

## CORRELATES OF BODY MASS INDEX IN THE 1990 ONTARIO HEALTH SURVEY

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### Abstract • Résumé

**Objectives:** To determine the average body mass index (BMI) and the prevalence of overweight and obesity among people aged 20 to 64 years, to identify sociodemographic, lifestyle and health variables that correlate with overweight and obesity, and, through a comparison of the results with those from an earlier survey, to determine whether prevalence has changed over time.

**Design:** Cross-sectional survey.

**Setting:** Ontario.

**Participants:** The 1990 Ontario Health Survey surveyed 61 239 people representative of the Ontario population. The authors' analyses were restricted to those aged 20 to 64 years, excluding pregnant women. In the multivariate analyses they included only people with no missing values for any of the variables in the models (n = 26 306).

**Outcome measures:** BMI (weight in kilograms divided by height in metres squared) was used to measure healthy weight (BMI between 20 and 25), overweight (BMI greater than 25) and obesity (BMI greater than 27).

**Results:** The prevalence of obesity among men and women was 33.6% and 22.8% respectively (adjusted odds ratio [OR] 1.78, 95% confidence interval [CI] 1.63 to 1.95). There was a positive relation with age (adjusted OR 1.53 [95% CI 1.24 to 1.89] for age 25 to 29 years and 2.78 [95% CI 2.20 to 3.51] for age 50 to 54 years compared with age 20 to 24 years) and an inverse relation with education level (postsecondary education v. primary education: adjusted OR 0.65 [95% CI 0.54 to 0.79]). Analysis of birthplace showed that the prevalence of obesity was lowest among those born in Asia (compared with Canadian born: adjusted OR 0.36 [95% CI 0.27 to 0.47]). The prevalence was higher among former smokers than among those who had never smoked (adjusted OR 1.20 [95% CI 1.18 to 1.22]). People with more health problems and those who rated their health as fair or poor were more likely to be obese. The estimates of the prevalence of obesity were higher than those reported in the 1985 Health Promotion Survey for both sexes in all three age groups examined.

**Conclusions:** These self-reported data indicate that overweight and obesity remain important health problems in Ontario, and the prevalence appears to be increasing.

**Objectifs :** Déterminer l'indice de masse corporelle (IMC) moyen et la prévalence de l'excès de poids et de l'obésité chez les 20 à 64 ans, dégager les variables de la sociodémographie, du mode de vie et de la santé qui sont liées à l'excès de poids et à l'obésité et, en comparant les résultats à ceux d'une enquête antérieure, déterminer si la prévalence a changé avec le temps.

**Conception :** Enquête transversale.

**Contexte :** Ontario.

**Participants :** Dans le cadre de l'Enquête sur la santé en Ontario de 1990, on a sondé 61 239 personnes qui formaient un échantillon représentatif de la population de l'Ontario. Les auteurs ont limité leurs analyses

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aux 20 à 64 ans, à l'exclusion des femmes enceintes. Ils n'ont inclus dans les analyses multivariées que les personnes chez lesquelles il ne manquait aucune valeur à l'égard des variables des modèles (n = 26 306).

**Mesures des résultats :** On a utilisé l'IMC (poids en kilogrammes divisé par la taille en mètres au carré) pour mesurer le poids sain (IMC entre 20 et 25), l'excès de poids (IMC de plus de 25) et l'obésité (IMC de plus de 27).

**Résultats :** La prévalence de l'obésité chez les hommes et les femmes s'est établie à 33,6 % et 22,8 % respectivement (ratio des probabilités [RP] corrigé de 1,78, intervalle de confiance [IC] à 95 % de 1,63 à 1,95). On a constaté un lien positif avec l'âge (RP corrigé de 1,53 [IC à 95 % de 1,24 à 1,89] chez les 25 à 29 ans et de 2,78 [IC à 95 % de 2,20 à 3,51] chez les 50 à 54 ans comparativement aux 20 à 24 ans) et une relation inverse avec le niveau de scolarité (études postsecondaires c. études primaires : RP corrigé de 0,65 [IC à 95 % de 0,54 à 0,79]). L'analyse du lieu de naissance a démontré que la prévalence de l'obésité était la plus faible chez les sujets d'origine asiatique (comparativement à ceux d'origine canadienne : RP corrigé de 0,36 [IC à 95 % de 0,27 à 0,47]). La prévalence était plus élevée chez les anciens fumeurs que chez ceux qui n'avaient jamais fumé (RP corrigé de 1,20 [IC à 95 % de 1,18 à 1,22]). Les personnes qui avaient plus de problèmes de santé et celles qui jugeaient leur état de santé moyen ou médiocre étaient plus susceptibles d'être obèses. Les estimations de la prévalence de l'obésité étaient plus élevées que celles de l'Enquête promotion santé de 1985 pour les deux sexes dans les trois groupes d'âge analysés.

**Conclusions :** Ces données produites par les intéressés indiquent que l'excès de poids et l'obésité demeurent d'importants problèmes de santé en Ontario et la prévalence semble à la hausse.

Overweight, particularly obesity, is a major risk factor for several important diseases, especially hypertension, coronary artery disease and diabetes mellitus.<sup>1-3</sup> The association with endometrial and breast cancer, gallbladder disease, osteoarthritis and dyslipidemia is well known.<sup>3-6</sup> A relation to psychologic problems has also been implied.<sup>7</sup> Obesity may also be considered a disease in itself.<sup>8</sup> From both these points of view it is important to determine the prevalence of overweight as well as its relation to nutritional, behavioural and social factors. Since overweight may be partly preventable and in some cases may be treatable,<sup>9-12</sup> this information can help target individual as well as public health intervention programs. Given the relation of overweight and obesity to three of the main risk factors for coronary artery disease (hypertension, dyslipidemia and diabetes), reducing the prevalence of overweight in the population should be an important strategy for reducing the most common cause of death in Canada.

Using data from the 1990 Ontario Health Survey (OHS),<sup>13</sup> we carried out a study to determine the average body mass index (BMI) and the prevalence of overweight and obesity overall and in specific subgroups of a representative sample of Ontarians. In addition, we assessed the relation between BMI, overweight and obesity, and important socioeconomic, lifestyle and health variables. Finally, we compared our results with those of an earlier Canadian survey to determine whether the prevalence of obesity has changed over time.

## METHODS

### ONTARIO HEALTH SURVEY

The 1990 OHS was an extensive omnibus survey that

collected information on risk factors, health status and use of health services from 61 239 respondents representative of the Ontario population (excluding natives on reserves and people in institutions).<sup>13</sup> In the survey, multistage cluster sampling was used to select approximately the same number of households from each of the 42 public health units in Ontario. The survey had one interviewer-administered section (response rate 87.5%) and one self-administered section (response rate 77.2%).<sup>14</sup> Information on risk factors was collected primarily through the self-administered section. This section also included a detailed, validated food-frequency questionnaire<sup>15</sup> that enabled estimation of the respondents' overall intake of important nutrients.<sup>14,16</sup> Earlier health-related surveys (including the 1978 Canada Health Survey<sup>17</sup> and the 1985 Health Promotion Survey<sup>18</sup>) influenced the questions and format of the OHS questionnaires.<sup>14</sup>

### BODY MASS INDEX

BMI (weight in kilograms divided by height in metres squared) was used by itself and as a measure of healthy weight (BMI between 20 and 25), overweight (BMI greater than 25) and obesity (BMI greater than 27). BMI is not a very suitable measure for infants, children, pregnant women or adults 65 years of age or more. In adolescents the use of BMI frequently results in an overestimate of fatness, and the association between increasing BMI and increasing risk of health-related problems is weaker after the age of 64.<sup>19</sup> We therefore restricted the analyses to nonpregnant respondents aged 20 to 64 years.

Self-reported BMI is considered to be reasonably precise.<sup>20</sup> However, we excluded people with extreme values (BMI less than 7 or greater than 45) from our analyses, since self-reported weight in such subjects is often con-

sidered less reliable.<sup>21</sup> This also prevented the inclusion of subjects who may have recorded their weight and height in the wrong units (pounds and inches rather than kilograms and centimetres, or vice versa).<sup>16</sup>

#### SELECTED COVARIATES

From over 1000 variables in the OHS a subset of 13 key variables was selected based on the suggested associations with overweight in the literature<sup>4,22,23</sup> and the attempt to minimize the number of subjects with missing values for any of the variables considered. The following variables were included: sociodemographic (sex, age, marital status, region of Ontario where respondent resides and birthplace), socioeconomic (education and occupation), health behaviour (smoking status, alcohol consumption and fat intake [as percentage of dietary energy]) and health status (number of health problems, self-assessed health status and history of diabetes). Physical activity (the sum of a series of specified activities) was not included as a covariate because of the high proportion of respondents with missing information for this variable.

#### STATISTICAL ANALYSIS

The mean BMI and standard deviation were calculated for subgroups defined by levels of the selected covariates. Multiple linear regression analyses were performed to estimate the independent relation between each of the predictor variables and BMI.

The prevalence of overweight and obesity in each of the subgroups was calculated. Using multiple logistic regression analysis, we estimated odds ratios for the relation between overweight/obesity and the predictor variables.

Of the 34 727 nonpregnant respondents aged 20 to 64 years in the OHS, 8421 were excluded from the analyses: 5609 because of missing information for one or more of the selected covariates and 2812 because of missing information for BMI. The final sample for our analyses thus included 26 306 subjects (representing 4 322 400 Ontarians). All analyses were weighted; statistical weights were adjusted for the probability of being selected, for nonresponse and to reflect the age-sex distribution at the public health unit level.<sup>14</sup> The variance estimates were also inflated by an average design effect of 4.95, as suggested by the Ontario Ministry of Health<sup>16</sup> to account for the deviation from simple random sampling.<sup>24</sup>

To compare the results from the OHS with published results from the 1985 Health Promotion Survey<sup>18,19</sup> we calculated the prevalence of obesity among men and women aged 20 to 29 years, 40 to 49 years and 60 to 69 years. Respondents from the OHS aged 65 to 69 years were included in this comparative analysis only. Estima-

tion of obesity in the Health Promotion Survey was also based on self-reported weight and height.

We performed data management and statistical analyses using the SAS software package (version 6.07; SAS Institute Inc., Cary, NC).

#### RESULTS

The respondents who were excluded from the analyses because of missing data were slightly younger and were more likely to be female than the respondents who were included. There were no obvious collinearity problems: bivariate correlations between the predictor variables were in general under 0.30. (If some of the predictor variables in the model had been highly correlated with each other, this could have led to inaccurate estimates of such measures as regression coefficients, variability and *p* values.<sup>25</sup>)

Table 1 lists the mean BMIs for the variables studied. The mean BMI was higher among men than among women. It increased with increasing age until age 60, then decreased slightly. Marital status was not significantly associated with BMI when the other variables were accounted for.

There was a decrease in the mean BMI with increasing levels of education, and professionals had a slightly lower mean BMI than people in skilled or semiskilled/unskilled occupations. An inverse relation was also seen between BMI and education level in the multivariate analyses.

There were small variations in BMI according to region of residence, respondents in the east having the lowest mean BMI and those in the northeast the highest. When birthplace was examined in the multivariate analysis Ontarians born in Asia had the lowest mean BMI and those born in the Caribbean the highest, but only the difference between Canadian-born and Asian-born respondents reached statistical significance.

The mean BMI also varied across health behaviours. When other covariates were controlled for, current smokers had a lower mean BMI than nonsmokers, and former smokers had a higher mean BMI than nonsmokers. The differences among categories of alcohol and fat consumption were not statistically significant.

The respondents without any health problems had a lower mean BMI than those who reported at least one health problem. Analysis of self-assessed health status showed that the mean BMI was lowest among people who rated their health status as excellent or very good and highest among those who rated their health status as fair or poor; when the other covariates were controlled for, this association was not significant. The mean BMI was significantly higher among people with diabetes than among those without the disease.

The prevalence of overweight and obesity and the results from the multiple logistic regression analyses are presented in Table 1. The overall prevalence of overweight was 32.8% among women and 52.4% among men. The corresponding figures for obesity were 22.8% and 33.6%. These results closely paralleled the results

Table 1: Unadjusted prevalence of overweight and obesity among adults aged 20 to 64 years sampled in the 1990 Ontario Health Survey<sup>13</sup> to represent the Ontario population\*

Variable	Sample	Estimated population, no. (and %) <sup>‡</sup>	Mean BMI, unadjusted (and SD)	Overweight <sup>†</sup>		Obesity <sup>†</sup>	
				Prevalence, %	Adjusted OR (and 95% CI)	Prevalence, %	Adjusted OR (and 95% CI)
<b>Sex</b>							
Female	13 330	2 071 400 (47.9)	24.40 (4.60)	32.8		22.8	
Male	12 976	2 251 000 (52.1)	25.86 (3.82)	52.4	2.39 (2.21–2.59) <sup>§</sup>	33.6	1.78 (1.63–1.95) <sup>§</sup>
<b>Age, yr</b>							
20–24	2 579	488 900 (11.3)	23.47 (3.82)	25.5		15.3	
25–29	3 555	589 900 (13.6)	24.18 (4.31)	35.2	1.55 (1.30–1.84) <sup>§</sup>	20.8	1.53 (1.24–1.89) <sup>§</sup>
30–34	4 046	672 900 (15.6)	24.66 (4.30)	39.4	1.82 (1.53–2.16) <sup>§</sup>	24.2	1.78 (1.45–2.20) <sup>§</sup>
35–39	3 895	633 100 (14.6)	24.89 (4.26)	40.9	1.92 (1.60–2.29) <sup>§</sup>	25.2	1.94 (1.57–2.40) <sup>§</sup>
40–44	3 542	583 400 (13.5)	25.70 (4.40)	46.0	2.33 (1.94–2.80) <sup>§</sup>	32.3	2.37 (1.91–2.95) <sup>§</sup>
45–49	2 704	429 500 (9.9)	25.95 (4.26)	52.1	2.95 (2.43–3.60) <sup>§</sup>	35.4	2.67 (2.12–3.35) <sup>§</sup>
50–54	2 156	357 600 (8.3)	26.10 (4.09)	54.8	3.01 (2.45–3.69) <sup>§</sup>	37.6	2.78 (2.20–3.51) <sup>§</sup>
55–59	1 974	294 300 (6.8)	26.28 (4.03)	57.8	3.26 (2.62–4.04) <sup>§</sup>	37.6	2.71 (2.12–3.46) <sup>§</sup>
60–64	1 855	270 100 (6.2)	26.02 (4.02)	53.6	2.49 (1.99–3.11) <sup>§</sup>	34.8	1.88 (1.46–2.43) <sup>§</sup>
<b>Marital status</b>							
Married	20 545	3 201 900 (74.1)	25.33 (4.23)	46.0		29.9	
Single	3 908	818 100 (18.9)	24.11 (4.34)	32.0	0.82 (0.73–0.93) <sup>§</sup>	19.6	0.81 (0.71–0.94) <sup>§</sup>
Divorced/ separated/ widowed	1 853	302 500 (7.0)	24.00 (4.65)	41.8	0.87 (0.75–1.01)	25.5	0.77 (0.65–0.92) <sup>§</sup>
<b>Education</b>							
Primary	1 837	247 600 (5.7)	26.74 (4.48)	59.7		43.9	
Secondary	12 763	1 938 600 (44.8)	25.30 (4.33)	46.4	0.90 (0.75–1.07)	29.9	0.80 (0.67–0.96) <sup>§</sup>
Postsecondary	11 706	2 136 400 (49.4)	24.67 (4.10)	38.0	0.73 (0.61–0.89) <sup>§</sup>	23.6	0.65 (0.54–0.79) <sup>§</sup>
<b>Occupation</b>							
Professional	7 475	1 402 200 (32.4)	24.84 (4.09)	40.1		24.6	
Skilled	6 855	1 086 600 (25.1)	25.33 (4.10)	46.9	1.16 (1.04–1.29) <sup>§</sup>	29.8	1.14 (1.01–1.29) <sup>§</sup>
Unskilled/ semiskilled	11 976	1 833 800 (42.4)	25.18 (4.52)	43.0	1.15 (1.04–1.27) <sup>§</sup>	29.3	1.20 (1.07–1.34) <sup>§</sup>
<b>Region of residence</b>							
Southwest	6 265	554 400 (12.8)	25.36 (4.37)	46.6		29.7	
Central west	5 268	850 700 (19.7)	24.99 (4.20)	44.8	0.93 (0.81–1.06)	27.1	0.91 (0.78–1.06)
Central east	6 338	1 870 400 (43.3)	24.80 (4.21)	41.5	0.90 (0.79–1.02)	25.9	0.91 (0.80–1.05)
East	3 717	673 100 (15.6)	25.00 (4.36)	39.7	0.79 (0.68–0.91) <sup>§</sup>	27.0	0.85 (0.72–0.99) <sup>§</sup>
Northeast	3 451	260 400 (6.0)	25.39 (4.23)	48.8	1.05 (0.87–1.28)	30.3	1.09 (0.89–1.34)
Northwest	1 267	113 500 (2.6)	25.72 (4.58)	45.3	0.93 (0.72–1.21)	32.4	1.05 (0.79–1.39)

from the multiple linear regression analyses for all predictor variables: again, the most striking observations were the increasing prevalence with increasing age and

with deteriorating health status, and the decreasing prevalence with higher education level.

The prevalence of obesity was higher in the OHS

Table 1 continued

Variable	Sample	Estimated population, no. (and %) <sup>‡</sup>	Mean BMI, unadjusted (and SD)	Overweight <sup>†</sup>		Obesity <sup>†</sup>	
				Prevalence, %	Adjusted OR (and 95% CI)	Prevalence, %	Adjusted OR (and 95% CI)
<b>Birthplace</b>							
Canada	21 698	3 256 800 (75.3)	25.17 (4.34)	43.8		28.4	
United States	324	55 400 (1.3)	25.11 (4.42)	36.2	0.78 (0.55–1.11)	28.7	0.68 (0.45–1.04)
Europe	3 246	666 400 (15.4)	25.22 (3.94)	46.0	0.85 (0.76–0.95) <sup>§</sup>	29.1	0.87 (0.77–0.98) <sup>§</sup>
Asia	530	186 100 (4.3)	23.07 (4.05)	23.4	0.33 (0.26–0.41) <sup>§</sup>	14.9	0.36 (0.27–0.47) <sup>§</sup>
Caribbean	200	63 300 (1.5)	24.77 (4.20)	43.9	1.09 (0.79–1.51)	24.5	1.16 (0.81–1.67)
Africa	101	33 400 (0.8)	23.85 (3.61)	39.2	0.71 (0.45–1.10)	15.8	0.58 (0.34–1.00)
South/Central America	179	56 300 (1.3)	24.44 (4.51)	35.6	0.69 (0.49–0.99) <sup>§</sup>	26.8	1.17 (0.81–1.69)
Oceania	28	5 000 (0.1)	24.00 (3.84)	22.6	0.31 (0.09–1.13)	17.9	0.44 (0.09–2.08)
<b>Smoking status</b>							
Never	10 871	1 870 500 (43.3)	25.02 (4.35)	40.6		24.3	
Current	9 434	1 522 300 (35.2)	24.73 (4.22)	41.0	0.80 (0.72–0.88) <sup>§</sup>	25.4	0.81 (0.74–0.90) <sup>§</sup>
Past	6 001	929 800 (21.5)	25.92 (4.22)	51.3	1.10 (1.09–1.12) <sup>§</sup>	34.7	1.20 (1.18–1.22) <sup>§</sup>
<b>Alcohol consumption</b>							
Never	1 975	358 000 (8.3)	25.10 (4.56)	39.7		29.5	
Current	22 553	3 717 900 (86.0)	25.06 (4.30)	42.8	0.95 (0.82–1.10)	27.6	0.89 (0.76–1.05)
Past	1 778	246 600 (5.7)	25.71 (4.90)	49.4	1.06 (0.86–1.32)	34.6	1.02 (0.81–1.29)
<b>% of dietary energy from fat</b>							
≤ 30	2 362	497 300 (11.5)	24.76 (4.33)	37.0		25.3	
> 30	23 944	3 825 200 (88.5)	25.16 (4.29)	43.8	1.12 (0.98–1.27)	28.4	1.12 (0.97–1.29)
<b>No. of health problems</b>							
0	8 082	1 353 700 (31.3)	24.71 (3.97)	39.8		24.0	
1	8 154	1 329 600 (30.8)	25.00 (4.19)	42.4	1.03 (0.93–1.13)	26.9	1.04 (0.93–1.16)
≥ 2	10 070	1 639 300 (37.9)	25.55 (4.59)	46.3	1.10 (0.99–1.21)	32.3	1.17 (1.05–1.31) <sup>§</sup>
<b>Self-assessed health status</b>							
Excellent/very good	16 717	2 766 400 (64.0)	24.45 (3.85)	38.4		23.1	
Good	7 422	1 212 000 (28.0)	25.82 (4.65)	49.4	1.58 (1.44–1.72) <sup>§</sup>	35.0	1.76 (1.60–1.94) <sup>§</sup>
Fair/poor	2 167	344 200 (8.0)	26.66 (5.15)	57.9	1.90 (1.63–2.22) <sup>§</sup>	43.3	2.01 (1.72–2.36) <sup>§</sup>
<b>History of diabetes mellitus</b>							
No	25 886	4 263 300 (98.6)	25.08 (4.26)	42.7		27.7	
Yes	420	59 300 (1.4)	27.89 (5.28)	65.7	1.52 (1.07–2.15) <sup>§</sup>	53.6	1.81 (1.30–2.53) <sup>§</sup>

\*The prevalence in each group as well as the regression model included weighted data; the confidence intervals for the odds ratios were adjusted with the use of a common variance inflation factor of 4.95. Odds ratios are adjusted for all the other variables in the multivariate logistic regression analysis. The population estimates are based on Ontario Health Survey sample weights. OR = odds ratio, CI = confidence interval.

<sup>†</sup>Overweight: body mass index (BMI) greater than 25; obesity: BMI greater than 27.

<sup>‡</sup>The totals for the categories may differ because of rounding.

<sup>§</sup>p < 0.05.

than in the Health Promotion Survey for both sexes in all three age groups examined (Table 2).

## DISCUSSION

Our study shows that overweight and obesity are prevalent in the Ontario population. If one assumes that all body weight above a BMI of 25 is superfluous, Ontarians between 20 and 64 years of age carry around approximately 20 000 metric tonnes of excess fat!

The most striking findings are the apparent gradual weight gain from age 20 to age 60 and the higher levels of reported overweight among men than among women. Although the OHS represents a "synthetic cohort" based on cross-sectional data, these findings are consistent with those from other studies.<sup>26,27</sup> Because women are more likely than men to underreport their weight,<sup>21</sup> the difference between the sexes may be less than reported. On the other hand, obesity in men tends to be of the less benign, abdominal type.<sup>28</sup>

The higher levels of overweight among people with lower education levels are also consistent with findings in previous studies.<sup>29</sup> This may imply that higher education may lead to a more healthy diet and a more active lifestyle, although another causal mechanism may be that obesity hinders career success.<sup>30</sup> Although we found little variation across occupational groups, this may reflect the greater heterogeneity in factors contributing to obesity within categories that are as diverse as "professionals" or "unskilled workers."

The low rate of obesity among Asian-born Ontarians is consistent with the lower levels found in many Asian countries.<sup>31,32</sup>

Weight gain after smoking cessation has been well documented, and our findings are consistent with those of other investigators.<sup>33</sup> Smoking has been postulated to be a weight-controlling strategy, especially among young women.<sup>34</sup> Since the negative health effects of smoking are much larger than the weight gain associated with quitting, this strategy obviously cannot be recommended. The relation between high fat intake and high

BMI makes biologic sense,<sup>35</sup> and it is surprising that the difference in BMI between the respondents who obtained more than 30% of their dietary energy from fat and those who obtained 30% or less from fat was not statistically significant when the effects of other variables were controlled for. The cutpoint of 30% or less of dietary energy from fat was decided primarily on the basis of risk for cardiovascular diseases, and this point may be too low to be a risk factor for obesity, particularly when mediating variables such as physical activity and total energy intake are not taken into consideration.

The increase in average BMI with increasing number of health problems and poorer self-assessed health status (especially for respondents who rated their health as fair or poor) and the higher BMI among subjects with diabetes are striking. However, little inference about causation can be made from cross-sectional studies in general. The causal pathways, especially of the relations identified to the three health status variables, are likely to be complex: excess weight may lead to disease; numerous diseases can lead to weight gain; underlying processes may cause weight gain as well as disease; and, finally, these mechanisms likely act simultaneously. Our results, therefore, can be used to identify the strengths of the relation between BMI and the other variables but not the causal directions.

The OHS was based on self-report. Certain data may therefore not be accurate. Self-reported BMI has been considered to be reasonably accurate.<sup>21</sup> Nevertheless, since obese subjects have been found to be more likely to underreport their weight than subjects with normal weight,<sup>36</sup> the average BMI and the prevalence of obesity may be even higher. Comparisons of the prevalence of overweight and obesity across surveys are not straightforward because of such factors as different inclusion criteria, different definitions of obesity, different geographic boundaries and self-reported versus actual weight. We calculated the prevalence of obesity (BMI greater than 27) in six subgroups of respondents to make the rates comparable with results reported from the 1985 Health Promotion Survey.<sup>18</sup> Such comparisons must be made with caution, but it is alarming that the OHS showed higher prevalence rates in all six subgroups. This increase in prevalence is consistent with findings from the 1990 Health Promotion Survey,<sup>37</sup> in which a method similar to that employed in the 1985 Health Promotion Survey was used.

Given the fitness-oriented 1980s, we expected the reverse trend or at least no increase. Although the prevalence of smoking decreased in most age groups during this period, this factor is not sufficient to explain the increased rates of obesity.<sup>18</sup> The increase clearly contrasts with the health objectives of the Ontario Premier's Council on Health Strategy, which set as one of its tar-

Table 2: Prevalence of obesity in the 1985 Canadian Health Promotion Survey<sup>17</sup> (HPS) (total sample 11 181) and the Ontario Health Survey (OHS) (total sample 61 239)\*

Age, yr	Prevalence, %			
	Men		Women	
	HPS	OHS	HPS	OHS
20-29	11	21	8	12
40-49	30	37	17	26
60-69	23	34	23	29

\*Both surveys were based on self-reported weight and height.

gets a reduction of 33% in the number of overweight Ontarians.<sup>38</sup>

In conclusion, overweight and obesity remain important health problems in Ontario, and the prevalence appears to be increasing.

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