Journal of Epidemiology and Community Health 1997;51:326–331

# Validation of a short telephone administered questionnaire to evaluate dietary interventions in low income communities in Montreal, Canada

Katherine Gray-Donald, Jennifer O'Loughlin, Lucie Richard, Gilles Paradis

**Abstract**

***Objective* – To validate an adaptation of a short questionnaire measuring behaviour related to selecting low fat diets. The questionnaire was adapted for telephone use in a low income, low education population.**

***Design*—The factorial structure of the 38 item adaptation was studied in a population based random sample of 1432 adults. Seven day test–retest reliability was measured in a convenience sample of 93 adults, and criterion related validity in measuring fat was assessed against a dietitian administered diet history in another convenience sample of 81 adults.**

***Setting*—Adults aged 18–65 years living in low income, inner city neighbourhoods in Montreal, Canada.**

***Results*—Principal components analysis identified five food factors: avoid fat, junk food, high fat traditional foods, low fat substitutes for high fat foods, and modification of meat to reduce fat. Two factors were similar to those of the original version. Internal consistency of the subscales ranged from 0.49–0.72. Test–retest reliability ranged from 0.72–0.90. Validation of the subscales against usual dietary intake indicated that the "junk food" factor, arising from questions added to the original questionnaire to reflect local dietary habits, was most closely related to fat intake ($r = 0.48$; $p < 0.001$).**

***Conclusion*—This telephone adaptation provides an inexpensive and valid method of measuring fat intake. However, these results suggest that adaptations of existing dietary instruments should be validated in the populations for which they are intended before they are used.**

(*J Epidemiol Community Health* 1997;51:326–331)

**School of Dietetics and Human Nutrition, McGill University, 21, 111 Lakeshore, Ste-Anne de Bellevue, Québec, Canada, H9X 3V9**
K Gray-Donald

**Department of Epidemiology and Biostatistics, McGill University, 1020 Pine Avenue West, Montreal, Québec, Canada, H3A 1A2**
J O'Loughlin
G Paradis

**Department of Public Health, Montreal General Hospital, Montreal, Québec, Canada, H2J 3GB**
J O'Loughlin
G Paradis

**Department of Social and Preventive Medicine and GRIS, University of Montreal, C. P. 6128, Station Centre-Ville, Montreal, Québec, Canada, H3G 3J7**
L Richard

Correspondence to:
Dr K Gray-Donald.

Accepted for publication September 1996

All recent large scale, community based cardiovascular disease (CVD) prevention programmes have promoted the adoption of diets low in fat and high in fruits, vegetables, and other high fibre foods in the general population.[1–5] Public health departments are now adapting dietary interventions tested in these trials to local conditions. Because public health departments often do not have access to large research budgets, an important challenge is to discover methods of evaluating dietary interventions in these new settings that are quick, simple, inexpensive, feasible, and valid. These methods must be relevant and applicable to the populations in which they are being used.

The five year coeur en santé St-Henri programme is a multifactorial, community based heart health promotion programme to reduce the prevalence of CVD risk factors among adults aged 18–65 years in a low income urban community. It is conducted by a local public health department in Montreal, Canada. The characteristics of the St-Henri community, the coeur en santé programme of interventions, and the methods to evaluate the impact of the programme on CVD risk factor prevalence, have been described earlier.[6,7] The coeur en santé programme has developed and tested numerous interventions promoting low fat diets including a low fat recipe contest, dietary counselling as part of a community based screening programme for hypercholesterolaemia, a nutrition education campaign in local grocery stores,[8] a menu labelling and healthy food discount programme in local restaurants, healthy eating workshops given by local community groups, and a variety of print, direct mail, and electronic media educational campaigns to heighten awareness and increase knowledge about healthy eating.[6]

To measure the impact of individual dietary interventions as well as the overall programme of interventions, we adapted and validated one of several recently reported short dietary questionnaires measuring fat intake—the eating patterns questionnaire, which is a modified version of the food habits questionnaire reported by Kristal *et al.*[9] Because it was originally developed as a self administered questionnaire for well educated women aged 45–59 years, the applicability of the eating patterns questionnaire in a low income, low education population including both males and females aged 18–65 years was unknown.

This paper aims to describe our adaptation and validation of the eating patterns questionnaire for use in evaluating dietary interventions. Exploration of the factorial structure of the modified questionnaire is reported, as well as internal consistency and test–retest reliability of the five subscales identified. Validation of the subscales against criterion measures of dietary fat intake obtained through diet history is also reported.

## Methods

A copy of the eating patterns questionnaire was obtained directly from the author. This 48 item questionnaire measures behaviour related to selecting low-fat diets during the previous three months. It is divided into six subsections by food category, with the time reference (over the past three months) repeated at the beginning of each section. The questionnaire contains 21 "root" questions to establish whether or not a particular food item was consumed (ie "Over the past three months, did you eat chicken? Did you eat red meat", etc) with up to three supplementary questions for each "root" question to determine whether or not the item was cooked and/or consumed in a manner which reduced or increased its fat content ("How often was it broiled, baked or poached? How often was it fried? How often did you trim all visible fat?").

### ADAPTATION OF THE EATING PATTERNS QUESTIONNAIRE

The questionnaire was adapted in three stages. First, the original version was translated into French and pretested over the telephone among 20 St-Henri adults aged 18–65 years randomly selected from the Bell Canada telephone directory list of residential subscribers. This pretest showed that the original version was too complex to be completed over the telephone.

Second, a small panel including an epidemiologist (JOL), a nutritionist-epidemiologist (KGD), and an intervention agent modified the original version for telephone administration. Subdivision into sections and repetition of the time reference at the beginning of each section was eliminated to reduce administration time and enhance clarity. Interviewers were trained, however, to repeat the time reference if the subject asked them to. Next, we reduced the original 48 items to 32 by removing questions on whether or not food items such as chicken, red meat, and ground beef were consumed. A recent nutrition survey of dietary habits among 301 randomly selected Montreal adults showed that most Montreal area residents ate these foods.[10] Third, we reduced the number of response categories from four (always, often, sometimes, rarely/never) to three (always/often, sometimes, rarely/never). Finally, we modified the items to reflect local dietary habits more closely. Tortillas was removed because these are not often eaten by the study population, and six food items/groupings reflecting high sources of dietary fat intake in this population were added: French fries; snacks such as chips, fritoes, doritos; donuts, cookies, cakes or pastries; chocolate or candy; bacon or sausages; and hot dogs, salami, bologna, or other processed meats. The total number of items in the modified version was 38.

In the final step, the modified questionnaire was translated into French, back-translated to English to verify the French translation, and then tested in another sample of 20 subjects using the same methodology described above. Minor changes suggested by this pretest were completed, and a final pretest (n=20) was conducted. The final version (hereafter referred to as the "modified questionnaire") took about five minutes to administer. Appendix 1 contains a copy of the English version of the modified questionnaire.

### VALIDATION OF THE MODIFIED QUESTIONNAIRE

Validation of the modified questionnaire was undertaken in three substudies. In the first substudy, its factorial structure was investigated in a sample of adults who participated in the June 1992 baseline survey of the coeur en santé St-Henri programme.[7] This population based telephone survey comprised representative samples of 849 adults aged 18–65 years from St-Henri and 825 age matched adults from a nearby comparison community, matched to St-Henri on size, geographic location, and sociodemography. The overall response rate was 78.6%.

The 38 items comprising the modified questionnaire were integrated into the baseline questionnaire and administered during the 35 minute telephone interviews of survey participants. Complete data with no missing responses to any of the dietary items were available for 1432 subjects.

The factorial structure was studied using all 38 items in principal components analysis with varimax rotation.[11] Principal components analysis is a data reduction technique used to explain correlations among sets of items or variables in terms of a few conceptually meaningful factors. These factors are linear functions which explain as much of the total variation in the data as possible. The principal components model leads to unique expressions for each factor. It is the method of choice if the purpose of the analysis is variable reduction or replacement of the original items with a score that summarises the data parsimoniously.[13] To be consistent with Kristal's work,[9] the first five factors were analysed. Polychoric correlations, which are more adapted to the categorical nature of the response scale,[14] were used as input for the analysis. Only items with loadings $\geq 0.4$ were retained.[12] Responses for items loading on each factor were reversed as appropriate, scored 3 (always/often), 2 (sometimes), and 1 (rarely/never), and summed to create five subscales. The internal consistency of each subscale and the total score was determined by Cronbach's alpha.

In the second substudy, the seven day test–retest reliability of the total score and of the five subscales identified in the first substudy was studied in a convenience sample of 93 adult volunteers recruited in the January 1993 awareness and participation survey.[7] This is one of three, population based, cross sectional telephone surveys which monitored awareness of and participation in coeur en santé activities in the St-Henri adult population. The sample size in the January 1993 survey was 461 and the response rate was 71.0%. The 38 items of the modified questionnaire were included in the January 1993 instrument. At the end of the interview, subjects were asked if they could be contacted in seven days to repeat the dietary

*Table 1 Sociodemographic characteristics of subjects in three substudies to validate an adaptation of the eating patterns questionnaire. Montreal, Canada, 1992–3*

| | *Factorial structure substudy (n=1432)* | *Test–retest substudy (n=93)* | *Validity substudy (n=81)* |
|---|---|---|---|
| Male (%) | 47.5 | 54.8 | 24.7 |
| Age (mean (SD) y) | 37.1 (12.0) | 37.1 (12.1) | 39.5 (12.5) |
| French-speaking (%) | 73.0 | 86.0 | 69.1 |
| High school incomplete (%) | 24.6 | 25.3 | 21.3 |
| Married (%) | 28.7 | 16.1 | 59.3 |
| Insufficient income* (%) | 30.3 | 45.6 | 25.0 |

* Total household income expressed as a function of the number of persons in the household. Income sufficiency was categorised as insufficient, sufficient, or high according to an adaptation of the 1991 Canadian census classification.[18].

*Table 2 Frequency of consumption and factor loadings of items retained after varimax rotation, in five factors identified in principal components analysis (n=1432). Montreal, Canada, 1992–3*

| | *Frequency (mean (SD))** | *Factor loading†* |
|---|---|---|
| Avoid fat (Eigen value 6.44) | | |
| Fresh fruit as snacks | 1.6 (0.8) | 0.65 |
| Fruit for dessert | 1.6 (0.8) | 0.62 |
| Raw vegetables for snacks | 2.0 (0.9) | 0.61 |
| A vegetarian dinner | 2.2 (0.8) | 0.47 |
| Cooked vegetables without butter or margarine | 1.7 (0.9) | 0.45 |
| Bread, rolls or muffins without butter or margarine | 2.0 (0.9) | 0.44 |
| Green salad with no dressing | 2.4 (0.8) | 0.44 |
| Junk food (Eigen value 3.05) | | |
| Donuts, cookies, cakes and pastries | 2.3 (0.8) | 0.64 |
| Chocolate or candy | 2.4 (0.7) | 0.62 |
| Ice cream | 2.4 (0.7) | 0.53 |
| French fries or poutine | 2.4 (0.7) | 0.52 |
| Snacks such as chips, fritoes, doritos | 2.4 (0.7) | 0.52 |
| Dessert with cream or whipped cream | 2.8 (0.5) | 0.50 |
| Hot dogs, salami, bologna, and other processed meats | 2.4 (0.7) | 0.48 |
| Spaghetti or noodles with meat, butter or cheese sauce | 1.7 (0.8) | 0.45 |
| Bacon or sausages | 2.4 (0.7) | 0.42 |
| High fat traditional (Eigen value 2.11) | | |
| Fried fish or fish sticks | 2.6 (0.7) | 0.61 |
| Fried chicken | 2.6 (0.7) | 0.56 |
| Homogenised or whole milk | 2.4 (0.9) | 0.55 |
| Sautéed or pan fried food | 2.2 (0.8) | 0.41 |
| Low fat substitutes for high fat foods (Eigen value 1.88) | | |
| Use low fat mayonnaise | 2.3 (0.9) | 0.64 |
| Green salad with calorie reduced dressing | 2.3 (0.8) | 0.62 |
| Skim or 1% milk | 2.6 (0.7) | 0.50 |
| Low fat cheese or cheese made with partly skimmed milk | 2.4 (0.8) | 0.49 |
| Modify meat to reduce fat (Eigen value 1.58) | | |
| Red meat with all visible fat trimmed | 1.9 (0.8) | 0.68 |
| Trimmed all the fat from red meat before cooking | 1.8 (0.9) | 0.54 |
| Extra lean ground beef (hamburger) | 1.9 (0.8) | 0.54 |
| Chicken without the skin | 1.9 (0.9) | 0.50 |

* Mean (SD) of responses scored 3 (always/often), 2 (sometimes), and 1 (rarely/never).
† Only items with factor loadings ≥0.40 were retained.

*Table 3 Internal consistency and seven day test–retest reliability of the five subscales and total score of the modified questionnaire. Montreal, Canada, 1992–3*

| *Subscale* | *No of items* | *Internal consistency (n=1432) Cronbach's alpha* | *Test–retest reliability (n=93) r** |
|---|---|---|---|
| Avoid fat | 7 | 0.67 | 0.84 |
| Junk food | 9 | 0.72 | 0.90 |
| High fat traditional | 4 | 0.49 | 0.69 |
| Low fat substitutes | 4 | 0.53 | 0.79 |
| Modify meat to reduce fat | 4 | 0.51 | 0.72 |
| Total score | 28 | 0.53 | 0.84 |

* Spearman rank correlation coefficients between measures taken seven days apart.

components of the questionnaire. The first 100 subjects who accepted were included in the study. Complete data were obtained from 93 of the 100 subjects. Test–retest reliability of the five subscales and the total score was measured by Spearman rank correlation coefficients.

In the third substudy, the validity of the five subscales and of the total score was studied in a convenience sample of 81 adults aged 18–65 years from St-Henri recruited from the May 1992 Bell Canada telephone directory list of residential subscribers. Four hundred and eighteen of 706 households randomly selected from the list were contacted by telephone. Of these, 118 were ineligible for inclusion in the study because they were located outside the study community, because there were no adults aged 18–65 years in the household, or because no eligible adult spoke French or English. In the remaining 300 households, 140 eligible adults refused to participate and 160 completed the modified questionnaire over the telephone. Eighty one of the 160 agreed to participate and completed a dietitian administered interview at home within one month of the telephone interview. This provided a Burke style diet history, including a 24 hour recall and a complete recall of foods consumed in the last month on a frequency basis.[15] The portion size of each food was estimated using santé Québec food models[16] and/or the subjects' own utensils.

Data from the 81 diet history interviews were coded and entered by the interviewing dietitian, and nutrient analysis was performed using *Food processor II*,[17] and the Canadian nutrient file.[18] Because total fat is associated with total energy intake, the percentage energy from total fat was calculated as a method of adjusting for total energy intake. This adjustment indirectly accounts for differences in energy intake due to gender, age, body size, and physical activity patterns. Adjustment for energy intake was also computed using the two step approach of Willett and Stampfer.[19] Spearman rank correlation coefficients were computed to describe the association between the percentage energy from fat from the diet history and each subscale, as well as the total fat score. Statistical analyses were conducted using *SAS*.[20]

## Results

Table 1 compares the sociodemographic characteristics of the subjects who participated in each of three substudies. The sociodemographic profiles of the two communities surveyed in the factorial structure substudy were similar to those from the 1991 Canadian census for these areas.[21]

Principal components analysis of the 38 food items identified five factors which explained 39.7% of the variance. Table 2 shows those food items with factor loadings ≥0.4 retained in each of the five factors. The first factor "avoid fat" represents low fat food choices or food practices; the second factor "junk food" relates to the frequency of consuming high fat, low nutrient dense foods; the third factor includes high fat traditional food choices; the fourth factor represents the use of specially manufactured low fat substitutes for high fat foods; and the fifth factor represents methods of modifying meat to reduce the fat content. Two of the five factors identified resembled those reported by Kristal *et al*,[9] including modification of meat to reduce the fat content and low fat substitutes for high fat foods.

Table 3 shows the internal consistency and test–retest reliability of each subscale and the total score. With the exception of "avoid fat" and "junk food", the Cronbach's alpha values were low, in part because of the low number of items loading on these factors. The test–retest

*Table 4 Spearman rank correlation coefficients between selected measures of fat intake as determined by diet history and subscale scores from the modified questionnaire (n=81). Montreal, Canada, 1992–3*

| | *Mean daily fat intake* | | | |
|---|---|---|---|---|
| | *% energy from fat* r | *Total fat (g)* r | *% energy from saturated fat* r | *Saturated fat (g)* r |
| Avoid fat | 0.35† | 0.19 | 0.30† | 0.22* |
| Junk food | 0.48‡ | 0.56‡ | 0.47‡ | 0.57‡ |
| High fat traditional | 0.19 | 0.36‡ | 0.10 | 0.28* |
| Low fat substitutes | 0.20 | 0.26* | 0.18 | 0.24* |
| Modify meat to reduce fat | 0.12 | 0.00 | 0.07 | 0.02 |
| Total score | 0.40‡ | 0.45‡ | 0.37‡ | 0.45‡ |

*$p \leq 0.05$; †$p \leq 0.01$; ‡$p \leq 0.001$.

reliability was high for each of the five subscales, ranging from 0.69–0.90. The "junk food" subscale showed the highest internal consistency and test–retest reliability.

The mean (SD) intake of dietary fat measured in the third substudy of 81 adult volunteers was 32.1 (8.0)% of total energy. Table 4 shows Spearman rank correlation coefficients between four measures of dietary fat intake obtained by diet history and each of the five subscale scores. The junk food subscale was most closely related to percentage energy from fat, with a Spearman correlation coefficient of $r=0.48$ ($p<0.001$) in males and females combined, and $r=0.59$ ($p<0.001$) in females only ($n=61$). The avoid fat subscale was less strongly correlated with percentage energy from fat ($r=0.35$; $p<0.01$). The total score was also correlated with percentage energy from fat in males and females combined ($r=0.40$; $p<0.001$). An analysis of the relationship between the tertile of subscale scores and the tertile of percentage energy from fat indicated that the junk food subscale correctly predicted the tertile of fat intake for 38 of 80 subjects. Only five subjects were classified in the wrong extreme of the distribution by tertile.

The correlation between the total score and total fat intake in grams was slightly higher than the correlation of total score with percentage energy from fat, because individuals who consumed more energy overall consumed more of most nutrients, including fat. Analysis of fat intake after controlling for total energy using the method of Willett and Stampfer,[19] yielded results very similar to those reported above, for both total and saturated fat. The relationships between fat intake and both the junk food subscale and total score were highly significant ($p<0.001$).

## Discussion

Public health departments confront important challenges in adapting lessons learned from recent, large scale, community based heart disease prevention programmes to local conditions. These include designing evaluations of the impact of dietary interventions which provide valid and useful information while remaining within limited budgets. Methods commonly used to assess eating habits and nutrient intake such as diet history, food records, and multiple 24 hour diet recalls, are usually not feasible in public health settings because they impose a heavy response burden on subjects, and because they are expensive and time consuming to administer.[22] Although self administered food frequency questionnaires are a cheaper way of measuring usual intake,[22] their usefulness in populations with low literacy levels is unknown.

Recently, there has been considerable interest in the development of short dietary questionnaires that are not costly and can be adapted to evaluate the impact of dietary interventions in public health settings.[9 23–26] Several studies have shown that measures of specific nutrients obtained from short dietary questionnaires correlate reasonably well with criterion measures from multiple 24 hour recalls or food records. In particular, correlation coefficients of between 0.45 and 0.68 have been reported for the percentage energy from fat.[9 23–26]

Because no appropriate instrument existed for measuring dietary fat intake in our context, we adapted the Kristal eating patterns questionnaire for use over the telephone in a low income, low education population. We selected the eating patterns questionnaire for the coeur en santé for several reasons. First, funding limitations precluded the use of in-person dietary interviews and in-depth assessments of nutrient intake required by 24 hour diet recalls, diet records, or diet histories. Second, the low literacy of the St-Henri population limited the use of self administered or complex questionnaires and instead, suggested the need for a short, simple method which minimised the response burden. Third, because it measures dietary behaviour rather than nutrient intake, the eating patterns questionnaire is especially relevant to evaluate interventions aimed at promoting change in dietary behaviour. Fourth, an earlier validation of the measure identified five subscales which were consistent with the objectives of our fat lowering intervention programme, including: avoid fat as seasoning; avoid meat; modify high fat foods; substitute high fat foods with specially manufactured lower fat foods; and replace high fat foods with low fat alternatives. These subscales showed good face validity. They were internally consistent with reliability coefficients ranging between 0.54 and 0.76. They had good test–retest reliability (0.67–0.90) and they correlated with criterion measures of dietary fat as a percentage of energy intake obtained from two, four day food records and a food frequency questionnaire.[9] The overall correlation coefficient for the earlier published version with the percentage of energy from fat was $r=0.68$. Finally, because it was short and simple, translation into French and adaptation for telephone administration was feasible. Many evaluations of the coeur en santé St-Henri programme rely on telephone survey methodology.[7]

We shortened and simplified the original questionnaire, and we modified the content to reflect better local eating habits. The modified questionnaire can be administered by a trained interviewer with minimal knowledge of nutrition in a five minute telephone interview. We estimate the cost of administration per person

is less than $1 Canadian, compared with $25 Canadian for an in-person dietitian administered interview. Although the cost might have been even lower using self administered mailed questionnaires, this option was rejected because of the generally low literacy levels in the St-Henri community.

Principal components analysis of the modified questionnaire yielded only two factors similar to those originally reported by Kristal *et al*,[9] including modify meat to reduce fat content and low fat substitutes for high fat foods. The avoid fat, junk food, and high fat traditional food factors did not resemble the original Kristal factors. Although our five subscales and total score showed good test–retest reliability, only two of the five subscales (avoid fat, junk food) showed acceptable internal consistency. The total score with 28 items had a Cronbach's alpha of 0.53, suggesting that although promising, further work is needed to improve the questionnaire. Finally, only the nine item junk food subscale, which included six food items that were added to the questionnaire to reflect local eating habits, correlated well with criterion measures of fat intake obtained by diet history. The observed correlation for the junk food subscale compared very favourably with those reported for other short dietary questionnaires.[9 23–28]

The results of this study underscore the need to carefully adapt short dietary instruments to the population for which they are intended. Kristal's original instrument was developed for use as a self administered questionnaire in middle class, middle aged American women. Our target group comprised men and women, mostly of French origin from a very low income community. Although it is not clear if the differences in the psychometric properties of the modified questionnaire were due to the modifications that we made to the instrument or to the differences in our study population, our results are supported by another recent Canadian study of male manual labourers which used an unmodified version of the Kristal questionnaire. This study showed that the subscales were not internally consistent and the factor analysis did not reveal the same subscale structure as that reported by Kristal *et al*.[29]

This non-transferability of short dietary questionnaires is not surprising because of the difficulty in identifying which dietary practices contribute most to fat intake in different populations. A good short measure of dietary intake should collect data on foods commonly consumed, and it should also be sensitive to the variability in intake within the population. Although our telephone adaptation of the Kristal instrument provides a useful tool to measure dietary fat quickly and inexpensively, those who wish to use it will have to consider carefully its appropriateness to local conditions and local dietary habits before deciding on its use.

## Appendix I

*English version of modified questionnaire*

*Now please think about what you eat. In the last three months, did you eat the following foods often, sometimes, rarely or never . . .*

| | *Always/ often* | *Sometimes* | *Rarely/ never* |
|---|---|---|---|
| Broiled, baked or poached fish | 1 | 2 | 3 |
| Fried fish or fish sticks | 1 | 2 | 3 |
| Broiled or baked chicken | 1 | 2 | 3 |
| Fried chicken | 1 | 2 | 3 |
| Chicken without the skin | 1 | 2 | 3 |
| Red meat with all visible fat trimmed | 1 | 2 | 3 |
| Extra lean ground beef (hamburger) | 1 | 2 | 3 |
| Hot dogs, salami, bologna, or other processed meats | 1 | 2 | 3 |
| Bacon or sausages | 1 | 2 | 3 |
| Spaghetti or noodles with meat, butter or cheese sauce | 1 | 2 | 3 |
| Spaghetti or noodles with a tomato (non-meat) sauce | 1 | 2 | 3 |
| A vegetarian dinner | 1 | 2 | 3 |
| Cooked vegetables without butter or margarine | 1 | 2 | 3 |
| French fries or poutine | 1 | 2 | 3 |
| Boiled or baked potatoes without butter or margarine | 1 | 2 | 3 |
| Raw vegetables for snacks | 1 | 2 | 3 |
| Green salad with no dressing | 1 | 2 | 3 |
| Green salad with calorie reduced dressing | 1 | 2 | 3 |
| Fruit for dessert | 1 | 2 | 3 |
| Fresh fruit for snacks | 1 | 2 | 3 |
| Homogenized or whole milk | 1 | 2 | 3 |
| 2% milk | 1 | 2 | 3 |
| Skim or 1% milk | 1 | 2 | 3 |
| Low fat cheese or cheese made with partly skimmed milk | 1 | 2 | 3 |
| Ice cream | 1 | 2 | 3 |
| Low fat ice cream, frozen yoghourt or sherbet | 1 | 2 | 3 |
| Dessert with cream or whipped cream | 1 | 2 | 3 |
| Bread, rolls or muffins without butter or margarine | 1 | 2 | 3 |
| Donuts, cookies, cakes or pastries | 1 | 2 | 3 |
| Chocolate or candy | 1 | 2 | 3 |
| Snacks such as chips, fritoes, doritos | 1 | 2 | 3 |

*Now I'd like to know about the way you prepare food. Over the last three months, have you done the following often, sometimes, rarely or never*

| | *Always/ often* | *Sometimes* | *Rarely/ never* | *Don't prepare food* |
|---|---|---|---|---|
| Sautéed or pan fried food | 1 | 2 | 3 | 4 |
| Fried with Pam or other non-stick spray instead of oil, butter or margarine | 1 | 2 | 3 | 4 |
| Trimmed all the fat from red meat before cooking | 1 | 2 | 3 | 4 |
| Removed the skin from chicken before cooking | 1 | 2 | 3 | 4 |
| Used low fat mayonnaise | 1 | 2 | 3 | 4 |
| Added salt to food at the table | 1 | 2 | 3 | 4 |
| Read labels on bought foods | 1 | 2 | 3 | 4 |

This research was funded by the National Health Research and Development Program, Health Canada (Grants no. 6605-3562-H, 6605-4432-201, 6605-3581-H and 6605-4444-201), and through a National Health Research Scholar Award to Jennifer O'Loughlin. We thank Tracie Barnett, Louise Johnson-Down, Garbis Meshefedjian and Isabelle Rioux for their contributions.

1 Puska P, Tuomilehto J, Salonen J, *et al. Community control of cardiovascular disease. The North Karelia project.* Copenhagen: WHO/EURO Monograph Series, 1981.
2 Maccoby N, Farquhar JW, Wood PD, Alexander J. Reducing the risk of cardiovascular disease: Effects of a community-based campaign on knowledge and behaviour. *J Epidemiol Community Health* 1977;**23**:100–14.
3 Farquhar JW, Fortmann SP, Flora JA, *et al.* Effects of community-wide education on cardiovascular disease risk factors. The Stanford five-city project. *JAMA* 1990;**264**: 359–65.
4 Luepker RV, Murray DM, Jacobs DR, *et al.* Community education for cardiovascular disease prevention: Risk factor changes in the Minnesota heart health program. *Am J Public Health* 1994;**84**:1383–93.
5 Carleton RA, Lasater TM, Assaf AR, Feldman HA, McKinlay SM and the Pawtucket Heart Health Program Writing Group. The Pawtucket heart health program: Community changes in cardiovascular risk factors and projected disease risk. *Am J Public Health* 1995;**86**:777–85.
6 Paradis G, O'Loughlin J, Elliott M, *et al.* Coeur en santé St-Henri—A heart health promotion programme in a low income, low education neighbourhood in Montreal, Canada: Theoretical model and early field experience. *J Epidemiol Community Health* 1995;**49**:503–12.
7 O'Loughlin J, Paradis G, Kischuk N, *et al.* Coeur en santé St-Henri—A heart health promotion programme in Montreal, Canada: design and methods for evaluation. *J Epidemiol Community Health* 1995;**49**:495–502.
8 O'Loughlin J, Ledoux J, Barnett T, Paradis G. La commande du coeur (Shop for your heart): A point-of-choice nutrition education campaign in a low income urban neighbourhood. *Am J Health Promot* 1996;**10**:175–8.
9 Kristal AR, Shattuck AL, Henry HJ. Patterns of dietary behaviour associated with selecting diets low in fat: Reliability and validity of a behavioral approach to dietary assessment. *J Am Diet Assoc* 1990;**90**:214–20.
10 Shatenstein B, Gagnon G. Predictors of saturated fat intake. *J Can Diet Assoc* 1992;**53**:274–80.
11 SPSS-X. *Advanced statistics guide.* 2nd ed. Chicago: SPSS Inc, 1988.
12 Nunnally JC. *Psychometric theory.* New York: McGraw Hill, 1978.
13 Kleinbaum DG, Kupper LL, Muller KE. *Applied regression analysis and other multivariable methods.* Boston: PWS-Kent Publishing Company, 1988.

14 Crocker L, Algina J. *Introduction to classical and modern test theory.* New York: Holt, Rinehart and Winston, 1986.
15 Burke BS. The dietary history as a tool in research. *J Am Diet Assoc* 1947;**23**:1041–6.
16 Santé Québec, Bertrand L. *Les Québécoises et les Québécois mangent-ils mieux? Rapport de l'enquête québécoise sur la nutrition, 1990.* Ministère de la santé et des services sociaux, Gouvernement du Québec. Montréal, 1995.
17 ESHA Research. *The food processor ver. V. nutrition and diet analysis system.* Salem: ESHA Research, 1993.
18 Verdier P, Beare-Rogers JL. The Canadian nutrient file. *J Can Diet Assoc* 1984;**45**:52–5.
19 Willett WC, Stampfer MJ. Total energy intake: Implications for epidemiologic analyses. *Am J Epidemiol* 1986;**124**: 17–27.
20 SAS Institute Inc. *SAS/STAT user's guide for personal computers, version 6.* 4th ed. Vols 1 and 2. Cary, NC: SAS Institute Inc, 1987:1028.
21 Statistics Canada. *Profile of census tracts in Montreal. 1991 Census.* Publication No. 95-329 and 95-330. Ottawa: Statistics Canada, 1993.
22 Willett W. *Nutritional epidemiology.* Oxford: England Oxford University Press, 1990.
23 Peters JR, Quiter ES, Brekke ML, *et al.* The eating pattern assessment tool: A simple instrument for assessing dietary fat and cholesterol intake. *J Am Diet Assoc* 1994;**94**:1008–13.
24 Ammerman AS, Haines PS, DeVellis RF, *et al.* A brief dietary assessment to guide cholesterol reduction in low income individuals. *J Am Diet Assoc* 1991;**91**:1385–90.
25 Kristal AR, Shattuck AL, Henry HJ, Fowler AS. Rapid assessment of dietary intake of fat, fibre and saturated fat: Validity of an instrument suitable for community intervention research and nutritional surveillance. *American Journal of Health Promotion* 1990;**4**:288–95.
26 Kinlay S, Heller RF, Halliday JA. A simple score and questionnaire to measure group change in dietary fat intake. *Prev Med* 1991;**20**:378–88.
27 Block G, Hartman AM, Naughton D. A reduced dietary questionnaire: Development and validation. *Epidemiology* 1991;**1**:58–64.
28 Curtis AE, Musgrave KO, Klimis-Tavantzis D. A food frequency questionnaire that rapidly and accurately assesses intake of fat, saturated fat, cholesterol, and energy. *J Am Diet Assoc* 1992;**92**;1517–8.
29 Birkett NJ, Boulet J. Validation of a food habits questionnaire: Poor performance in male manual laborers. *J Am Diet Assoc* 1995;**95**:558–63.