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About the cover:

Moneca Sinclair is an Aboriginal Services Project Coordinator at CancerCare Manitoba, and her son, Osani, is a student in grade 5. They are Innu (Cree) originally from Northern Manitoba. Moneca does not allow smoking in her home or vehicle, and Osani understands the bans and the consequences of smoking. They are not just models for the cover photo, but role models for tobacco prevention.

Ash Raichura is a Winnipeg-based freelance photographer who loves to capture the special moments of everyday life.

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Effects of socialization in the household on youth susceptibility to smoking: a secondary analysis of the 2004/05 Canadian Youth Smoking Survey

A. S. H. Schultz, PhD (1); J. Nowatzki, MSc (2); D. A. Dunn, MSN (3); E. J. Griffith, PhD (2, 4)

Abstract

Objective: To determine associations between younger youths' susceptibility to smoking and four household variables related to tobacco socialization: parental and sibling smoking, restrictions on smoking in the home and exposure to smoking in vehicles.

Methods: A secondary analysis of the 2004/05 Canadian Youth Smoking Survey used logistic regression to investigate the relationships between youth susceptibility to smoking, gender, and four household variables related to tobacco socialization. Susceptibility to smoking was operationalized by three levels of smoking experience and intention: non-susceptible non-smoker, susceptible non-smoker and experimenter/smoker. The national survey included 29 243 grade 5 to 9 students from randomly sampled public and private schools in ten provinces.

Results: For non-smokers, the odds of being susceptible to smoking increased with having a sibling who smokes, a lack of a total household smoking ban and riding in a vehicle with a smoker in the previous week, when adjusting for all other variables in the model. These variables also increased the odds of being an experimenter/smoker versus a susceptible non-smoker. Parent smoking status was not significant in these models.

Conclusion: Denormalization messages, through enforced home and vehicle smoking bans, appear to support youth in maintaining a resolve to not smoke, regardless of parental smoking status.

Key words: youth; smoking susceptibility, socialization; home and vehicle smoking bans; sibling smoking, Canadian Youth Smoking Survey 2004/5.

Introduction

Preventing youth from smoking continues to be a public health priority.¹⁻⁶ Research has typically focused on factors associated with the self-reported smoking behaviour of adolescents 14 years and older. Since most adult smokers report having smoked their first cigarette by the time they were 14 years old,³ thoughts about experimenting with smoking are likely to develop before then. A longitudinal study by Pierce et al. suggests that youths' perceived susceptibility to try smoking—defined as the degree of resolve to remain a non-smoker versus the likelihood of smoking a puff or a whole cigarette in the future—was strongly associated with future smoking behaviours.⁶ Therefore, it is important to focus on a younger age group to examine factors associated with both future intentions regarding smoking and smoking behaviours that have already occurred.

The 2004/05 Youth Smoking Survey (YSS) utilized data collected from 29 243 Canadian youth in grades 5 to 9 (age 11 to 15 years).⁷ There were few established smokers (1.9%) and experimenters (13%) in these grades; of the 85% of youth who were non-smokers, 64% were categorized as being non-susceptible and 36% were categorized as susceptible to experimenting with smoking in the future. Investigation of the differences between non-susceptible non-smokers, susceptible non-smokers, and experimenters/smokers

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gives us opportunities to explore factors associated with smoking intentions and behaviours.

This study is designed to explore the associations between younger youths' susceptibility to smoking and household variables related to tobacco socialization. We chose to focus on the household environment because caregivers' anti-smoking messages, rules and behaviour are particularly critical during this developmental phase when youths' resolve to remain a non-smoker is being shaped.^{3,6}

Living with a parent or sibling who smokes is associated with adolescents (aged 12 to 17 years) establishing smoking behaviour.^{4,5,8-11} Pierce et al. proposed that parental smoking may be one of the factors that shape children's cognitive maps regarding the acceptability of smoking.⁶ As such, it is plausible that family members' smoking shapes youths' attitudes towards smoking before smoking initiation.

Caregiver-defined rules that restrict smoking in the home are on the rise,^{12,13} possibly as a result of evidence of negative health effects from exposure to environmental tobacco smoke (ETS). Not only do anti-smoking actions, such as smoking bans in the home, protect youth from ETS, they are inversely related to smoking rates of older youth, even in homes with a parent who smokes.^{6,14,15} Household rules seem to influence youths' decisions related to experimenting with smoking,^{8,16} and youth in homes with total bans were significantly less susceptible to ever trying smoking.¹⁶ Thus, home smoking bans are an important factor to consider when examining youth susceptibility to smoking.

In addition to exposing youth to ETS, exposure to smoking in vehicles, much like exposure to smoking in homes, may be sending messages that smoking is acceptable. Thus, parent-enforced vehicle smoking bans are an additional anti-smoking strategy that could influence youths' decisions regarding tobacco use. This strategy may be particularly useful with children under

the age of 15 because they are most likely to be passengers in vehicles driven by their parents or by drivers known to their parents. We found no studies that explored the relationship between youths' susceptibility to smoking and parental rules related to smoking in vehicles or youth exposure to smoke in vehicles.

Given the importance of the household environment, the current study focuses on associations between youth susceptibility to smoking and the following variables: parental* smoking, sibling smoking, restrictions on smoking in the home and exposure to smoking in vehicles.

Methods

This secondary analysis of the 2004/05 YSS, a Health Canada-sponsored national survey of grade 5 to 9 youth, was conducted using logistic regression analysis to determine the association between variables in the household environment and youths' susceptibility to smoking. Data used to calculate variables were obtained from the Public Use Microdata files for the 2004/05 YSS.⁷

Sampling procedure

The YSS study design was based on sampling in two stages and included public and private schools from ten provinces.¹⁷ The first stage involved sampling school boards within each province, using stratification based on corresponding adult smoking rates. At stage two, schools were sampled from the selected school boards. A random sample of private schools was also selected from each province. If a board or school declined to participate in the study, a replacement was chosen from a predetermined substitute list. All students in the selected schools were eligible to participate as long as parental consent was given.

Measures

The independent variables in our analysis were gender, grade and four household variables related to tobacco socialization: parent smoking status, sibling smoking status, home smoking restrictions and

exposure to smoking inside a vehicle. For parent (mother, father, guardian, or other caregiver) smoking status, respondents were classified as being from a family where no parent smokes, one parent smokes, or both parents smoke. For sibling smoking status, respondents were classified as having no siblings who smoke or having at least one sibling who smokes. Home smoking restrictions were defined by responses to the question "What are the rules about smoking in your home?" with possible responses being a total ban ("no one is allowed to smoke in my home"), some restrictions ("only special guests are allowed to smoke in my home" or "people are allowed to smoke only in certain areas in my home") and no restrictions ("people are allowed to smoke anywhere in my home"). Exposure to people smoking inside a vehicle was determined from responses to "During the past 7 days, on how many days did you ride in a car with someone who was smoking cigarettes?" with possible responses falling into two categories: none ("0 days") and 1 or more days ("1 or 2 days," "3 or 4 days," "5 or 6 days," or "All 7 days").

The dependent variable used in this study was youth susceptibility to smoking operationalized through three levels of youth smoking uptake. Measurement of the dependent variable was constructed from responses to two YSS-derived variables on smoking intentions and behaviours. This measure was based on work on youth smoking uptake by Wakefield et al. that used responses about past and current smoking behaviour and intentions regarding future smoking behaviour.¹⁶ In the current study, non-susceptible non-smokers had never tried a cigarette and intended not to smoke in the future; susceptible non-smokers had never tried a cigarette and had weak intentions regarding future non-smoking, or they had tried a few puffs of a cigarette and had strong intentions not to smoke in the future; and experimenters and smokers include those youth who had tried a few puffs of a cigarette and had weak intentions regarding future non-smoking or those who, regardless of intentions regarding future smoking, had smoked a whole cigarette or more.

* "Parent" signifies a parental figure or caregiver who is the father/mother or guardian or other caregiver.

Statistical analysis

Logistic regression analysis was conducted using Stata/SE version 9.2 for Windows. Like Wakefield et al.,¹⁶ we performed a threshold of change analysis that allowed independent variables to have varying effects at different threshold levels.¹⁸ As such, a multivariate logistic regression was performed at each threshold between the different sequential levels or degrees of smoking susceptibility. (This does *not* mean that youth will progress through the levels in a direct sequence.) The first regression compares non-susceptible non-smokers to susceptible non-smokers, and the second, susceptible non-smokers to experimenters and smokers.

The weighting of the individual participants compensated for the complex sampling strategy used in the YSS study design. The weights took into consideration the board selection scheme, school selection and student non-response. Individual weights were also calibrated to the province, gender and grade distribution. A set of bootstrap weights were generated to attach to the data.¹⁷

Results

A total of 29 243 grade 5 to 9 students participated in the 2004/05 YSS. The overall response rates for this national survey were as follows: 78% of selected school boards participated, 55% of selected schools participated and 58% of eligible youth in those schools completed a survey. The sample included slightly fewer students in grade 9 than in other grades; there were approximately the same proportion of male and female students responding; and the majority of respondents reported that no parent(s) smoked, no sibling(s) smoked, there was a total ban on smoking in their home, and they had not been exposed to smoking in vehicles in the previous seven days. With regard to smoking susceptibility, 85% reported being non-smokers, with almost two-thirds non-susceptible non-smokers and one-third, susceptible non-smokers. Table 1 shows the characteristics of the respondents.

Logistic regression

In preliminary analyses, Spearman's correlations were calculated for each pair of independent variables. There were statistically significant positive correlations between all of the four household variables related to tobacco socialization. Because of the high correlations, tests were conducted to check for collinearity amongst the independent variables. The variance inflation factors for all independent variables considered for the model were acceptable. However, including grades in the analyses reduced the overall stability of the model below acceptable levels, so grade level was not included in the final model. Table 2 shows the Spearman's correlations between the independent variables included in the final model.

Results suggest that the variables that increase the odds of being a susceptible non-smoker versus a non-susceptible non-smoker, when adjusting for the other variables in the model, include having at least one sibling who smokes, having only some restrictions or no restrictions on smoking in the home, and having been recently exposed to smoking in vehicles. Gender and parental smoking are not significantly associated with susceptibility to take up smoking for non-smoking youth when adjusting for all other variables in the model. The same variables increase the odds of being an experimenter or smoker versus a susceptible non-smoker, when adjusting for the other variables in the model. Once again, gender and parental smoking are not significant at this threshold when adjusting for all other variables in the model. Table 3 shows the logistic regression results for each of the youth smoking susceptibility thresholds.

Discussion

This analysis of the Canadian 2004/2005 YSS has provided some unique evidence concerning youths' susceptibility to smoking and the smoking socialization that occurs in the household environment: evidence of sibling smoking, some or no household smoking restrictions, and riding in a vehicle with a smoker were each associated with increased odds of being at a higher level or degree of smoking

susceptibility when adjusting for the other variables in the model.

There are at least two plausible socialization mechanisms that could provide an explanation for these results.^{6,10} First, exposure to smokers may model smoking behaviour, provide positive images of smoking and ease access to cigarettes. Second, total smoking bans in the home and in vehicles may provide denormalization messages that indicate that smoking is neither appropriate nor socially acceptable.

Parental smoking has been linked with higher rates of youth experimenting with smoking,^{4,9,10} though our findings suggest no significant relationship between parental smoking and youth smoking at either of the smoking susceptibility thresholds when adjusting for the other variables in the model. There are at least three points to consider related to this unexpected finding. First, the influence from parental smoking might be exerted through riding in a vehicle with a smoker who is a parental figure in the youths' life. Second, parental smoking status at younger ages (i.e. grade 3) influences smoking behaviour during adolescence (in grade 12).¹ Thus, parental smoking status during adolescence may not be a complete reflection of the influence parental smoking has on children. Third, a total home smoking ban appears to be more strongly associated with youth smoking uptake than parental smoking status,¹⁶ evidence for which is supported by our study findings. Perhaps parental anti-smoking actions, such as a home smoking ban, provide strong denormalization messages about smoking irrespective of parental smoking status.

Exposure to older youth who smoke appears to influence the decisions youth make about smoking.^{4,5} For example, youths aged 14 to 16 years with siblings who smoked were more likely to report being smokers themselves.⁴ In addition, Leatherdale et al. found that grade 5 and 6 youth who attended a school with higher smoking rates among grade 8 students were more likely to have smoked a whole cigarette.⁵ In our study, sibling smoking was linked with respondents' expectations about future smoking and current smoking

TABLE 1
Characteristics of 2004/05 Canadian Youth Smoking Survey respondents

	Respondents N = 29 243	
	n	%
Grade at school		
5	5881	20.1
6	6657	22.8
7	5894	20.2
8	5864	20.1
9	4947	16.9
Gender		
Male	13 911	47.6
Female	15 332	52.4
Number of parents who smoke		
0	19 280	66.6
≥ 1	9652	33.4
Number of siblings who smoke		
0	25 717	88.5
≥ 1	3331	11.5
Household smoking restrictions		
Total ban	18 578	65.5
Some restrictions	6551	23.1
No restrictions	3223	11.4
Days exposed to smoking in vehicles in the previous 7 days		
0	21 041	72.9
≥ 1	7827	27.1
Stage of smoking susceptibility		
Non-susceptible non-smoker ^a	15 855	54.2
Susceptible non-smoker ^b	9036	30.9
Smoker or experimenter ^c	4344	14.9

Abbreviations: N, overall sample size; n, sub-sample size; %, percent; ≥, equals or greater than.

^a Non-susceptible non-smokers had never tried a cigarette and intended to not smoke in the future.

^b Susceptible non-smokers have never tried a cigarette but nevertheless had weak intentions regarding future non-smoking, or had tried a few puffs of a cigarette and had strong intentions not to smoke in the future.

^c Experimenters have smoked a whole cigarette or more, or had tried a few puffs of a cigarette and had weak intentions regarding future non-smoking.

behaviours. Though the age of the study participants' siblings is unknown, based on the young age and the low smoking rates of the YSS participants, it is reasonable to assume that the siblings who smoked were older. Regardless, findings from this study suggest that sibling smoking has a strong association with youths' smoking behaviours and intentions when adjusting for the other variables in the model.

This study demonstrates that a lack of household smoking restrictions is associated with a higher degree of smoking susceptibility at both tested thresholds when

adjusting for the other variables in the model. In other words, living in a home without a full smoking ban or only some smoking restrictions means non-smoking youth are more likely to be susceptible to future smoking and susceptible non-smokers are more likely to be experimenters or smokers. These findings concur with previously reported associations between home smoking bans and youth smoking uptake.^{8,16}

Exposure to smoking in vehicles is also strongly associated with being at a higher level of smoking uptake at both thresholds

when adjusting for the other variables in the model. This suggests that youth who are passengers in cars where others smoke are more likely to have begun to consider smoking in the future (susceptible non-smoker) or even to experiment with smoking. This new finding raises several questions that require further investigation. Who is smoking in the vehicles—drivers or passengers? Are the drivers the parents of the youth or licensed drivers known to them? What beliefs exist around the effects of smoking in vehicles? A qualitative study of low-income White and Black families reported that decisions to ban smoking in cars was commonly not discussed regardless of the smoking status of adults within the family.¹⁹ For families with no smokers, the common underlying rationale for this lack of discussion was that smokers rarely rode in their cars. For families with smokers, there was lack of clarity concerning risks associated with exposure to second-hand smoke in cars. Regardless, banning smoking in vehicles is another anti-smoking measure parents can use to influence their children's decision related to taking up smoking, even if the parents themselves are smokers.

As such, banning smoking in cars might be more than simply an issue of protecting children from second-hand smoke; it may indicate that smoking is neither acceptable nor appropriate and thus help prevent children from considering or experimenting with smoking in the future. This finding provides evidence that supports legislation that bans smoking in cars when children are passengers; such legislation is currently being implemented or considered for implementation in various places in Canada, the United States and Australia, among others.²⁰

Limitations

Findings from this study are subject to several limitations. First, cross-sectional survey data cannot provide causal conclusions but can provide evidence to support or dispute identified associations. Findings from this study reflect a comparison between three levels of smoking uptake at two thresholds of change and not a progression along a trajectory of smoking acquisition. Further investigation using longitudinal survey

TABLE 2
Spearman's correlations between independent variables

Variables	Gender	Parent smoking	Sibling smoking	Household restrictions	Days exposed to smoking in vehicles in the previous 7
Gender	—				
Parent smoking	-.02*	—			
Sibling smoking	-.03**	.20**	—		
Household smoking restrictions	-.0*	.50**	.15**	—	
Days exposed to smoking in vehicles in the previous 7 days	-.04**	.56**	.20**	.41**	—

* $p < .05$ ** $p < .01$

Variables were defined as follows: Gender: 0 = females, 1 = males; Parent smoking: 0 = no parents/guardians smoke; 1 = 1 parent/guardian smokers; 2 = 2 parents/guardians smoke; Sibling smoking: 0 = no siblings smoke; 1 = 1 or more siblings smoke; Household restrictions: 0 = total ban, 1 = some restrictions, 2 = no restrictions; Days exposed to smoking in vehicles in the last 7 days: 0 = 0 days, 1 = 1 or more days.

TABLE 3
Logistic regression thresholds of change analysis

	Susceptible non-smoker threshold ^a OR (CI) ^c	Experimenter/smoker threshold ^b OR (CI) ^c
Gender		
Female	1.00	1.00
Male	1.04 (.92-1.16)	1.02 (.85-1.22)
Number of parents who smoke		
0	1.00	1.00
1	1.09 (.90-1.32)	1.02 (.84-1.24)
2	.99 (.77-1.27)	1.12 (.86-1.46)
Number of siblings who smoke		
0	1.00	1.00
≥ 1	1.61** (1.24-2.10)	3.10** (2.55-3.77)
Household smoking restrictions		
Total ban	1.00	1.00
Some restrictions	1.60** (1.34-1.92)	1.26* (1.06-1.50)
No restrictions	1.46** (1.13-1.90)	1.70** (1.31-2.21)
Days exposed to smoking in vehicles in the previous 7 days		
0	1.00	1.00
≥ 1	1.43** (1.18-1.73)	2.34** (1.84-2.97)

Abbreviations: CI, confidence interval; OR, odds ratio; p , p-value.

^a Threshold between non-susceptible non-smoker level and susceptible non-smoker level.

^b Threshold between susceptible non-smoker level and experimenter/smoker level.

^c 95% confidence interval.

* $p < .05$; ** $p < .01$

design would refine our understanding of independent variable influences and causation. Next, secondary data analysis commonly raises questions not covered by original survey items. For example, it would have been useful to know if those siblings who smoked were older, if they lived at home, and if they smoked in vehicles in which the respondents were passengers. A third limitation is that the data are based on youth self-reports. In a related study, youth responses were compared to available parent responses. Although the majority of parent and youth responses were in agreement, when discrepancies occurred many produced a non-random pattern of disagreement.²¹ Therefore, when interpreting the results of the present study, it is important to keep in mind that household variables are measured from the perspective of the youth.

Conclusion

This secondary analysis of the 2004/05 YSS has deepened our understanding of youths' smoking intentions and behaviours and the associations with socialization in the household. Youths' attitudes towards smoking and their decisions to smoke will likely be shaped by many factors in their environment, including such things as peer smoking behaviours, school smoking bans, and community smoking norms. Findings from this study suggest that strong denormalization messages in the household environment may serve as a protective mechanism for youth. Smoking bans in the home and in vehicles may provide a means of socialization that support youth in their resolve to remain smoke free, regardless of the parents' smoking status. Further research is needed to explore the mechanisms underlying the relationships between household factors and youth smoking susceptibility. Developing prevention strategies that focus on influencing actual smoking behaviour of youth along with their susceptibility to smoke in the future would help address the identified public health priority of decreasing youth smoking rates. Health promotion messages directed at parents and guardians could highlight the potential potency of home and vehicle smoking bans.

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Discrepancies between youth and parent perceptions of their household environment relevant to smoking: a secondary analysis of the 2004/05 Canadian Youth Smoking Survey

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Abstract

Objective: To compare the perceptions of youth in grades 5 to 9 and parents regarding their household environment relevant to smoking socialization.

Methods: We conducted secondary analysis of the 2004/05 Canadian Youth Smoking Survey and corresponding parent survey, and used the McNemar Test to compare youth and parent responses.

Results: Results showed statistically significant patterns of disagreement between youth and parent responses at most levels of youth smoking uptake regarding parental smoking, household rules around smoking, and smoking in the home and vehicles. When youth and parents disagreed, the following patterns emerged: non-susceptible, non-smoking youth perceived their parents as non-smokers and youth with more smoking experience perceived their parents as smokers; youth at all levels of smoking uptake perceived fewer rules in the home than parents indicated, more smoking in the home than parents indicated, and exposure to smoking in vehicles in contrast to vehicle smoking bans indicated by parents.

Conclusion: To the best of our knowledge, this is the first study to compare the perceptions of youth and parents regarding household variables related to the socialization of tobacco use. The discrepancies between youth and parent responses suggest that there is room to improve on establishing household environments that clearly condemn the use of tobacco, which may affect youth susceptibility to future smoking.

Key Words: youth, smoking, parents, socialization, smoking in the home, smoking in vehicles, Canadian Youth Smoking Survey 2004/05

Introduction

Understanding the factors that affect the decisions youth make about smoking is essential to inform effective public health program and policy development focused on youth health. Although few Canadian youth in grades 5 to 9 are established smokers,¹ they may already be developing susceptibility to trying smoking—defined as the absence of a strong resolve to remain smoke-free in the future—which is a predictor of future experimentation

among adolescents.² Parents may have significant influence over youths' susceptibility to smoking;³⁻⁶ however, we know little about whether there is agreement between parental actions and youth perceptions of those actions. A study of families in San Diego, California, showed discrepancies between parents and children about perceptions of parental actions related to smoking prompts, including requests to clean ashtrays and to retrieve cigarettes.⁷

The home environment is one social context where parents can influence their children's susceptibility to future smoking. The influence of social context on behavioural intentions is supported by social cognitive theory.⁸ In particular, social norms about smoking may be developed through modeling of behaviours, expressed attitudes and associated rules within the home.

Several studies have reported a link between family members' smoking and adolescent smoking.^{3,5,6} Komro et al. suggest that household norms and attitudes towards smoking held by parents affect grade 8 to 10 adolescents' cigarette use and that the presence of role models in the home who smoked increased the odds of adolescents' smoking.⁵ However, the socialization of attitudes towards smoking may be taking place prior to adolescence; Bricker et al. reported that the smoking behaviour of parents when their child is in grade 3 influenced the child's smoking behaviour in grade 12.³ Therefore, youth perception of their parents as smokers may have serious consequences.

The social context of the home environment can also be shaped by household smoking restrictions. Emerging evidence suggests an association between home smoking bans and lower levels of youth smoking⁹⁻¹¹ as well as less perceived susceptibility to trying smoking.^{12,13} In comparison, evidence regarding an association between vehicle smoking bans and youth smoking behaviour has received less attention. Schultz et al. demonstrated that youth in grades 5 to 9 who reported no exposure

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to smoking while riding in vehicles were more likely to not have experimented with smoking and to sustain a resolve to not smoke in the future than youth who had reported exposure to smoking while riding in vehicles.¹² One plausible link between smoking bans and youth behaviour is that bans support the attitude that smoking is unacceptable. Thomson et al. found that among adolescents aged 12 to 17 years household smoking bans were associated with a perceived lower prevalence of adult smoking and lower social acceptability of smoking.¹⁴ In addition, adolescents who perceived that adults disapproved of smoking were less likely to smoke.⁴ Therefore, in addition to protecting against exposure to environmental tobacco smoke (ETS), smoking restrictions within the home can serve as a socialization mechanism that dissuades from the use of tobacco.

Given that both smoking behaviour of youth and their intent to smoke in the future are associated with messages received in the home, it is important that parents are clear in communicating their attitudes towards smoking. Whether or not youth consistently perceive the environment that their parents are trying to shape is not known. We are interested in examining concordance between youth and parental perceptions of their household environment as it relates to tobacco use by comparing youth and parent responses to relevant 2004/05 Youth Smoking Survey (YSS) survey questions.

Methods

Participants

This study involved a secondary analysis of a subset of data from the 2004/05 YSS, a Health Canada-sponsored national survey of grade 5 to 9 youth, and the corresponding parent survey data set. The overall YSS study design was based on sampling that occurred in two stages.¹⁵ The first stage involved sampling school boards which had been stratified based on corresponding adult smoking rates. Boards were randomly selected with probability proportional to the total enrolment in the board. In stage 2, schools were sampled from the selected

school boards and stratified based on the grade levels offered to ensure that selection of schools would produce a relatively fair representation of each of the grades covered in the survey. Within each stratum, schools were randomly selected with equal probability. As well, a random sample of private schools was selected from each province. In the case that a board or school declined to participate, a replacement selection was made from a predetermined substitute list. All students in selected schools were eligible to participate contingent on parental consent. Two classes per school and per grade were randomly selected, and parents* of youth from these classes were invited to participate in a brief telephone survey. The resulting youth and corresponding parent data were used in this analysis (n = 9199). Survey weights were not used; therefore the results of the analysis are only representative of the sample.

Measures

Four dichotomous variables related to tobacco socialization in the household were constructed based on selected questions from the youth and parent surveys. Both youth and their responding parents were asked about the parents' smoking status. Youth were asked if their father/mother or the person who is like their father/mother smokes cigarettes. Responding parents were asked if they themselves smoke cigarettes and if another parent, step-parent or guardian of their children smokes cigarettes. Responses were summarized into two categories of parent smoking status: "no parent smokes" and "one or more parent smokes." Home smoking restrictions were defined as a total home smoking ban or lack of a total home smoking ban. Lack of a total ban included no restrictions about smoking in the home as well as allowing smoking in certain rooms or by special guests. Smoking inside the home was assessed by asking how many people smoke *inside* the home every day or almost every day. Responses were grouped into either no people, or one or more people smoked inside the home. For youth, exposure to people smoking inside a vehicle was derived from responses to the question, "During the past 7 days, on

how many days did you ride in a car with someone who was smoking cigarettes?" Possible outcomes were none ("0 days") and 1 or more days ("1 or 2 days," "3 or 4 days," "5 or 6 days," or "All 7 days"). Parents were asked "Is smoking restricted in your vehicles?" with possible responses being "yes" or "no."

Similar to Schultz et al.,¹² the youth smoking uptake measure drew on the work of Wakefield et al. and was constructed using YSS questions about smoking behaviour (history) and perceived smoking susceptibility (intentions).¹³ While Wakefield et al. identify 5 levels of smoking uptake,¹³ due to few youth respondents in advanced levels of smoking uptake, we used 3 levels of smoking uptake in our analysis: "non-susceptible non-smokers" had never tried a cigarette and intended to not smoke in the future; "susceptible non-smokers" had never tried a cigarette but had weak intentions regarding future non-smoking, or they had tried a few puffs of a cigarette and had strong intentions not to smoke in the future; and "experimenters or smokers," including youth who had tried a few puffs of a cigarette and had weak intentions regarding future non-smoking, and those who had smoked a whole cigarette or more in their lifetime, regardless of intention. See Table 1 for a summary of the stages of youth smoking uptake.

Statistical analysis

Statistical analyses were performed using SAS version 9.1 run on a 64-bit platform Win.NET server.¹⁶ Youth and parent perceptions of household variables related to tobacco use were compared for each of the 3 defined levels of youth smoking uptake. Because the variables of comparison were dichotomous and the responses were paired (youth and parent), we used the McNemar test to determine if there was a significant difference between two paired proportions. For parent smoking status, home smoking restrictions, and smoking inside the home, the wording of the youth and parent questions were equivalent, and therefore the McNemar test was conducted on the youth responses against the parent's corresponding responses. For smoking inside a

* A parent refers to a mother, a father, or a parental figure who is like a mother or a father.

vehicle, the McNemar test was conducted on the youth responses of number of days of exposure to smoking in a vehicle (0, 1 or more days) against the parent's responses to the presence of smoking restrictions in the vehicle (yes, no).

Results

To the best of our knowledge, this is the first study to compare the perceptions of youth and parents regarding household variables related to the socialization of tobacco use.

For characteristics of the youth respondents and parent respondents see Table 2. Statistically significant differences were found between the parent and youth perceptions for each variable and at most levels of youth smoking uptake (see Table 3).

For parent smoking status, the pattern of disagreement between parents and youth were different for each of the three levels of youth smoking uptake: for non-susceptible non-smoking youth, there were more cases in which parents indicated at least one parent was a smoker yet youth perceived their parent(s) as non-smokers than cases in which parents indicated at least one parent was a non-smoker yet youth perceived their parent(s) as smokers; results for susceptible non-smoking youth were not statistically significant for this variable. For experimenters and smokers, there were more cases in which parents indicated that at least one parent was a non-smoker yet youth perceived their parent(s) as smokers.

For home smoking restrictions, there was no significant difference between parent and youth responses for the non-susceptible non-smoking youth. However, for susceptible non-smoking youth along with experimenters and smokers, there was a significant difference between parent and youth responses: where there was disagreement, there were more instances in which parents indicated they had a total smoking ban in the home and youth did not perceive a total ban than cases for which youth perceived a total ban and parents indicated otherwise.

TABLE 1
Stages of youth smoking uptake

	Smoking experience		Strength of intentions to remain smoke-free
Non-susceptible non-smokers	None	and	Strong
Susceptible non-smokers	None	and	Weak or
	A few puffs	and	Strong
Experimenters or smokers	A few puffs	and	Weak or
	A whole cigarette	and	Weak or strong

For smoking inside the home, there were significant differences between parent and youth responses at all levels of youth smoking uptake and the pattern of disagreement was the same: there were more instances in which the parental response indicated no one smoked in the home while the corresponding youth response indicated one or more smokers in the home than instances of the reverse pattern.

Finally, there were significant differences between parent and youth responses to the questions about smoking in vehicles. The pattern of disagreement was the same across the three levels of youth smoking uptake. As for home smoking restrictions, where youth and parents disagreed there were a greater number of instances of parents indicating that they restricted smoking in their vehicle while the corresponding youth indicating riding in a vehicle in the last week with someone who was smoking.

Discussion

Preventing youth from smoking is a health priority.²⁻⁶ Emerging evidence suggests that household environments influence youth decisions about future smoking.^{3,5,6,9-13} Hence, one strategy to achieve this health priority is to support adolescents' resolve to remain smoke-free.¹² However, all four household variables investigated in this study demonstrated systematic differences between the reported perceptions of youth and parents, and these discrepancies pro-

vide unique insights into communication related to tobacco use in the home.

In the current study, parents and youth had statistically significant patterns of disagreement regarding parents' smoking status. When non-susceptible non-smoking youth disagreed with their parents, they were more likely to report that their parents were non-smokers. This might suggest that some smoking parents of non-susceptible non-smoking youth are successfully hiding their smoking behaviour from their children. Alternatively, experimenting and smoking youth were more likely to report that their parents were smokers when there was disagreement with parental responses. In these instances, it is possible that parents are trying to quit smoking and are labelling themselves as non-smokers, while their children still consider them to be smokers. Further, youth with smoking experience may tend to label their parents as smokers to justify their own smoking behaviour.

Parents can communicate anti-smoking messages and influence household social norms about smoking by banning smoking in the home. Such rules have been associated with adolescents holding more negative attitudes towards smoking and perceiving less smoking behaviour by adults.¹⁴ Perceiving a total smoking ban within the home supports youth in maintaining a resolve to remain smoke-free.¹² Moreover, evidence suggests that even when parents are unable to quit smoking themselves, enforcing anti-smoking

TABLE 2
Comparison of youth and parent responses about smoking characteristics

Response by youth stage of smoking uptake								
Youth responses					Parent responses			
Stage of smoking uptake	Total n (%)	Non- susceptible non-smoker ^a n (%)	Susceptible non-smoker ^b n (%)	Experimenter or smoker ^c n (%)	Total N (%)	Non-susceptible non-smoker ^a n (%)	Susceptible non-smoker ^b n (%)	Experimenter or smoker ^c n (%)
Total	9199	5358	2818	1018	—	—	—	—
Gender								
Female	4604 (50.0)	2741 (51.2)	1366 (48.5)	496 (48.7)	7420 (80.7)	4319 (80.6)	2267 (80.4)	829 (81.4)
Male	4595 (50.0)	2617 (48.8)	1452 (51.5)	522 (51.3)	1779 (19.3)	1039 (19.4)	551 (19.6)	189 (18.6)
Grade at school								
5	2569 (27.9)	1732 (32.3)	733 (26.0)	102 (10.0)	—	—	—	—
6	2455 (26.7)	1528 (28.5)	750 (26.6)	174 (17.1)	—	—	—	—
7	1672 (18.2)	911 (17.0)	561 (19.9)	200 (19.6)	—	—	—	—
8	1465 (15.9)	732 (13.7)	480 (17.0)	253 (24.9)	—	—	—	—
9	1038 (11.3)	455 (8.5)	294 (10.4)	289 (28.4)	—	—	—	—
Parent smoking status								
0	6756 (73.4)	4249 (79.3)	1964 (69.7)	542 (53.2)	6704 (72.9)	4160 (77.6)	1962 (69.6)	578 (56.8)
≥ 1	2346 (25.5)	1054 (19.7)	825 (29.3)	466 (45.8)	2469 (26.8)	1179 (22.0)	850 (30.2)	439 (43.1)
Home smoking restrictions								
Full ban	6368 (69.2)	4021 (75.1)	1822 (64.7)	522 (51.3)	6917 (75.2)	4144 (77.3)	2094 (74.3)	675 (66.3)
Lack of a full ban	2537 (27.6)	1161 (21.7)	907 (32.2)	469 (46.1)	2255 (24.5)	1196 (22.3)	715 (25.4)	343 (33.7)
Number of people smoking inside the home								
0	7499 (81.5)	4645 (86.7)	2226 (79.0)	625 (61.4)	8065 (87.7)	4846 (90.4)	2438 (86.5)	777 (76.3)
≥ 1	1612 (17.5)	671 (12.5)	564 (20.0)	377 (37.0)	1125 (12.2)	506 (9.4)	377 (13.4)	241 (23.7)
Days of exposure to smoking inside a vehicle during the past 7 days								
0	7131 (77.5)	4529 (84.5)	2083 (73.9)	516 (50.7)	8016 (87.1)	4756 (88.8)	2471 (7.7)	785 (77.1)
≥ 1	1950 (21.2)	762 (14.2)	702 (24.9)	486 (47.7)	1050 (11.4)	552 (10.3)	311 (11.0)	187 (18.4)

Missing data are not shown. Percentages are based on column totals.

Abbreviations: N, overall sample size; n, sub-sample size.

^a Non-susceptible non-smokers have never tried a cigarette and intend to not smoke in the future.

^b Susceptible non-smokers have never tried a cigarette but have weak intentions regarding future non-smoking, or they have tried a few puffs of a cigarette and intend to not smoke in the future.

^c Experimenters or smokers have tried a few puffs of a cigarette and have weak intentions regarding future non-smoking, or have smoked a whole cigarette or more in their lifetime.

TABLE 3
Comparison of parent and youth responses with the McNemar test

Youth responses	Parent responses					
	Non-susceptible non-smokers ^a		Susceptible non-smokers ^b		Experimenters and smokers ^c	
Parent smoking status	No parent smokes	≥1 parent(s) smoke(s)	No parent smokes	≥1 parent(s) smoke(s)	No parent smokes	≥1 parent(s) smoke(s)
No parent smokes	3935	299	1773	186	470	72
1 or more parent(s) smoke(s)	185	865	169	655	102	363
	$\chi^2 = 26.8512, p < .0001$		$\chi^2 = .8141, p < .3669$		$\chi^2 = 5.1724, p < .0229$	
Home smoking restrictions	Full ban	Lack of a full ban	Full ban	Lack of a full ban	Full ban	Lack of a full ban
Full ban	3461	546	1549	268	439	83
Lack of a full ban	566	592	482	421	219	250
	$\chi^2 = .3597, p < .5487$		$\chi^2 = 61.0613, p < .0001$		$\chi^2 = 61.2450, p < .0001$	
Number of people smoking inside the home	0	≥ 1	0	≥ 1	0	≥ 1
0	4556	84	2168	57	601	24
≥ 1	254	416	248	314	163	214
	$\chi^2 = 85.5030, p < .0001$		$\chi^2 = 119.6098, p < .0001$		$\chi^2 = 103.3209, p < .0001$	
Days of exposure to smoking inside a vehicle during the past 7 days	Restrictions	No restrictions	Restrictions	No restrictions	Restrictions	No restrictions
0	4161	327	1913	149	444	47
≥ 1	537	218	532	155	328	137
	$\chi^2 = 51.0417, p < .0001$		$\chi^2 = 215.4023, p < .0001$		$\chi^2 = 210.5627, p < .0001$	

Analysis excludes unmatched responses, i.e. youth (parent) responses were excluded if corresponding parent (youth) responses were missing. Therefore, totals do not reconcile to Table 2.

Abbreviations: χ^2 , chi-square, ≥, equal or greater than; *p*, *p*-value.

^a Non-susceptible non-smokers have never tried a cigarette and intend to not smoke in the future.

^b Susceptible non-smokers have never tried a cigarette but have weak intentions regarding future non-smoking, or they have tried a few puffs of a cigarette and intend to not smoke in the future.

^c Experimenters or smokers have tried a few puffs of a cigarette and have weak intentions regarding future non-smoking, or have smoked a whole cigarette or more in their lifetime.

socialization practices seems to encourage their children to remain smoke-free.^{9,13} However, the results of our study demonstrate a pattern of disagreement where youth perceive fewer anti-smoking rules but more smoking in the home than their parents indicate. Thus, it appears that parental intent about smoking bans is not always being perceived by their children. This discrepancy is noteworthy as a reflection of the ineffectiveness of parents to influence use of tobacco in the home, which increases the likelihood of their children experimenting with smoking and becoming established smokers.^{12,13,17,18} Thus future prevention strategies may need to focus on parental efficacy in communicating anti-smoking messages and setting rules.

For youth at all levels of smoking uptake, the pattern of disagreement between youth and parent responses suggests that youth are riding in vehicles where someone is smoking, in spite of parents saying their vehicles are smoke-free. It is possible that this discrepancy is because youth are also passengers with older siblings and/or friends who smoke and not in vehicles exclusively driven by their parents, or because they carpool with other adults who smoke inside their vehicles. Laws banning smoking in vehicles carrying children have been instilled in many areas of Canada, the United States and Australia, and in Mauritius, South Africa and Bahrain, among others.¹⁹ In addition to protecting youth from ETS, vehicle smoking bans (either mandated by law or because parents

clearly communicate smoking bans in their own vehicles and disapproval of exposure to ETS in general) may also socialize youth to remain smoke-free,¹² as do home smoking bans.

Limitations

This study is subject to several limitations. First, the results cannot be generalized beyond the sample because survey weights are not available for the parent data. Though sampling of parents was random, participation was voluntary; there may be selection bias in the parents who chose to participate. The YSS 04/05 does not provide a response rate for the parent participants. Despite this limitation, the results do provide insights into discrepancies

between parent and youth perceptions of the household environment.

Next, although the analyses were done on three subsets of data based on level of youth smoking uptake, we can only infer about differences within a subset and not between the subsets of youth. Between-group differences in patterns of disagreement between parent and youth responses may be due to confounding factors such as socioeconomic status. Further analyses to test for between-group differences are not possible because the YSS does not include data on potential confounding variables such as socioeconomic status of the youth. Therefore, we must view the results for the three subsets of data as distinct.

Another limitation exists with respect to the interpretation of the results. The analyses indicate that the disagreement between parent and youth responses was not random; however, we cannot make causal conclusions but must speculate as to the reasons for the disagreements. Nevertheless, it is important to recognize these non-random patterns of disagreement between parents and youth, given the importance of the social environment on adolescent smoking behaviour.

Conclusion

Parent and youth participants in this study had systematic patterns of disagreement regarding perceptions of household factors concerning tobacco use. It is important to acknowledge these discrepancies and to recognize that neither parent nor youth perception alone paints the full picture of what is occurring in their homes. The results suggest there may be room for parents to improve on setting a household environment that condemns the use of tobacco, which in turn encourages youth to cultivate intentions to remain smoke-free.

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A descriptive study of the prevalence of psychological distress and mental disorders in the Canadian population: comparison between low-income and non-low-income populations

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Abstract

Objective: This descriptive study compares rates of high psychological distress and mental disorders between low-income and non-low-income populations in Canada.

Methods: Data were collected through the Canadian Community Health Survey – Mental Health and Well-being (CCHS 1.2), which surveyed 36 984 Canadians aged 15 or over; 17.9% (n = 6620) was classified within the low-income population using the Low Income Measure. The K-10 was used to measure psychological distress and the CIDI for assessing mental disorders.

Results: One out of 5 Canadians reported high psychological distress, and 1 out of 10 reported at least one of the five mental disorders surveyed or substance abuse. Women, single, separated or divorced respondents, non-immigrants and Aboriginal Canadians were more likely to report suffering from psychological distress or from mental disorders and substance abuse. Rates of reported psychological distress and of mental disorders and substance abuse were much higher in low-income populations, and these differences were statistically consistent in most of the sociodemographic strata.

Conclusion: This study helps determine the vulnerable groups in mental health for which prevention and promotion programs could be designed.

Key words: psychological distress, mental disorders, poverty, community survey.

Introduction

For the past 40 years, evidence accumulating from epidemiological studies in several parts of the world¹⁻¹⁰ has demonstrated that economically disadvantaged populations have higher rates of psychiatric symptomatology and psychological distress. This larger vulnerability appears to result from the presence of an increased number of risk factors and a deficiency of certain protective factors.

Studies have clearly identified that the presence of stressful life events and persistent difficult living conditions related to income, housing, work and social relationships are significant forerunners of the onset of symptoms of depression in economically disadvantaged populations.¹¹⁻¹⁶ Moreover, these populations face stressful life events, such as the death of a loved one, accidents, illness, divorce and loss of employment, more frequently than more affluent populations.¹⁶⁻¹⁸

Added to this, economically disadvantaged populations are often lacking in one of the key protective factors for the development and maintenance of mental health, namely social support. A number of studies have established a link between social support and health in general and mental health in particular.¹⁹ Specific studies on mental health have demonstrated a strong relationship between availability and adequacy of support and severity of mental illness,¹⁹⁻²¹ and others have identified a significant deficiency of both these dimensions of social support in economically disadvantaged populations.²²⁻²⁶

Although the link between economic disadvantage and a greater prevalence of psychiatric symptomatology has been demonstrated, no literature has reported (1) how and to what extent economically disadvantaged populations across Canada suffer more than affluent ones, or (2) whether the difference in psychiatric symptomatology between low-income and more affluent populations in Canada relates to sociodemographic characteristics.

The objective of this study is to give an overview of how income level is related to mental health in the Canadian population. As many sociodemographic variables, e.g. age, gender, education, marital status, language, race, ethnicity, region of residence,^{1,27-32} have been linked to mental health in previous studies, we will compare the prevalence of psychological distress and mental disorders in low-income

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and non-low-income populations of Canada based on these parameters.

Methods

Survey and sample

In 2002, Statistics Canada conducted the Canadian Community Health Survey – Mental Health and Well-being (CCHS 1.2),* a nationally representative cross-sectional survey that collected information on various aspects of Canadians' psychological well-being, mental disorders and mental health problems.

The survey targeted Canadians aged 15 and older living in private dwellings in the ten provinces, and excluded residents of institutions, Indian Reserves, Crown lands, and certain remote areas, as well as full-time members of the Canadian Forces. The survey sample totalled 36 984 people, or approximately 98% of the target population, and the response rate was 77%.

Measures

The measures were sociodemographic characteristics, psychological distress and selected mental disorders, and substance dependence (SMDSD).

Sociodemographic characteristics. The selected sociodemographic characteristics were age, gender, education, marital status, race/ethnicity, immigration status, first language, income, employment status, accommodation, and living region.

Low income measures (LIMs) were developed by Statistics Canada to identify the low income population. LIM was calculated as follows: (1) Obtain family income before tax by asking survey participants the question "What is your best estimate of the total income, before taxes and deductions, of all household members from all sources in the past 12 months?" (2) Calculate family-adjusted factors. These are based on the total number of persons in the family. For the first adult (≥ 16 years), the adjust factor equals 1; for the rest of adults, the adjust factor equals .4 multiplied by the number of persons; for the rest of children (< 16

years), the adjust factor equals .3 multiplied by the number of persons. The total family adjust factors is the sum of all family members' factors. (3) Calculate adjusted-family income, which equals "family income before tax" divided by "family-adjusted factors." (4) Calculate the median adjusted-family income for the total survey population. (5) Identify individuals with an adjusted-family income lower than 50% of the median level as "low-income population" and others as "non-low-income population."

Psychological distress. Psychological distress was assessed using the Kessler Psychological Distress Scale (K-10)³³ which contains 10 questions that assess the frequencies of psychological distress symptoms in the previous month on a 5-point Likert scale. Scores ranged from 0 to 40. Although the K-10 is widely used to measure psychological distress, there is no standard cut-off point for determining high psychological distress. To obtain the optimal cut-off point, we conducted two approaches. In the first, logistic regression was used between continuous scores of psychological distress and mental disorders including depression, mania, panic disorder, social phobia, agoraphobia and substance dependence to compare the values of specificity and sensitivity for each possible cut-off point. The optimal cut-off point was 9 since it provides a sensitivity of 47.9% and a specificity of 91.7%; the area under the curve (AUC) was .836. The second approach, based on the criteria used in "Enquête Santé Québec,"³⁴ uses the upper statistical quintile of the distribution of the K-10 scale among the total study population as the optimum cut-off point. This also points to a cut-off point of 9. As a result, the cut-off point to identify high psychological distress was determined to be 9.

Mental disorders and substance dependence. Past-year prevalence of DSM-IV[†] mental disorders³⁵—major depression, mania, panic attacks, social phobia, agoraphobia, alcohol dependence and drug dependence—was assessed using

the Composite International Diagnostic Interview (CIDI).^{36,37}

Statistical analysis

We calculated point estimates of prevalence using the sampling weights provided by Statistics Canada and estimates of variance and confidence interval (CI) by bootstrapping using Bootvar V20 program for SAS provided by Statistics Canada. The Bootstrap method was used to conduct comparison t-tests between different groups. When multiple comparisons between categories are presented in the text (not the tables), only the lowest values of the t-test (t_{\min}) are presented, which means that the other t-test values are higher.

Results

Sociodemographic characteristics

The sociodemographic characteristics of Canadians aged 15 and older are shown in Table 1. The ratio of men to women is approximately 1. The average age of this population is 44, just over one-half (52.32%) are married, and a little over half (55.42%) have post-secondary education. New Canadians account for almost one-quarter (22.15%) of the respondents. The majority (83.76%) are White. The majority of the respondents live in Ontario (38.63%) and Quebec (24.17%). Together, they accounted for almost two-thirds of the total population.

The low-income population—a total of 6620 respondents (18%)—exhibits significantly different distributions of most of the sociodemographic variables compared with the non-low-income population. They are more likely to be women, younger than 25 years or older than 65, immigrants, and living in Quebec, Saskatchewan or Atlantic Canada; they are less likely to have completed post-secondary education, to live with a spouse or a common-law partner, or to be White Canadian (Table 1).

Psychological distress

Overall prevalence profile. The overall prevalence of high psychological distress in the 12 months prior to the survey is

* <http://www.statcan.gc.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=5015&lang=en&db=imdb&adm=8&dis=2>

† Diagnostic and Statistical Manual of Mental Disorders, 4th edition.

TABLE 1
Sociodemographic characteristics of low-income, non-low-income, and total population, household population aged 15 or older, Canada excluding territories, 2002 (CCHS 1.2)

Sociodemographic characteristics	Total population N = 36 984	Low-income population n = 6620	Non-low-income population n = 30 364	Comparison test ^a	
				<i>t</i> [499] ^b	<i>p</i>
	%	%	%		
Gender					
Men	49.15	43.28	50.43	7.16	< .001
Women	50.85	56.72	49.57	7.16	< .001
Age					
15-24	16.55	20.03	15.79	5.45	< .001
25-44	38.03	33.14	39.10	5.82	< .001
45-64	30.51	25.26	31.65	7.14	< .001
65+	14.91	21.57	13.45	11.91	< .001
Education					
Lower than secondary school	25.50	42.16	21.86	21.15	< .001
Secondary school	19.08	17.71	19.38	2.12	.03
Post secondary school	55.42	40.13	58.76	18.74	< .001
Marital status					
Married	52.32	39.96	55.02	14.71	< .001
Common-law	9.33	7.65	9.70	3.90	< .001
Widowed	5.46	10.34	4.39	13.24	< .001
Separated	2.57	3.92	2.28	5.59	< .001
Divorced	4.80	7.89	4.13	7.63	< .001
Single	25.41	30.03	24.40	6.21	< .001
Immigrant					
Yes	22.15	28.59	20.74	7.75	< .001
No	77.85	71.41	79.26	7.75	< .001
First language					
English	57.23	48.95	59.04	9.77	< .001
French	23.85	25.62	23.47	2.39	.02
Allophone	19.54	25.83	18.16	6.77	< .001
Ethnic group					
White	83.76	75.52	85.56	9.56	< .001
Black	2.01	3.29	1.73	3.19	.001
Chinese	3.59	5.16	3.25	4.01	< .001
Aboriginal (Indian, Métis, Inuit)	1.08	2.14	.85	6.06	< .001
South Asian	3.34	4.56	3.08	2.63	.01
Latin American	.61	1.37 ^c	.45	2.40	.02
Others	.78	1.45 ^c	.64	2.97	.003
Province/region					
Alberta	9.72	8.76	9.92	2.27	.02
British Columbia	13.33	12.74	13.46	1.06	.29
Manitoba	3.46	3.71	3.41	1.20	.23
Atlantic Canada ^d	7.66	9.96	7.16	7.82	< .001
Ontario	38.63	32.58	39.95	7.53	< .001
Quebec	24.17	28.52	23.22	5.31	< .001
Saskatchewan	3.04	3.73	2.88	3.56	< .001

Abbreviations: CCHS 1.2, Canadian Community Health Survey – Mental Health and Well-being, Cycle 1.2; N, overall sample size; n, sub-sample size; *p*, *p*-value.

^a Comparison tests were conducted between low-income population and non-low-income population with the bootstrapping method (500 bootstrap samples).

^b *t*-value with degree freedom = 499, calculated from the 500 differences from bootstrap samples.

^c Bootstrapping techniques were used to produce the coefficient of variation (CV). Data with a coefficient of variation (CV) from 16.6% to 33.3% are identified and should be interpreted with caution.

^d Atlantic Canada includes Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick.

21% (Table 2). The highest prevalence of high psychological distress is found among the youngest age group (15 to 24 years), Aboriginal Canadians and individuals who are separated; among these groups, 3 out of 10 Canadians report high psychological distress. Those over 65 years and married people report the lowest prevalence (approximately 15%) of high psychological distress.

Compared to men, women are more likely to suffer high psychological distress ($t = 4.75, p < .001$). The prevalence of high psychological distress decreases with increased age ($t_{\min} = 3.96; p < .001$) and education level ($t_{\min} = 2.10; p < .05$). Married, widowed or common-law spouses report lower rates of high psychological distress than separated, divorced or single individuals ($t_{\min} = 2.17; p < .05$). Compared to immigrants, non-immigrants report higher rates of high psychological distress ($t = 3.01; p < .01$). High psychological distress is much more common among French-speakers ($t_{\min} = 3.24; p < .01$). Canadians of Chinese descent report the lowest prevalence of psychological distress, and this is significantly lower than that for Aboriginal, South Asian, White or Black Canadians ($t_{\min} = 2.58; p < .05$). High psychological distress is much more prevalent among Aboriginal Canadians than among the White population ($t = 3.39; p < .01$). Psychological distress is much more common in Quebec than in Atlantic Canada, Ontario, British Columbia and Alberta ($t_{\min} = 2.38; p < .05$).

Effect of being in a low-income population. The prevalence of high psychological distress is 50% higher for low-income populations (28.5%) than for non-low-income populations (18.96%; $t = 10.30; p < .001$). Low-income populations report higher psychological distress for most of the sociodemographic variables; the prevalence ratios of the low-income groups to the non-low-income groups ranges from 1.2 to 2.22 ($t_{\min} = 2.11; p < .05$) except for some analyses by ethnic origin. Specifically, there is no significant difference within the strata of Canadians of Black, Chinese, South Asian, Arab or Latin American ethnic origin.

Interaction of low-income status and sociodemographic characteristics. Significant gender and education differences in the prevalence of high psychological distress exist only among the non-low-income population ($t_{\min} = 3.61; p < .001$). Black Canadians showed lower psychological distress than White Canadians in non-low-income populations ($t = -2.1, p < .05$) but not in low-income populations ($t = .79, p > .05$). Conversely, significant differences between immigrants and non-immigrants exist only in the low-income population ($t = 4.12; p < .001$). Among the low-income population, nearly half (45.49%) of those separated from their spouse report suffering from high psychological distress, and this prevalence is significantly higher than for most of the other marital status subgroups ($t_{\min} = 2.83; p < .01$). However, this was not observed among the non-low-income population. Similarly, although the prevalence among low-income Aboriginal Canadians (45.17%) was significant and much higher than among most of the other low-income ethnic subgroups ($t_{\min} = 2.28; p < .05$), non-low-income Aboriginal Canadians report a prevalence of high psychological distress quite similar to that for most of the other ethnic subgroups.

Mental disorders and substance dependence

Major depression (4.81%) is the most prevalent mental disorder in the Canadian population, followed by substance dependence (3.07%), social phobia (3.01%) and panic disorder (1.53%). Mania and agoraphobia affects less than 1% of the population. The same pattern of distribution of diagnoses is in both the low-income and the non-low-income populations, but the prevalence rates are significantly higher in the low-income group for all disorders, and double for mania and agoraphobia. The male to female prevalence ratio for mental disorders is much lower for men (depression = .63, panic attack = .66, social phobia = .74 and agoraphobia = .31) except for mania, where the rates are similar. However, the substance dependence ratio is more than double for men (2.75) (Table 3).

As describing the prevalence of each disorder in relation to each sociodemographic substratum would take too long to present,

we have grouped together selected mental disorders and substance dependence (SMDSD).

Prevalence profile. The prevalence of SMDSD is based on cases involving at least one of the disorders or substance dependencies (including major depression, mania, panic attack, agoraphobia, social phobia, alcohol dependence and illicit drug dependence) in the 12 months prior to the survey. Nearly 11% of Canadians aged 15 and over report having at least one SMDSD. The overall prevalence of SMDSD decreases significantly with age ($t_{\min} = 6.15; p < .001$); Canadians aged 15 to 24 are 5 times more likely to have SMDSD than those aged 65 and over. Canadians who are separated, divorced or single report a significantly higher prevalence of SMDSD than those who are married, living with a common-law spouse or widowed ($t_{\min} = 2.20; p < .05$). Those living with a common-law spouse are twice more likely to suffer from SMDSD than married people ($t = 6.52; p < .001$). (Table 4).

Non-immigrants report twice as high a prevalence of SMDSD as immigrants ($t = 10.12; p = .001$). A similar prevalence exists for English-speakers compared to those whose first language is neither English nor French ($t = 10.17; p < .001$). Aboriginal Canadians are between 2 and 5 times more likely to experience SMDSD compared to other ethnic subgroups ($t_{\min} = 4.12; p < .001$). The rates of SMDSD among Chinese and Black Canadians are approximately half that of White Canadians ($t_{\min} = 3.24; p < .01$).

Effect of being in a low-income population. The overall prevalence of SMDSD for the low-income population is 13.47%, which is 37% higher than for non-low-income Canadians (10.02%; $t = 5.890; p < .001$). This significant difference exists in almost all the stratified analyses, with prevalence ratios ranging from 1.3 to 2.2. Nonetheless, there are some exceptions: there is no significant difference in the prevalence of SMDSD among those aged 15 to 24; who have less than a high school education; who are married, widowed or single; who are immigrants or of Black, Chinese, South Asian or Latin American

TABLE 2
Prevalence of high psychological distress among low-income, non-low-income, and total population, household population aged 15 or older, Canada excluding territories, 2002 (CCHS 1.2)

	Total population N = 36 984	Low-income population n = 6620	Non-low-income population n = 30 364	Prevalence ratio ^a	Comparison test ^b	
					t[499] ^c	p
	%	%	%			
	20.74	28.50	18.96	1.50	10.30	< .001
Gender						
Men	19.23	26.84	17.80	1.51	6.36	< .001
Women	22.20	29.89	20.28	1.47	7.98	< .001
Age						
15-24	29.20	32.95	28.16	1.17	2.31	.02
25-44	21.28	31.00	19.47	1.59	6.98	< .001
45-64	18.40	29.42	16.48	1.79	7.35	< .001
65+	14.74	19.76	12.99	1.52	4.35	< .001
Education						
Lower than secondary school	25.58	29.50	23.93	1.23	3.80	< .001
Secondary school	20.44	30.54	18.42	1.66	5.91	< .001
Post secondary school	18.62	26.72	17.42	1.53	6.89	< .001
Marital status						
Married	15.94	22.28	14.93	1.49	5.05	< .001
Common-law	23.28	32.45	21.70	1.50	3.85	< .001
Widowed	19.53	23.27	17.60	1.32	2.80	.005
Separated	30.67	45.49	25.14	1.81	4.59	< .001
Divorced	26.98	37.28	22.71	1.64	3.96	< .001
Single	27.79	33.38	26.29	1.27	4.18	< .001
Immigrant						
Yes	18.85	22.88	17.63	1.30	2.75	.006
No	21.13	30.56	19.27	1.59	11.56	< .001
First language						
English	19.76	29.49	18.00	1.64	10.40	< .001
French	23.32	31.64	21.31	1.48	5.27	< .001
Allophone	19.90	23.14	18.89	1.22	2.11	.04
Ethnic group						
White	20.48	29.35	18.77	1.56	10.73	< .001
Black	17.41	24.94	14.28	1.75	1.79	.07
Chinese	16.39	17.79	15.90	1.12	.45	.65
Aboriginal (Indian, Métis, Inuit)	29.17	45.17	20.35	2.22	4.83	< .001
South Asian	23.72	21.50	24.46	.88	.54	.59
Arab	25.86	23.04	27.75	.83	.37	.71
Latin American	22.64	15.43	26.21	.59	1.54	.12
Province/region						
Alberta	20.61	26.50	19.36	1.37	3.00	.003
British Columbia	20.01	27.90	18.20	1.53	4.26	< .001
Manitoba	20.89	29.20	18.78	1.55	3.99	< .001
Atlantic Canada ^d	19.41	26.32	17.25	1.53	6.43	< .001
Ontario	19.64	27.61	18.15	1.52	6.61	< .001
Quebec	23.35	31.32	21.16	1.48	4.39	< .001
Saskatchewan	20.78	26.55	19.07	1.39	2.94	.003

Abbreviations: CCHS 1.2, Canadian Community Health Survey – Mental Health and Well-being, Cycle 1.2; N, overall sample size; n, sub-sample size; p, p-value.

^a Comparison tests were conducted between low-income population and non-low-income population with the bootstrapping method (500 bootstrap samples).

^b Bootstrapping techniques were used to produce the coefficient of variation (CV). Data with a coefficient of variation (CV) from 16.6% to 33.3% are identified and should be interpreted with caution.

^c t-value with degree freedom = 499, calculated from the 500 differences from bootstrap samples.

^d Atlantic Canada includes Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick.

TABLE 3
Prevalence of selected mental disorders and substance dependence (SMDSD) among low-income, non-low-income, and total population, over the previous 12 months, household population aged 15 or older, Canada excluding territories, 2002 (CCHS 1.2)

Mental disorders	Total population N = 36 984	Low Income population n = 6620	Non-low Income population n = 30 364	Prevalence ratio ^a	Comparison test ^b	
	%	%	%		t[499] ^c	P
Major depression	4.81	6.51	4.41	1.48	5.36	< .001
Mania	.96	1.64	.81	2.02	4.57	< .001
Panic Disorder	1.53	2.13	1.37	1.55	3.11	.002
Social phobia	3.01	3.57	2.86	1.25	2.51	.01
Agoraphobia	.74	1.30	.61	2.13	2.52	.01
Substance dependence	3.07	3.86	2.87	1.34	2.66	.01

Abbreviations: CCHS 1.2, Canadian Community Health Survey – Mental Health and Well-being, Cycle 1.2; N, overall sample size; n, sub-sample size; p, p-value.

^a Prevalence ratio: prevalence in low-income population / prevalence in non-low-income population.

^b Comparison test of the prevalence between Low income and Non-low-income population using bootstrapping technique (500 bootstrap samples).

^c t-value with degree freedom = 499, calculated from the 500 differences from bootstrap samples.

ethnic origin; whose first language is neither English nor French; and who live in Alberta or Manitoba.

Interaction with low-income status. We identified similar associations between sociodemographic variables and the prevalence of SMDSD among both low-income and non-low-income populations within the age, marital status, immigrant status and first language strata. However, among the non-low-income population, the prevalence of SMDSD among Aboriginal Canadians is 1.5 times that of White Canadians ($t = 2.07$; $p = .0434$), while this ratio is 2.2 among the low-income population ($t = 4.42$; $p < .001$).

Discussion

Rates of psychological distress and of any selected mental disorder and substance abuse (SMDSD) are much higher in the low-income population, and these differences are statistically consistent in most of the sociodemographic strata: region/province, gender, age, marital status, immigration, first language and ethnic origin. This confirms most of the epidemiological studies conducted around the world: the poorest individuals are the most vulnerable to mental health problems.¹⁻¹⁰

One out of five Canadians report high psychological distress, a rate that concurs with the results of an analysis of the National

Population Health Survey.²⁷ However, in the low-income population the rate of high level of distress is 50% higher than for the population living above the low-income threshold. Almost 14% of the low-income population has been diagnosed with a mental disorder or substance dependence, a rate 37% higher than for other Canadians.

Two frameworks have been proposed to explain this relationship.^{38,39} First, there could be an indirect association between poverty and mental illness through a selection and drift process. The concept of selection holds that certain individuals may be predisposed both to a mental illness and to lower expectations in life that may result in lower levels of educational and occupational achievement and poverty. The drift hypothesis refers to the likelihood that those with a mental illness may drift into poverty as they have difficulty attaining and maintaining regular employment. There is some evidence supporting the drift hypothesis in the case of psychosis.⁴⁰ On the other hand, the social fragility hypothesis states a more direct association between poverty and mental illness; it posits that the living conditions prevalent within socio-economically disadvantaged populations would generate additional psychiatric symptomatology. There is considerable evidence that poor populations face more chronic stress and life events,^{1,15-18} and cannot count on the reliable social networks that the higher-income population

can.²²⁻²⁶ When combined with a genetic predisposition, such factors may contribute to the development of mental illnesses. In another study on CCHS1.2, Caron and Liu⁴¹ found that coping skills, social support and sources of stress were the best predictors of psychological distress in Canada's low-income population.

Women, people who are single, separated or divorced, non-immigrants and Aboriginal Canadians are more likely to suffer from psychological distress or from SMDSD. People over 65, those who are married, immigrants, those whose first language is neither French nor English, and Chinese Canadians report the lowest prevalence of psychological distress or SMDSD. Women, people with less than high-school education, French speakers and Quebec residents show higher rates of psychological distress, but their rate of prevalence of SMDSD is no higher than other groups in their sociodemographic strata.

Stephens et al.²⁷ found that the probability of experiencing a heightened sense of coherence significantly increases with age, and self-esteem and a feeling of happiness reach a peak between the ages of 40 and 59 years. This could explain our findings that age is associated with lower levels of psychological distress and SMDSD, which is also consistent with the literature.^{27,42-46}

TABLE 4

Prevalence of selected mental disorders and substance dependence (SMDSD) among low-income, non-low-income, and total population, household population aged 15 or older, Canada excluding territories, 2002 (CCHS 1.2)

	Total population N = 36 984	Low-income population n = 6620	Non-low-income population n = 30 364	Prevalence ratio ^a	Comparison test ^b	
					t[499] ^c	p
	%	%	%			
	10.99	13.47	10.02	1.34	5.89	< .001
Gender						
Men	10.23	12.86	9.74	1.32	3.31	.001
Women	11.71	14.77	10.95	1.35	4.52	< .001
Age						
15-24	18.61	19.78	18.28	1.08	.99	.32
25-44	12.23	15.76	11.58	1.36	3.57	.001
45-64	8.84	14.74	7.82	1.88	4.72	< .001
65 +	3.40	4.54	3.00	1.51	2.17	.03
Education						
Lower than secondary school	11.54	12.75	11.03	1.16	1.64	.10
Secondary school	11.78	16.11	10.92	1.48	2.90	.004
Post secondary school	10.46	14.24	9.89	1.44	4.52	< .001
Marital status						
Married	6.59	6.88	6.55	1.05	.39	.70
Common-law	13.96	18.54	13.18	1.41	2.26	.02
Widowed	6.60	7.73	6.03	1.28	1.07	.29
Separated	20.75	29.95	17.30	1.73	3.21	.001
Divorced	17.48	23.43	14.95	1.57	2.63	.009
Single	17.59	19.62	17.04	1.15	1.95	.05
Immigrant						
Yes	6.66	7.05	6.55	1.08	.47	.64
No	12.17	16.66	11.29	1.48	7.29	< .001
First language						
English	12.58	17.76	11.65	1.52	6.90	< .001
French	10.56	14.39	9.64	1.49	3.51	.001
Allophone	6.63	6.31	6.74	.94	.32	.75
Ethnic group						
White	11.38	15.19	10.64	1.43	6.52	< .001
Black	6.82	9.96	5.47	1.82	1.34	.18
Chinese	4.16	3.51	4.39	.80	.47	.64
Aboriginal (Indian, Métis, Inuit)	22.18	33.51	15.95	2.10	3.62	< .001
South Asian	9.59	4.89	11.10	.44	1.94	.05
Arab	-	-	-	-	-	-
Latin American	6.92	4.75	8.04	.59	.74	.46
Province/region						
Alberta	12.19	14.82	11.69	1.27	1.47	.14
British Columbia	12.41	16.78	11.51	1.46	2.61	.01
Manitoba	11.28	14.06	10.63	1.32	1.47	.14
Atlantic Canada ^d	10.21	12.39	9.56	1.30	2.35	.02
Ontario	10.70	13.05	10.29	1.27	3.12	.002
Quebec	10.27	13.71	9.35	1.47	2.84	.005
Saskatchewan	11.94	16.06	10.77	1.49	2.25	.03

Abbreviations: CCHS 1.2, Canadian Community Health Survey – Mental Health and Well-being, Cycle 1.2; N, overall sample size; n, sub-sample size; p, p-value.

^a Prevalence ratio: prevalence in low-income population / prevalence in non-low-income population.

^b Comparison test of the prevalence between low-income and non-low-income population using bootstrapping technique (500 bootstrap samples).

^c t-value with degree freedom = 499, calculated from the 500 differences from bootstrap samples.

^d Atlantic Canada includes Newfoundland and Labrador, Prince Edward Island, Nova Scotia and New Brunswick.

Consistent with many studies,^{27,44,46-54} women in the non-low-income population report higher rates of psychological distress than do men, and they also report higher rates of depression and anxiety disorders independently of their economic status. On the hand, men report substance abuse rates twice that of women. Some research has found no gender difference.^{43,47} The higher rates of psychological distress but not SMDSD among women may indicate that the measure of psychological distress detects depression and anxiety disorders more efficiently than substance dependence.

Many studies have reported the protective effect of higher education on psychological distress,^{49,51} which is consistent with our finding for the whole population. However, further analyses on education level according to economic status shows that lower education is related to higher psychological distress only in non-low-income populations. Caron et al.¹ found that higher education was related to an increase in psychological distress in poor populations in Montreal, and explained it as a result of higher expectations for a better quality of life among people who had completed a higher level of education but were nevertheless economically disadvantaged. Surprisingly, no relationships were found between SMDSD and level of education.

Our result concurs with the studies that suggest a protective function of marriage on mental health.^{45,49,51,54} Other investigations have found interactions between age, gender and marital status; McDonough and Strohschein⁵⁴ reported that the significant association between marital status and distress was limited to those less than 44 years old, while Banhadur and Hauff⁴⁷ and Caron and Liu⁴¹ reported that living without a partner increased the level of distress only among females. In low-income populations nearly half of those separated report suffering from psychological distress, but the magnitude of this effect was not observed among non-low-income populations. On the other hand, the rate of SMDSD is the lowest among married people, but doubles for people living common-law in non-low-income populations and nearly triples in low-income populations. Many hypotheses

could be formulated for these phenomena, but specific research is necessary to understand these.

Our results show that psychological distress is much more common in Quebec than in Alberta, British Columbia, Atlantic Canada or Ontario. Similarly, Stephens et al. found that the populations of Newfoundland and Prince Edward Island report the lowest level of psychological distress in Canada and Quebecers report the highest.²⁷ However, some differences were noted between the prevalence of psychological distress and the prevalence of SMDSD according to first language and province. French-speakers report a higher rate of psychological distress than English-speakers, but have the lowest rate of mental disorders. The same phenomenon occurs for Quebec residents, where most of the population is French-speaking: a higher rate of psychological distress but one of the lowest rates of mental disorders in Canada. One possible explanation could be formulated using the stress/coping/social support models.¹²⁻¹⁴ These models view psychological distress as a transient state generated by chronic stressful situations or life events that could be alleviated by coping strategies and social support. One possible hypothesis for explaining these results is that French-speakers and Quebec residents experience more stress and distress, but may use better coping strategies or have better social support to prevent their distress from turning into a chronic condition resulting in mental disorders or drug dependency. Future research is needed to verify this hypothesis.

Being an immigrant is associated with a lower level of psychological distress and lower rate of SMDSD. In the Ethnic Diversity Survey,⁵⁵ immigrants were more likely to report a strong sense of belonging to their ethnic or cultural group than individuals born in Canada. Regardless of when they arrived in Canada, immigrants are also more likely to participate in ethnic or immigrant associations than are Canadian-born individuals. A sense of belonging to community is a predictor of lower psychological distress.^{1,27,41,56} Lower psychological distress and lower rates of SMDSD among immigrants could also be

explained by the immigration selection criteria, which excludes potential immigrants with chronic disease such as mental illness.

The prevalence of high psychological distress was 42% more frequent in the Aboriginal Canadians living off-reserve than among White Canadians, and was the highest of all ethnic groups. Aboriginal Canadians were also approximately 2 to 5 times more likely to experience SMDSD, compared to other ethnic subgroups. Although the prevalence of high psychological distress among low-income Aboriginal Canadians was significant and much higher than among most of the other low-income subgroups, non-low-income Aboriginal Canadians reported a level of psychological distress quite similar to most of the other subgroups. In the low-income Aboriginal subgroup, one person in three reported SMDSD. This seems to be a clear indication of the effect of poverty on the mental health of Aboriginal Canadians. Kirmayer et al.⁵⁷ also found a high rate of psychological distress in a community survey of the Cree of James Bay and found many risk factors; however, having a good relationship with others in the community and spending more time in the bush were associated with less distress. In Australia, researchers found higher rates of psychological distress and mental disorders among Aboriginal people and Torres Strait Islanders living in urban areas.^{58,59} However, those who had grown up with their families and had a strong sense of their identity and culture appeared to be less likely to show psychological distress.

Compared with White Canadians, Chinese Canadians indicated a significantly lower level of distress in both the low-income and the non-low-income populations. This group also showed a lower rate of SMDSD, nearly half that of the White subgroup. A protective effect of Asian ancestry has been reported in the literature in the USA⁴⁴ and Finland.³⁷ However, the cultural norms and reluctance to disclose distress because of perceptions of stigma might partly explain these lower rates.⁶⁰ It is also possible that the majority of instruments used in population surveys are designed in western countries and are not culturally

suites to detect psychological distress in an Asian population.

Black Canadians declared lower psychological distress than White Canadians in non-low-income populations but not in low-income populations and rates of SMDSD nearly half that of the White subgroup. However, the rate of mental disorders in the low-income group was almost double that of the non-low-income group. Black Canadians are more likely to report feeling that they had been discriminated against or treated unfairly by others because of their ethno-cultural characteristics.⁵⁵ Having a better income may mitigate the sense of discrimination experienced in this group and reduce stressful experiences.

Limitations

The CCHS 1.2 survey had several limitations. Underestimation of the prevalence of mental disorders and substance dependence is likely. First the survey does not measure all mental illnesses. Second, survey respondents were likely to answer questions in a way that was more socially accepted; those with illicit drug dependence may have underreported the frequency of their drug use or not reported their history of drug use at all. Third, homeless and institutionalized populations, both known to have a higher prevalence of mental disorders and substance dependence than the household population, were not included in the CCHS1.2.

Although the sample size and design was representative of the Canadian population and enabled us to identify many sociodemographic variables related to high psychological distress and mental disorders, its cross-sectional character did not allow us to infer causal relationships for the variables identified. Longitudinal studies will be necessary to assess the directional pathways.

We used crude proportions of high psychological distress for the comparison between low-income and non-low-income population. The results might be biased due to confounding by age and other factors. However, given that age distribution does not differ much between the income groups (average age is 45.31 and 43.66 for

low-income and non-low-income population, respectively), we believe that our results would not be seriously biased. However, analysis adjusting for age and other potential confounding variables would result in more accurate results.

A number of sociodemographic variables such as age, gender, level of education, marital status, poverty and ethnic background are linked to more powerful predictors of mental disorders and psychological distress, such as sources of stress, coping strategies and social support.^{1,41} Thus, in order to evaluate the relative contribution of sociodemographics, it is important to test multivariate models including many other powerful variables. This has been done for psychological distress among the Canadian population.⁴¹

In conclusion, even if the prevalence is underestimated, this study has helped portray the vulnerable groups in mental health for which prevention and promotion programs could be designed.

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Child Health Ecological Surveillance System (CHESS) for childhood obesity: a feasibility study

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Abstract

Objective: To assess the feasibility of employing an ecologically guided childhood obesity relevant surveillance system

Methods: Cross-sectional qualitative and quantitative data were collected from 31 organizational representatives across 28 unique organizations and/or departments from three purposively sampled communities in the Capital Health Region in Alberta, Canada.

Results: All the organizational representatives surveyed reported awareness of childhood obesity and 36% reported participation in child obesity initiatives. Data to support a surveillance system are available but not in a suitable format, and privacy legislation present significant barriers. Interest in developing and sustaining an ecologically based surveillance system was low (18%).

Conclusion: Due to the heterogeneity of available data and limited vision for the development and implementation of a surveillance system, the application of an ecologically based surveillance system relevant to childhood obesity may be constrained. Broad-based awareness of childhood obesity by a wide range of organizations could assist in establishing an effective coalition to address this issue over the long term by supporting the establishment of a surveillance system.

Key words: ecological surveillance system, child health, obesity, Alberta

Introduction

Prevalence rates of overweight and obesity in children and youth point to an urgent need to address this public health concern.¹⁻⁴ Given the complex etiology of overweight and obesity, the low level of success of pediatric obesity treatment and the absence of a comprehensive surveillance system to monitor child health in Canada, there is a need for an ecologically driven child health surveillance strategy to inform research, policy and practice related to this public health concern.⁵⁻⁷

Within the context of moderating childhood obesity, the development and validation of a systematic approach to surveillance that considers individual and multilevel environmental factors could enhance capacity for ongoing surveillance, theoretical and applied research, and public health initiatives at a local level.⁸⁻¹⁰ More specifically, such a framework could serve to explicate the interactions between the well-established individual behavioural determinants of childhood obesity (i.e. physical inactivity and excess energy intake) and the less

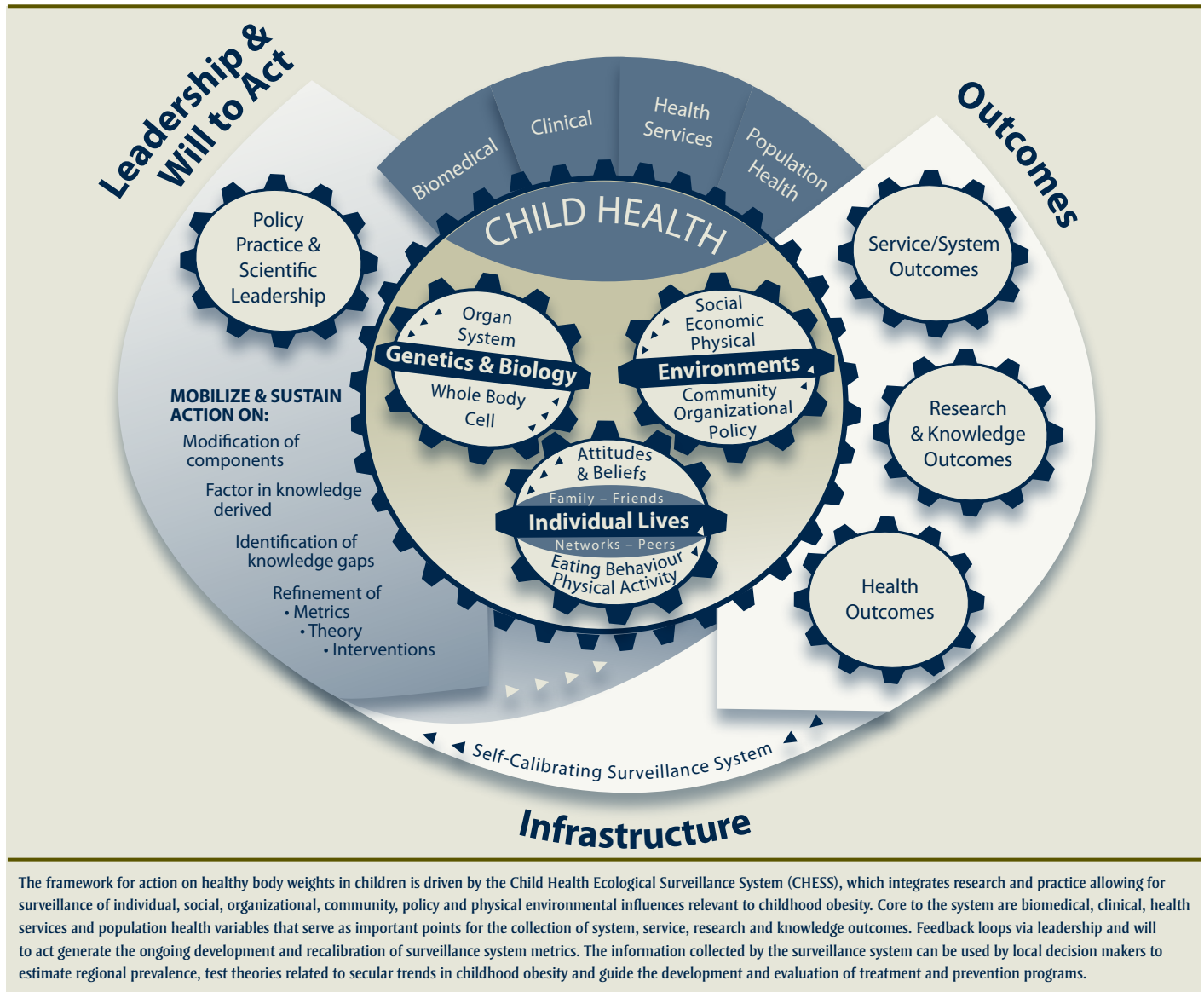
understood social and environmental determinants of those behaviours.¹¹⁻¹⁴

To gain further insight into the complex nature of childhood obesity, the Capital Health Region in Edmonton, Alberta, Canada, collaborated with the University of Alberta to initiate a research study addressing childhood obesity from a regional perspective. Initially the project involved the development of a pediatric ecological surveillance prototype whose objective was to address obesity prevention and management among children and youth living in the Capital Health Region. From this emerged the Child Health Ecological Surveillance System (CHESS), which incorporates a multilevel (i.e. individual and environmental) ecological framework that organizes and captures the important constructs and a range of outcomes (i.e. systems/services, research, knowledge and health) driven by existing infrastructure (e.g. resources), leadership (i.e. policy practice and scientific leadership) and the *will to act* (see Figure 1; the details of the CHESS framework are published elsewhere⁸). The various outcomes are then fed back to local decision makers to modify the surveillance system as needed and to identify knowledge gaps and refine metrics, theory and interventions. The ongoing collection of local data on core measures at multiple levels will provide ongoing regional prevalence data, allow for the testing of theories related to secular trends in childhood obesity, and guide the development and evaluation

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FIGURE 1
Framework for action on healthy body weight in children



of treatment and prevention programs by providing reliable information.

Although CHES was developed with certain applications in mind, it is thus far only conceptual⁸ and questions remain as to the practicality and sustainability of the framework at a regional level. Therefore, we sought to further develop CHES by

(1) delineating fundamental system and operational characteristics and determining the metrics (core and subsidiary) within 6 explicit ecological levels* relevant to childhood obesity (study objective 1), and (2) testing the feasibility of applying the framework at a regional level (study objective 2). The primary aim of this paper is to provide evidence for the feasibility of

applying CHES at a regional level within the context of childhood obesity.

Methods

This feasibility study was conducted over 2 phases with the primary aim of testing the practicality and sustainability of applying a global ecological surveillance framework

* Individual (intrapersonal) levels include genetic, biomedical, behavioural cognitive and attitudinal behaviours; social (interpersonal) aspects such as family, peers, neighbours, other groups and larger social networks; organizational aspects such as norms, culture, structures, rules, regulations and incentives in schools and other institutions that relate to children; community aspects such as area economics, media, community services, neighbourhood organizations, folk practices, relationships among organizations in the community, municipal structures, formal and informal leadership; macroeconomic policy such as local, provincial and federal legislation, policy, taxes, regulatory agencies; and physical environments such as facilities, playgrounds, parks, trails, prevalence of convenience/fast foods versus more healthy options, safety factors, and geographical aspects such as climate.

such as CHES to a local community. The study's steering committee, which was purposively sampled, included a physician, a scientist, 2 senior public health administrators, 2 epidemiologists and a project coordinator. They contributed knowledge and expertise in the relevant areas of community health, influencing systems and designing health surveillance initiatives. The group was charged with developing an information collection protocol (phase 1) utilizing both qualitative and quantitative data/information gathering techniques.¹⁵ Subsequent testing of the newly developed information-gathering protocol (described below) was completed in phase 2.

Phase 1: Creating the Healthy-weight Information Protocol

Using an interactive hybrid Delphi method,¹⁶ the Healthy-weight Information Protocol (HIP) was created based on a review of published literature and expert stakeholder input. It includes a working typology of potentially feasible and ecologically relevant indicators/targets of childhood obesity in keeping with guiding principles of the World Health Organization,¹⁷⁻²¹ and is sorted into core[†] (essential) and subsidiary or additional[‡] (useful, ideal) metrics.

Creating the HIP was a necessary first step towards the development of an information-gathering protocol to facilitate the systematic collection and analysis of data for the feasibility testing of CHES (phase 2). The goals of the HIP were to develop a user-friendly and straightforward system capable of collecting and maintaining longitudinal data using the 6 ecological levels (i.e. individual, social, organizational, community, policy and physical environments); identify gaps in the information needed to determine the significant indicators affecting rates of obesity; create a plan for analyzing the data and develop a variety of multilevel community programs

and health initiatives that address child/youth obesity from a population health perspective. The HIP is regionally directed; it builds on existing regional programs and services, provides valuable longitudinal information regarding children's weight gain at the regional population level, and integrates research and action. The ultimate aim is to produce a theoretically sound and cost-effective tool for collecting relevant information regarding children's health/obesity in regions throughout Canada and stimulating viable community action regarding child obesity from a population health perspective.

Central to the HIP was the creation of an interview guide to gather pertinent information about community organizations relevant to CHES within the context of childhood obesity. The interview guide contained 17 questions which sought to describe the organization's current involvement and perceived commitment to childhood obesity issues (5 questions); estimate relevant and available data/information systems and resources (8 questions); and probe current levels of awareness regarding organizational and community capacity and the degree of perceived motivation within the community and the organization (4 questions). While the questions were primarily open-ended, 7 questions included Likert-type scales enabling the quantification of responses. The HIP Interview Guide (see Table 1) was field tested and changes were made prior to the feasibility assessment (phase 2).

Phase 2: Feasibility assessment

The HIP facilitated the evaluation of the applicability of CHES in terms of degree of interest and motivation within a community; the quantity and quality of relevant data; the availability of both human and financial capacity; and the potential

for sustainability of CHES at the community level.

Three diverse communities—based on social/cultural, economic and population size indicators—within the Capital Health Region of Alberta were purposively sampled¹⁵ for data-gathering using HIP. The populations of the 3 communities range from 15 000 to approximately 50 000, and the overall median family incomes approximate \$78,000.[§]

Key individuals within organizations in the 3 communities were included in the assessment if they had expertise and current or potential involvement in child obesity. They were identified through a snowball sampling technique with names initially selected by the study's steering committee. In each of the 3 communities, groups/organizations within 5 distinct organizational categories (Tables 2 and 3) were targeted and at least one person from each organization was interviewed in person by the study coordinator. Two individuals from relevant government departments (Education and Child Services), an economist and a social marketing researcher were also interviewed. All interviewees resided and/or worked in one of the 3 study communities.

This study received ethics approval from the University of Alberta Health Research Ethics Board.

Results

Both qualitative and quantitative cross-sectional data were collected and collated from 31 representatives (58% women; n = 18) across 28 unique organizations and/or departments relevant to childhood obesity. All the individuals approached completed the interviews. (See Tables 3 and 4 for further details.)

[†] Core metrics at the individual or intrapersonal ecological level consist of height, weight, physical activity (PA) and nutrition levels.

[‡] Subsidiary metrics at the individual (intrapersonal) ecological level include energy expenditure, PA and nutrition patterns and practices, attitudes and body fat; at the social (interpersonal) ecological level, include parental attitudes and food choices; at the organizational level, include information regarding the nutritional value of school meals and access to healthy choices, access to dietician/nurse in schools and daily PA in school; at the community level, include local media campaigns and the number, accessibility and cost of community-based PA programs; at the macroeconomic policy level, include municipal, regional and/or provincial policies related to nutrition, statistical reports related to obesity, and regulations for food services and PA in schools and daycares; at the level of physical environments, include proximity to and number of fast food outlets, number of schools with vending machines selling junk foods, access to public transit (cost and location), available infrastructure (parks, cycling walking paths, secure bike racks, number of cross-walks), design of community buildings and space for PA.

[§] <http://www.albertafirst.com/profiles/community/>

TABLE 1
Healthy-weight Information Protocol (HIP) interview guide

CHILD OBESITY CONCERN/INTEREST/INITIATIVES				
1. Tell me how strongly you agree or disagree with the following statement: “Child health is of concern for our community.”				
Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
1	2	3	4	5
2. Are there specific programs/services/initiatives/coalitions presently operating in the community that address child health concerns? Tell me about them.				
3. Tell me how strongly you agree or disagree with the following statement: “Child obesity is of concern for your community?”				
Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
1	2	3	4	5
4. Are there specific programs/services/initiatives/coalitions presently operating in the community that address concerns related to child obesity? (Yes/No) Tell me about them.				
5. Has the organization collaborated with any of the following groups/organizations on issues related to child health and/or obesity concerns in the past twelve months?				

	Child Health		Child Obesity	
	Yes	No	Yes	No
Government				
Municipal				
Provincial				
Federal				
Professional Associations				
Unions				
Businesses outside the health sector				
Private sector				
Consultants				
Universities/colleges				
Schools				
Public Health				
Names/contacts:				

INFORMATION/DATA

1. What types of information/data does your organization presently collect?
(Demographic, social, health, program, etc. How the information is collected, i.e. ecological models, form, etc.)

Type of information/data collected:

2. The information presently collected by our organization is used to develop policy, plans and programs/services.
To what degree do you agree/disagree with this statement?

Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
1	2	3	4	5

Other specific uses:

3. How much of the information presently collected by your organization is specifically related to children's health?
Estimated best guess _____% (for each of the items 3-5)

4. How much of the information presently collected is specifically related to child obesity?

5. How much of the information presently analyzed and utilized by your organization is used to address child health and obesity concerns in the community?

6. Is your organization presently involved in a project that links the information you gather on a regular basis with another organization?
(Yes/No) Discuss the collaboration and the linkage.

7. Tell me what challenges your organization dealt with or might deal with if linking information with another organization?
What supports this type of collaboration?

8. Tell me about the information systems operating in your organization that collect, analyze, and utilize data/information. Specialized dept. staffing, resources etc.

COMMUNITY BUILDING

This section explores the potential capacity you think your organization and the
Community has for developing, maintaining and utilizing CHESS. We are interested in obtaining your feedback in this section.

1. This organization has the capacity for developing, maintaining and utilizing a Child Health Ecological Surveillance System. (How would you identify/characterize the capacity of your organization to collaborate?)

Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
1	2	3	4	5

2. This community has the capacity for developing, maintaining and utilizing a Child Health Ecological Surveillance System. (Identify/characterize the capacity of the community to collaborate.)

Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
1	2	3	4	5

3. CHESS could be useful in helping our organization to address child health concerns in the following ways. Circle each option.

Our Organization					
Policy	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Planning	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Programs/Services	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Awareness	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Program evaluation	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Research	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Other	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree

4. CHESS could help our community address child health concerns in the following ways. Circle each option.

Our Community					
Policy	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Planning	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Programs/Services	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Awareness	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Program evaluation	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Research	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree
Other	Strongly disagree	Disagree	Neither agree/disagree	Agree	Strongly agree

TABLE 2
Categorical organization for feasibility assessment of a child health ecological surveillance system

Organizational categories	Groups/organizations	Relevant ecological level
Municipal Government	Planning	Public policy ^a
	Parks and Recreation	Institutional factors ^b
		Physical environment ^c
Community Services	Family and Child Social Services	Community factors ^d
	Non-profit children's clubs and organizations	Public policy ^a
	Food banks	
Education	Day Care	
	Public/Private	Public policy ^a
	School	Institutional factors ^b
	Elementary/Junior/High	
Medical	Health Services	Personal factors ^e
		Interpersonal process ^f
Business	Food Industry	
	Fitness Centres	Organizational factors ^b

^a Macroeconomic policy level including municipal and provincial policies related to nutrition, regional/provincial statistical reports related to obesity, regulations for food services for schools and daycares, and provincial regulations regarding physical activity (PA) in schools.

^b Organizational level including nutrition information regarding school meals and access to healthy choices, access to dietician/nurse in schools, daily PA at school.

^c Physical environments include proximity to and number of fast food outlets in a neighbourhood, number of schools with vending machines selling junk foods, access to public transit (cost and location), available infrastructure (parks, cycling and walking paths, secure bike racks, number of cross-walks), design of community buildings, and space for PA.

^d Community level including local media campaigns and the number, accessibility and cost of physical activity-related programs to community members.

^e Individual level, i.e. height, weight, physical activity (PA) levels, nutrition patterns and practices, attitudes, body fat.

^f Social level, e.g. parental attitudes and food choices.

TABLE 3
Organizational and personal characteristics of feasibility study participants

	Total number	Community			Expert
		A	B	C	
Organizations	28				
Municipal Government	7	3	2	2	—
Schools/Daycares	6	2	2	2	—
Community Resources	5	1	3	1	—
Fast Food Industry	3	1	1	1	—
Health Services	3	1	1	1	—
Fitness Industry	2	1	0	1	—
Provincial Government	2	0	0	8	—
Individual representatives	31				
Men/women	13/18	4/6	5/4	4/6	0/2
Years employed in current position					
Less than 2	—	2	3	2	0
3–5	—	4	4	3	0
6–10	—	2	0	2	1
More than 10	—	2	2	3	1
Job Position					
Manager	—	2	2	3	1
Owner	—	2	2	0	0
Director	—	3	2	3	1
Programmer	—	0	0	1	0
Planner	—	1	1	1	0
Coordinator	—	1	2	0	0
Educator	—	1	0	2	0

Organizational awareness, involvement and interest

All the interviewees (N = 31) reported being aware of childhood obesity and expressed interest in the topic (Table 4).

Data

Based on interviewees' responses, of the 28 organizations that completed the study, 68% provide some form of child health service or program, 36% participate in childhood obesity prevention initiatives, 100% have individual child health data and all have program data relevant to childhood obesity readily available (Table 4). Although all the relevant data are in an electronic format, these data are managed using a variety of platforms and thus only 39% of the available data are potentially accessible and in a practical format for addressing the childhood obesity components germane to CHES.⁸

Table 5 shows general health indicators and data associated with childhood obesity available from the various organizations within the levels outlined in the CHES framework.⁸

Sustainability

While 64% of the representative organizations reported the availability of an infrastructure suitable for the development and maintenance of a surveillance system, interest in developing such a surveillance system was expressed by only 18% and seemed to possess the requisite vision and leadership to initiate and sustain it was reported by 43%.

Discussion

Childhood obesity is an important public health concern, yet there is little evidence of practical and sustainable surveillance strategies to inform research, policy and best practice. To address this gap, we sought to assess the feasibility of employing a multilevel childhood obesity-related surveillance system at a regional level.

Childhood obesity prevention initiatives are available at regional and provincial levels. For example, the Government of

Alberta, Department of Education, has mandated daily physical activity guidelines and, more recently, province-wide nutrition guidelines.²¹⁻²³ Initiatives such as the promotion of healthy body weights at health centres where children are vaccinated, specialized pediatric centres dedicated to obesity management and the formation of various partnerships with local business exist at the regional level.²⁴⁻²⁵ Also, data from our study suggest that daycare operators are attempting to increase daily physical activity and provide healthier food options, and that Parks and Recreation departments are actively marketing outdoor activity opportunities (i.e. nature trails) as a part of building healthy communities. In one community, the city logo was recently changed to highlight the benefits of outdoor activity in creating a healthy community. Fast food and fitness organizations are offering additional menu choices and fitness programs appropriate to children and youth. Thus, there appears to be some initiative and capacity to address childhood obesity at different levels and settings.

Not surprisingly, our findings show that organizations and their representatives from the three communities are mindful of the epidemic nature of childhood obesity. However, despite cogent *personal will* to address childhood obesity, there are overpowering infrastructure barriers, such as data in different forms, legislative barriers and organizations with funded mandates for which they are accountable, leaving scant excess capacity to address this public health issue.

Based on the information collected, there is not yet sufficient and/or suitable data to populate an ecological model such as CHES. Thus, there continues to be a need to collect data specific to childhood obesity, at all levels of the ecological framework.⁸ There exist, however, pockets of information that serve as a solid platform to create a useful surveillance system. Two key conclusions can be drawn from this feasibility assessment of CHES within the context of childhood obesity:

1) Disparate data, in a variety of formats, present both technical and accessibility

challenges to the application of an ecological model.

Essential to the feasible application and utilization of an ecological framework is the availability of relevant data in a format easy to capture and transfer. Our study suggests that cross-sectional data regarding the general health of children and youth are being collected by a variety of organizations, but not data that specifically relates to childhood obesity (for example, there are no data on physical activity and nutrition).

While some degree of information on physical activity and nutrition exists at the organizational, community and macroeconomic policy levels, data at social levels are either non-existent, cannot be shared due to differing data formats or are withheld due to confidentiality concerns. Moreover, longitudinal data at all levels are lacking. These data limitations make effective assessments of interventions and policy changes problematic.

In terms of physical activity indicators, municipalities (Parks, Recreation, Community Services and Planning Departments) have general information concerning parks and trail usage, program statistics, current resource distribution as well as the types of resources necessary to facilitate or foster physical activity in each community. Comparable nutrition specific information appears to be non-existent.

Based on the evidence collected in this feasibility study, most available data are stored in electronic mediums; however, these data may not be congruent in terms of measurement, collection and synthesis appropriate for populating the ecological model. Although information access was acknowledged as a technical challenge, participants generally agreed to share data with others.

2) Broad-based awareness and interest regarding child obesity by a wide range of groups and organizations could facilitate establishing an effective coalition to address the issue over the long term.

TABLE 4

Organizational awareness, interest and current involvement in the issue of childhood obesity, available data, and potential ability to sustain a child health ecological surveillance system (number of positive responses)

Organizations (N=28)	Number of positive responses									
	Aware of topic	Interested in topic	Provision of child health program or service	Obesity initiatives	Individual child health data	Program data	Easy and practical access to records	Interest in developing surveillance system	Potential for developing infrastructure	Vision/ leadership
Community Resources n = 5										
Community A	3	3	3	3	3	3	2	–	3	1
Community B	1	1	1	–	1	1	1	–	1	–
Community C	1	1	1	–	1	1	1	–	1	–
Fast Food Industry n = 3										
Community A	1	1	1	–	1	1	–	–	1	–
Community B	1	1	1	–	1	1	–	–	1	–
Community C	1	1	1	–	1	1	–	–	1	–
Fitness Industry n = 2										
Community A	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Community B	1	1	1	1	–	1	1	–	1	–
Community C	1	1	1	1	–	1	1	–	1	1
Health Services n = 3										
Community A	1	1	1	1	1	1	1	–	1	–
Community B	1	1	1	1	1	1	1	1	1	1
Community C	1	1	1	1	1	1	1	1	1	1
Municipal Govt. Dept. n = 7										
Community A	2	2	2	1	–	2	2	–	1	2
Community B	3	3	3	1	–	3	3	–	1	1
Community C	2	2	2	1	–	2	2	–	1	2
Schools/Daycare n = 6										
Community A	2	2	2	2	–	2	2	–	–	–
Community B	2	2	2	1	1	2	2	1	–	1
Community C	2	2	2	1	1	2	2	1	–	–
Provincial Govt. n = 2										
	2	2	2	2	2	2	2	2	2	2
Total positive responses	28	28	19	10	28	28	11	5	18	12
% of orgs. with positive responses	100%	100%	68%	36%	100%	100%	39%	18%	64%	43%

Abbreviations: –, not present in the representative organization; N, overall sample size; n, sub-sample size; n/a = no representative organization.

Note: all data from various participating organizations were stored in electronic formats.

TABLE 5
Application of the HIP model based on organizations with accessible information from the 3 communities

Ecological level	Application	Measures	Organizations with the information
Individual/intrapersonal ^a	Child health	Demographic	Most of the participants; Statistics Canada
	Child obesity	BMI	Regional Health Authority
Social/interpersonal ^b	Child health	TV watching	Community Services; Food Banks
	Child obesity	—	—
Organizational ^c	Child health	Demographic	Public schools; Recreation Centres
	Child obesity	Monitoring of nutrition and physical activity; journaling	Public high schools
Community ^d	Child health	Program registration, wellness, fitness statistics, sports team data	Recreation; Community Services; Boys and Girls Clubs of Canada
	Child obesity	—	—
Macroeconomic policy ^e	Child health	Hot lunch programs; Daycare nutrition programs	Daycares; Provincial and Municipal Governments
	Child obesity	Mandatory daily fitness program ^f	Provincial Government
Physical environment ^g	Child health	Playgrounds, trail usage, parks, planning and development information, playing field usage	Municipal Government

Abbreviations: BMI, body mass index; HIP Healthy-weight Information Protocol.

^a Individual (intrapersonal) levels include genetic, biomedical, behavioural cognitive and attitudinal behaviours.

^b Social (interpersonal) aspects such as family, peers, neighbours, other groups and larger social networks.

^c Organizational aspects such as norms, culture, structures, rules, regulations and incentives in schools and other institutions that relate to children.

^d Community aspects such as area economics, media, community services, neighbourhood organizations, folk practices, relationships among organizations in the community, municipal structures, formal and informal leadership.

^e Macroeconomic policy such as local, provincial and federal legislation, policy, taxes, regulatory agencies.

^f Introduced in January 2005.

^g Physical environments such as facilities, playgrounds, parks, trails, prevalence of convenience/fast foods versus more healthy options, safety factors, and geographical aspects such as climate.

Even in the absence of an overarching, multilevel community-based policy targeting for child health and childhood obesity, there are a number of initiatives, programs and services operating in all three communities. A wide range of after-school and recreational sports and activity programs, and the intentional actions on the part of daycare centres and schools to provide healthy food choices, address general child health concerns.

This broad-based interest in child health establishes a viable context for collaborating on the issue of childhood obesity. Existing initiatives speak positively to the interest that has already spawned action in a number of the categories. Potential partners are equipped with a significant level of knowledge and data given their existing commitment and community connections. A number of participants, particularly private businesses, suggested that if they were to collaborate they would want to know the benefits for their organization. Broad-based awareness of childhood obesity by a wide range of organizations could assist in establishing an effective coalition to address this issue over the long term by supporting the establishment of a surveillance system. Public Health departments may be the cornerstone organization to lead such initiatives.

Limited vision, human resources and financial support at the local level were detected. Consequently, any action towards the development of a regional surveillance system for childhood obesity may require leadership from provincial and regional bodies that are already involved. It is also evident that limited human and financial resources in addition to other competing mandates are barriers to participation in the development of a large-scale, broad-based initiative on childhood obesity such as CHES.

Insufficient leadership at the local level does not mean that there are limited opportunities to explore potential collaboration—technological, survey and system. Planning departments in all three communities provided a wealth of broad-based information, as did Parks and Recreation departments. The expansion of existing

community service programs and services to incorporate childhood obesity initiatives is feasible according to the organizations who participated in this study. In addition, local organizations with a national network (e.g. Boys and Girls Clubs of Canada) have access to national data and programs in addition to their local information. This information may be useful in the development of a regional system.

Conclusion

The feasibility of operating a surveillance system like CHES in the three targeted communities may be complicated by a mandate for action rather than surveillance on the part of local organizations; limited applicability of tools that measure physical activity and nutrition within the ecological model; limited access to local resources (both human and financial); competing organizational mandates; and differing formats of electronic data and privacy legislation. In addition, the absence of developed strategic plans and a leadership framework significantly limits the sustainability of a childhood obesity agenda.

It is also important to acknowledge the limitations of this study, which include the minimal number of communities examined and the incongruence in the number of organization types surveyed within each of the 3 communities, thereby potentially limiting the generalizability of the study results. Future research may examine the generalizability of these findings by applying CHES to other regional health jurisdictions and including a wider group of organizations.

Despite these limitations, our findings (including the process evaluation components) indicate that diverse initiatives exist and the information gathered is being applied in a variety of contexts at individual and multi-environmental levels. Although developing a large-scale system (populated with multilevel data) is still the ultimate recommended goal for local communities to tackle the child obesity epidemic, other interim staged strategies are required for the development and maintenance of an integrated framework such as CHES. For example, an incremental process of data

gathering capitalizing on easily accessible and affordable metrics may be more practical in the short term, and a more interactive, cohesive, yet flexible framework with a project-centered focus may need to be developed. At a minimum, it is recommended that local jurisdictions obtain the core individual-level measures (i.e. height, weight, physical activity behaviour, and nutrition behaviour) and, where possible, any of the environmental levels. As the capacity for generating quality data improves, local jurisdictions can continue to populate the multilevel database with appropriate metrics in a strategic and coordinated fashion. Further, it may be warranted for academic experts to work with organizations to identify data that would be useful for the organizations, identify the indicators organizations could use and provide support as needed.²⁶ Comparable organizations could use the same indicators and the experts could compile and report back results specific to each organization (along with aggregated data, i.e. across all organizations) for particular indicators. Such information could assist organizations with their planning, programming and evaluation. Such approaches underscore the importance of partnerships between researchers, practitioners and policy-makers.

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Trends in diabetes treatment in Canadians, 1994–2004

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Abstract

Objective: To examine trends in the treatment of diabetes using the biannual interviews of the longitudinal National Population Health Survey (NPHS), 1994–2004 as they relate to changes in Clinical Practice Guidelines (CPGs).

Methods: A sample of 17 276 Canadians 18 years and older was selected for repeated interviews at two-year intervals from 1994 to 2004 for the NPHS. The population used for this study includes all respondents aged 40 to 79 for any of the cycles.

Results: CPGs issued by the Canadian Diabetes Association in 1998 and 2004 recommend a stepwise introduction of lifestyle changes, to be followed by single then multiple oral antidiabetic agents (OA), and finally insulin until adequate control is achieved. While the use of OA increased, only a small proportion indicated diet or physical exercise as part of their treatment; those with no drug treatment reported less diet modification and physical exercise. Antihypertensives and statin use in Canadians with diabetes increased to double that of Canadians overall, but remained underutilized.

Conclusion: This study provides an update on the treatment of diabetes in Canada between 1994 and 2004. While some changes in diabetes treatment were compatible with CPGs, there is room for improvement, especially in lifestyle modifications.

Keywords: diabetes management, oral antidiabetic agents, clinical practice guidelines, lifestyle modifications, obesity, NPHS Survey

Introduction

People with diabetes have a greatly increased risk of many adverse health outcomes, including heart disease, stroke, blindness and renal disease.¹ Up to 80% of people with diabetes die of vascular diseases. Primary cardiovascular disease prevention with lipid-lowering medication, such as statins and antihypertensive therapies, markedly reduces cardiovascular events and risk of death in people with diabetes;^{2,3} however, improved patient outcome as a result of glucose lowering is assumed but has not yet been convincingly

demonstrated.⁴ A program that comprehensively addressed lifestyle and pharmacotherapy for multiple risk factors resulted in a 40% reduction in total mortality, highlighting the importance of an inclusive approach.⁵

Over the last decade, several sets of clinical practice guidelines (CPGs) have been produced by the Canadian Diabetes Association in order to help health care professionals develop efficient treatment plans for their patients. Of these, two will be relevant to this study.^{6,7}

The objectives of this study are to examine trends in the treatment of glycemia, dyslipidemia and hypertension in Canadians with diabetes. Of interest will be whether changes in these trends over the years are generally compatible with CPG recommendations.

Methods

The study population was derived from the longitudinal National Population Health Survey (NPHS) which began in 1994 with a random sample of the Canadian population. The sampling frame for this sample originated with the Labour Force Survey for all provinces except Quebec, for which a provincial sampling frame was used. The sample design was a stratified multi-stage design. In the first stage, samples of clusters were drawn from pre-specified strata, and in the second stage, households were selected from lists of members of the chosen clusters. One person was randomly chosen from each household as the longitudinal respondent. A sample of 17 276 Canadians 18 years and older was selected for repeated interviews at two-year intervals from 1994 to 2004 for the NPHS. The study population used includes all respondents aged 40 to 79 for any of the cycles. To keep the age composition constant for each successive cycle of interviews, younger respondents were added to the study population as they reached age 40, while older respondents were dropped as they reached age 80.

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Information available for analysis included background, lifestyle, health and treatment variables. Respondents were asked to rate their health status on a five-point Likert scale. The top two categories were combined as “good health” and the bottom three as “poor health.” Respondents were also asked whether they had taken any medications in the previous two days. If the answer was yes, the person was then asked to spell the name of the medication on the label of the container. The drug name was then coded using the Anatomical Therapeutic Chemical (ATC) classification system.

Self-reported diabetes was elicited by the question “Do you have diabetes?” Further questions were about insulin use and other treatment. Questions on diet and exercise started with the question “Do you take medication or treatment for your diabetes other than insulin?” Those who answered “yes” were asked separate questions about medication use, diet and exercise as part of their treatment of diabetes.

Body mass index (BMI; kg/m²) was based on self-reported height and weight, and grouped into optimal weight (BMI less than 25), overweight (25–29.9) and obese (30 and over).

Results

The number of respondents in the study population increased from 3970 in 1994 to 5400 in 2004 (Table 1). This net increase of 1430 was as a result of adding participants who reached age 40 and dropping those who reached age 80 in the previous interval. The number of people with diabetes increased from 156 to 431.

Table 2 shows the attributes of the overall study population and of people with diabetes. Differences between the two populations were apparent for age, education, BMI and self-reported health. While the overall population showed an increasing prevalence for obesity (BMI ≥ 30) between 1994 and 2004, obesity among people with diabetes remained at about double that of the overall population. Changes in medication use over the years include small decreases in insulin use and

an approximate 30% increase in the use of oral antidiabetic agents (OA), with the greatest increase occurring between 1998 and 2000 (Table 2). Similar patterns are reflected by the odds ratios (OR) adjusted for age and sex presented in Table 3. Since OA and insulin were not used by people without diabetes, no meaningful OR could be derived for these medications. The use of antihypertensives and statins increased markedly over this time and the increase in their use in the diabetic population was greater than in the overall population (Tables 2 and 3).

The proportion of people with diabetes who did not use any medication decreased, as did the proportion treated with insulin only (Table 4). The proportion of the diabetic population treated with any OA increased over the years, especially after the 1998 cycle. In terms of specific OA, biguanide (metformin) use increased from about 20% in the first two cycles (1994 and 1996) to about 46% in the last two cycles (2002 and 2004), while sulfonylurea use fluctuated around 40% in the first four cycles (1994, 1996, 1998, 2000) but decreased over the last two cycles (2002 and 2004). The proportions of individuals taking more than one OA started to increase in 1998.

The proportion of people with diabetes using diet as part of their treatment stayed at around 20% over the years of the study but peaked at 24% in 1998 and showed the start of another peak in 2004. These peaks were higher, and the troughs lower, for people with diabetes who were not using any antidiabetic medication. Exercise as part of the treatment for diabetes showed a slight decrease over time and was lower for those with no anti-diabetic drug treatment.

Discussion

This study provides an update on the treatment of diabetes in Canada between 1994 and 2004, during which many changes took place. Obesity increased from 16% to 21% in the overall population and from 38% to 44% in people with diabetes. The diabetic population showed increased use not only of OA, but also of statins and anti-hypertensive agents. Only a remarkably

small proportion of the diabetic population reported lifestyle changes as part of their treatment for diabetes.

Two sets of CPGs were produced by the Canadian Diabetes Association within the period covered by this study, in 1998 and in 2003.^{6,7} The 1998 CPG published a chart illustrating a stepwise approach to the management of type 2 diabetes.⁶ The first line of action should be lifestyle modification, including diet, exercise, and smoking cessation, and education about diabetes self-care. If the goals for glucose control have not been achieved after a few months, the next step is OA monotherapy using biguanides, alpha-glucosidase inhibitors or sulfonylureas, depending on the needs of the individual. If glucose control is still not achieved, or is no longer achieved, oral combination therapy can be started, most commonly with a combination of the OA classes mentioned above. The next step would be the addition of insulin, with or without OA. The 2003 CPGs include more stringent recommendations regarding the control of blood pressure and lipids than those for the rest of the population.⁷

Only about 20% of respondents with diabetes said that they used diet as part of their treatment for diabetes, and only about 10% exercised as part of their treatment. Neither of these percentages changed much over the years of the study. Although the survey question leading to diet and exercise is obscure (not everyone sees exercise as a treatment for diabetes), it confirms our previous study where we reported little change in lifestyle after diagnosis of hypertension in Canadians.⁸ While the slight increase in the percentage of the study population who become more physically active is encouraging, the increasing prevalence of obesity is worrisome, both directly as a risk factor for diabetes, and indirectly, as obesity decreases the motivation for exercise. Of special interest are the short-term changes in dieting, corresponding to the publications of the 1998 and 2003 CPG.^{6,7} These changes are compatible with a short-term enthusiasm when the new CPG recommendations were still fresh in the minds of physicians and patients; new guidelines in hypertension therapy also caused similar short-lived

TABLE 1
Study population, age 40–79 years, Canada, 1994–2004

Population		1994	1996	1998	2000	2002	2004
All	N =	3970	4263	4579	4901	5184	5400
With diabetes	n =	156	201	236	309	387	431
	%, unweighted	3.9	4.7	5.2	6.3	7.5	8.0
	%, age-adjusted and weighted	3.7	4.8	5.0	5.9	6.9	7.5

Abbreviations: N, overall sample size; n, sub-sample size.

TABLE 2
Comparing people with diabetes to the overall population (shaded), age 40–79 years, weighted for the Canadian population, 1994–2004

Percentage of the study population												
Categories	1994		1996		1998		2000		2002		2004	
	Diabetes %	Overall %	Diabetes %	Overall %	Diabetes %	Overall %	Diabetes %	Overall %	Diabetes %	Overall %	Diabetes %	Overall %
Sex												
Male	51.8	46.1	51.8	46.7	50.2	46.9	52.1	46.9	50.2	47.4	50.7	47.7
Female	48.2	53.9	48.2	53.3	49.8	53.1	47.9	53.1	49.8	52.6	49.3	52.3
Age												
40–59	48.2	70.4	43.6	69.2	43.7	68.2	41.5	67.6	43.5	67.3	41.8	66.3
60–79	51.8	29.6	56.4	30.8	56.3	31.8	58.5	32.4	56.5	32.7	58.2	33.7
Education												
< High school	54.9	36.5	49.4	34.8	48.8	32.7	44.9	30.7	42.1	29.0	40.2	27.7
≥ High school	45.1	63.5	50.6	65.2	51.2	67.3	55.1	69.3	57.9	71.0	59.8	72.3
Smoking												
Yes	17.8	21.2	14.5	22.5	15.9	21.8	14.7	21.3	16.4	19.5	17.7	18.8
No	82.2	78.8	85.5	77.5	84.1	78.2	85.3	78.7	83.6	80.5	82.3	81.2
BMI												
< 25	26.2	42.3	18.3	42.5	20.5	42.1	15.4	39.9	18.5	38.2	21.9	38.5
25–29.9	36.2	41.3	48.4	41.1	42.6	39.7	46.3	40.0	41.9	40.6	34.6	40.1
≥ 30	37.6	16.4	33.4	16.5	36.9	18.2	38.3	20.2	39.5	21.2	43.5	21.4
Physical activity												
More active	33.7	39.4	33.3	41.3	40.6	46.4	40.4	41.8	43.3	50.1	41.3	47.6
Less active	66.3	60.6	66.7	58.7	59.4	53.6	59.6	58.2	56.7	49.9	58.7	52.4
Health												
Better	23.2	60.8	29.2	60.5	38.1	60.9	29.3	58.0	25.5	54.7	23.5	55.1
Worse	76.8	39.2	70.8	39.5	61.9	39.1	70.7	42.0	74.5	45.3	76.5	44.9
MD visits per year												
< 5 visits	38.4	92.0	46.3	74.3	45.1	71.5	45.9	71.5	47.4	70.7	47.8	70.6
≥ 5	61.6	8.0	53.7	25.7	54.9	28.5	54.1	28.5	52.6	29.3	52.2	29.4
Medications used in past two days												
OA	47.7	1.8	44.3	2.0	49.4	2.6	60.0	3.6	60.1	4.3	59.0	4.5
Insulin	13.9	.5	11.8	.5	12.0	.6	9.9	.6	7.6	.5	9.8	.7
Statins	3.4	2.4	8.3	3.8	12.3	5.3	23.2	7.4	31.0	10.6	35.8	11.9
Antihypertensives	29.0	12.7	42.9	16.1	49.5	17.8	55.1	19.8	61.0	22.4	58.0	24.4

Abbreviations: BMI, body mass index; MD, doctor of medicine; OA, oral antidiabetic agents.

TABLE 3
Age-sex-adjusted odds ratio, comparing people with diabetes to the overall population,
age 40–79 years, weighted for the Canadian population, 1994–2004

		1994	1996	1998	2000	2002	2004
Sex	Female/Male	.7	.7	.8	.9	.8	.8
Age	Per 10 years	1.7*	1.7*	1.7*	1.8*	1.8*	1.7*
Education	Less than HS/HS completed	.6	.7	.7	.8	.8	.9
Current smoker	Yes/No	.9	.7	.8	.8	1.0	1.2
BMI	25–29.9 / < 25	1.3	2.7*	2.1*	3.0*	2.1*	1.5
	≥ 30 / < 25	4.2*	5.3*	4.6*	5.8*	4.5*	4.3*
Physical activity	No/Yes	1.4	1.5	1.3	1.1	1.3	1.3
Health	Worse/Better	4.8*	3.4*	2.5*	3.0*	3.3*	3.7*
MD visits per year	≥ 5 / < 5	4.2*	3.4*	3.0*	2.8*	2.6*	2.5*
Drug use categories in last 2 days							
Statins	Yes/No	.9	1.8	1.8	3.2*	3.3*	3.9*
Antihypertensives	Yes/No	2.1*	3.2*	3.9*	4.1*	4.9*	3.6*

Abbreviations: BMI, body mass index; HS, high school; MD, doctor of medicine.

* statistically significant at $p < .05$

TABLE 4
Percentage of persons aged 40–79 with diabetes receiving treatment, weighted for the Canadian population, 1994–2004

		1994	1996	1998	2000	2002	2004
		N = 156	N = 201	N = 236	N = 309	N = 387	N = 431
		%	%	%	%	%	%
Diabetes treatment							
	No insulin/OA	40.0	44.3	40.7	32.7	34.8	35.9
	Insulin	13.9	11.8	12.0	9.9	7.6	9.8
	Any OA	47.7	44.3	49.4	60.0	60.1	59.0
	Both insulin / OA	1.1	.4	2.1	2.6	2.4	4.6
Specific OA							
	Biguanides	21.2	17.9	28.6	36.0	45.7	46.7
	Sulfonylureas	40.3	39.0	37.2	41.4	35.2	29.7
	Alpha-glucosidase inhibitors	–	–	2.8	2.0	.5	.8
	Thiazolidinediones	–	–	–	2.5	7.3	12.9
	One OA	33.8	31.6	31.5	39.5	32.9	31.3
	More than one OA	13.9	12.6	17.9	20.1	26.5	26.7
Lifestyle changes							
Diet	All diabetics	–	19.9	23.9	18.6	21.1	23.6
	Diabetics without OA / insulin	–	14.7	26.0	14.1	17.9	25.0
Exercise	All diabetics	–	–	11.9	9.7	9.8	9.1
	Diabetics without OA / insulin	–	–	9.1	4.4	8.5	6.7
Other medications							
	Antihypertensives	29.0	42.9	49.5	55.1	61.0	58.0
	Statins	3.4	8.3	12.3	23.2	31.0	35.8

Abbreviations: N, sample size; OA, oral antidiabetic agents.

changes.⁹ Even those not taking medication for their diabetes did not seem to pay any greater attention to their diet. Of interest are the even higher peaks of dieting among those not taking any medication for their diabetes at the time of release of the CPG. Although we cannot be sure of any causal association, these peaks are consistent with an even higher level of short-term good intentions by the diabetic population not taking any OA.

After lifestyle changes fail to have the desired effects, the next step in the step-wise approach would be to start pharmacological treatment. Single OA was used in about one-third of people with diabetes, but the use of multiple OA almost doubled over the study period. The two main classes of OA are sulfonylureas, which stimulate insulin production, and biguanides, i.e. metformin, which reduce hepatic glucose production.¹⁰ Biguanide use shows a steadily increasing trend from an average of 20% in the first two cycles to 46% in the last two. Sulfonylurea use did not show this increase and, in fact, showed a decrease after 2000. This is consistent with physicians following the 1998 CPG for a more aggressive pharmacological treatment and the 2003 guidelines recommending starting biguanides before sulfonylureas. Biguanides are especially effective in overweight and obese diabetic patients.¹⁰ The thiazolidinedione, including rosiglitazone, showed increasing trends in this data; however, there is some concern about increased risk of heart disease with rosiglitazone use.¹¹

The 2003 CPGs also acknowledged that people with diabetes need to be treated more aggressively with antihypertensive medications and statins than the general population.⁷ In fact, there was a considerable increase in the use of antihypertensives and statins over the years of the study. In 1994, statin use was similar for the diabetic and non-diabetic populations, but by 2004 people with diabetes were three times as likely to be taking statins. However, this still only amounts to one-third of the diabetic population in the last cycle, and there remain important gaps in the use of lipid-lowering and antihypertensive therapy in Canadians with

diabetes.¹² While the emphasis in diabetes CPG has been on glucose lowering, there is even stronger evidence from clinical trials that large reduction in mortality came from approaches that include both lipid-lowering and antihypertensive therapy.⁵

There have been marked changes in the management of people with diabetes in Canada between 1994 and 2005. Some of the changes in the treatment data presented are compatible with the recommendations of the 1998 and 2003 Canadian Diabetes Association guidelines. For example, signs of more aggressive treatment of diabetes are evident from the increased OA use, especially of multiple OA. Using biguanides rather than sulfonylureas might also be a response to the CPG, as might be the increased use of antihypertensives and statins. Although encouraging changes were noted, there is still plenty of room for improvement. In particular, a large proportion of respondents with diabetes still do not report getting any treatment. Lifestyle changes such as diet and exercise need to be instituted and sustained since the short-term increases in dieting which coincide with CPG publication are clearly insufficient.

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Book review

Food and Nutrients in Disease Management

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Author: Ingrid Kohlstadt (ed.)

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This 740-page textbook discusses the role of foods and nutrients in the etiology, pathophysiology and management of various disease states. Meant primarily for medical doctors and students, other health care professionals including nutritionists and nurses could also benefit from this reference as a guide to easing the integration of a nutritional perspective into daily clinical practice. In the preface, the editor expresses a desire to reconcile modern medicine and food and to encourage doctors to consider nutrients as factors equally necessary to the care of diseased patients as the treatment itself.

Recently there has been a rise in popular interest in the role of food and nutrients in health promotion and disease prevention. The literature has mostly addressed the capacity of certain foods to promote and preserve health. (One example is the very popular *Foods to Fight Cancer* by Dr. R. Béliveau and Dr. D Gingras.) However, the role of food and nutrients in the etiology, screening, treatment and management of disease states has not been well explored; as such, this medical textbook is a timely addition to health care professionals' bookshelves.

The textbook is divided into 9 sections that group diseases according to shared characteristics, for example, cardiovascular and pulmonary diseases, neurologic and psychiatric disorders. In total, the book contains 43 chapters written by 64 experts, each addressing one and sometimes two afflictions. The vast majority of the disorders discussed are chronic or recurrent (for example, rhinosinusitis) and

representative of prevalent health issues in North America. Although the spectrum of diseases covered is quite large, a few but important disorders with known ties to nutrition were left out, for example, multiple sclerosis and HIV.

Most chapters vary in their structure, the topics discussed and the order in which each subheading is presented. The information is up-to-date with many references to the most recent studies in nutritional epidemiology. However, the detail of the information provided varies greatly from one expert to the next; while some authors favour lengthy descriptions of one specific etiological theory and the relevant actions, others used a broader approach that incorporates suggestions that go beyond the discussed disease.

Despite the pertinence of the information in this book, a stricter editorial approach would have added clarity and practicality. The emphasis placed on nutrition, food or nutritional indicators is uneven from one author to the next. A certain number of chapters systematically address key issues in keeping with the book's aim, such as the role of food and nutrients in the etiology of the disease, diet-associated risk factors, the possibility of prevention through nutritional adjustments, nutritional parameters to screen for when completing patient evaluations, possible interactions between foods and traditional treatments, and foods and nutrients as treatment; however, in other chapters, the relevance of the information with regard to disease management or prevention is less obvious, incomplete,

insufficiently discussed, restricted to a very small proportion of the chapter or addressed in a very general manner rather than linked to the diseased state under consideration. Similarly, in a few chapters, certain disease-related topics, such as patient evaluation, are discussed without reference to nutritional risk factors.

Overall, physicians, medical students and health care professionals will find this textbook quite informative and useful. The pertinent nutritional information presented within its pages holds practical applications to assist the evaluation and management of patients. This work is long overdue and reflects the crucial fact that diet and eating habits can significantly impact disease management and should not be overlooked when caring for patients.

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July 11-15, 2010, Geneva, Switzerland

www.iuhpeconference.net

International Congress on Obesity 2010

July 11-16, 2010, Stockholm, Sweden

www.ico2010.org

World Congress on Heart Disease

July 24-27, 2010, Vancouver (British Columbia), Canada

www.cardiologyonline.com

IDOF 2010 – 1st International Diabetes and Obesity Forum

October 21-23, Athens, Greece

<http://www.idof2010.com>

138th Annual Meeting and Exposition of the American Public Health Association

November 6-10, 2010, Denver (Colorado), U.S.A.

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