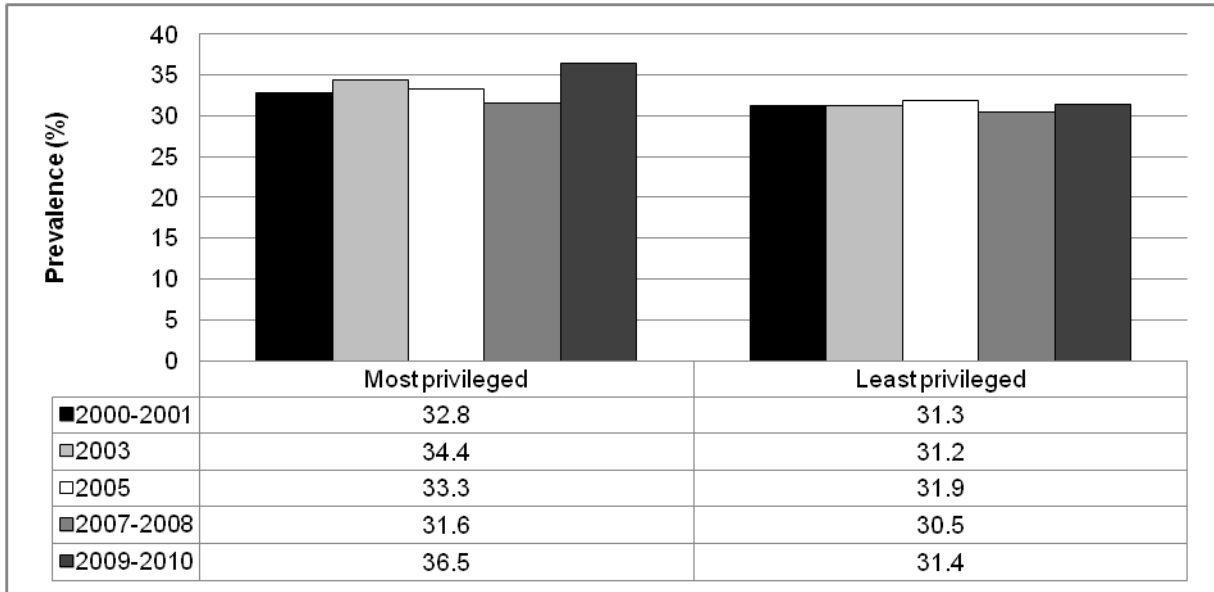


Figure 5I Trends in the prevalence of overweight by most privileged and most materially and socially disadvantaged environments in population aged 18 and over, Québec, 2000 to 2010

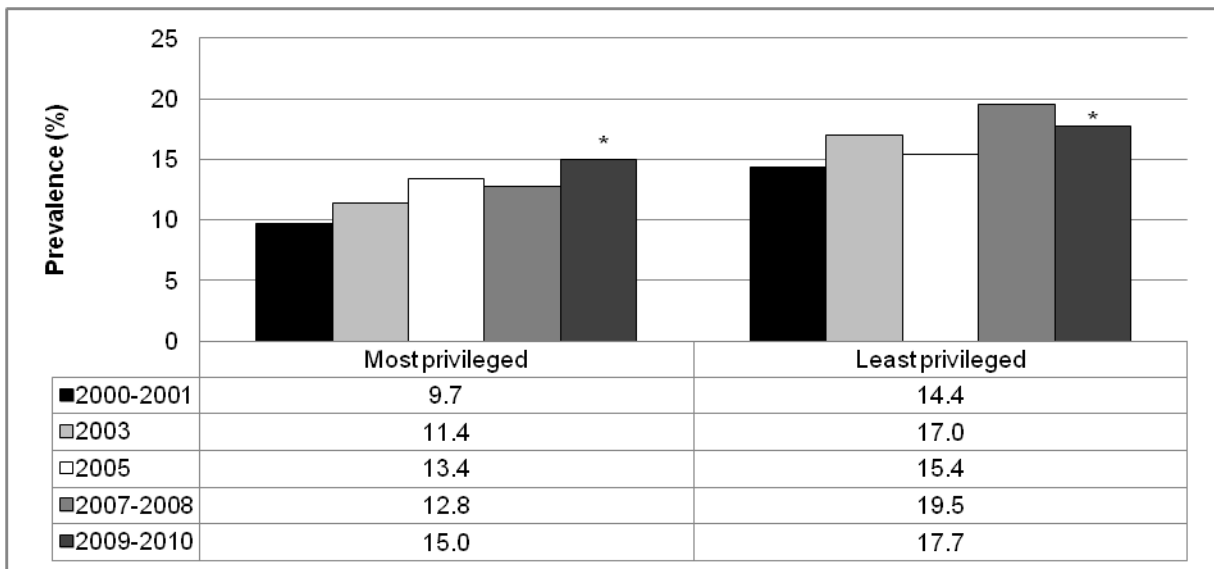


Figure 5J Trends in the prevalence of obesity by most privileged and most materially and socially disadvantaged environments in population aged 18 and over, Québec, 2000 to 2010

* Value differs significantly from the estimate for 2000–2001 in this deprivation category.



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