Coeur en santé St-Henri - a heart health promotion programme in Montreal, Canada: design and methods for evaluation

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Abstract

Study objective **– This paper describes the objectives, design, and methods of evaluation of the impact of the coeur en santé St-Henri programme, as well as selected results from the evaluation to date. It discusses the possible effects of study design choices made to maintain the impact evaluation within budget.**

Design **– The impact of the programme is evaluated in a community trial which compares the prevalence of cardiovascular disease behavioural risk factors before and after programme implementation in the intervention and a matched comparison community, in both longitudinal cohort and independent sample surveys. In addition, repeated independent sample surveys are conducted in the intervention community to monitor awareness of and participation in the programme.**

Participants **– The baseline sample for both the longitudinal cohort and independent sample surveys included 849 subjects from the intervention community (79·3% of 1071 eligible subjects – 8·0% could not be contacted and 12·6% refused) and 825 subjects from the comparison community (77·8% of 1066 eligible subjects – 6·6% could not be contacted and 15·6% refused). The two surveys on awareness and participation conducted to date, included 461 (71·0% of 649 eligible subjects) and 387 (67·9% of 570 eligible subjects) subjects respectively from the intervention community.**

Measurements **– Baseline data for the longitudinal cohort and independent sample surveys on behavioural risk factor outcomes including use of tobacco, physical activity behaviour, high fat diet, and behaviours related to blood pressure and cholesterol control were collected in 35 minute telephone interviews in both the intervention and comparison communities. Data on awareness of and participation in the programme were collected in 10 minute interviews in the intervention community only in two independent sample surveys conducted seven and 22 months respectively after the baseline survey.**

Results **– With the exception of smoking, the intervention and comparison communities were similar at baseline with regard to the prevalence of behavioural risk factors studied. Awareness of the coeur en santé programme increased from 64·1% in January 1993 to 72·9% 15 months later. Participation in the programme increased from 21·3% to 33·7%.**

Conclusions **– This paper presents background information on the evaluation of the impact of the coeur en santé programme, as a reference for future publications.**

(*J Epidemiol Community Health* 1995;49:495–502)

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Accepted for publication April 1995

Over the past 20 years, considerable research effort and funding have been invested to test community based programmes designed to reduce the risk of cardiovascular disease (CVD) in the general population. To date, results from the evaluation of the impact of these programmes on CVD risk factor prevalence are mixed,[1–7] raising some concerns about their effectiveness and about our ability to evaluate their impact against marked secular trends of decreasing risk factor prevalence, changes in normative standards, and shifts in social and cultural tastes.[8] Nevertheless, the public health impact of CVD makes community based intervention compelling, especially in population subgroups which continue to suffer a disproportionate burden of CVD, such as low income groups.[9] The challenge now is to find cost effective ways of adapting and implementing useful strategies identified in earlier work for subgroups such as the poor. Indeed, it has been argued that the next phase of research in CVD prevention should focus on diffusion of effective prevention models, especially in communities with potentially important barriers to diffusion such as language, culture, and poverty.[10–12]

Coeur en santé St-Henri is a five year, multifactorial, community based heart health promotion research and demonstration project in St-Henri, a low income, low education, urban neighbourhood of 25 000 persons located in west-central Montreal. The coeur en santé St-Henri programme is modelled on the European and American initiatives in North Karelia,[1] Stanford,[13] Minnesota,[14] and Pawtucket[15] and aims to promote heart-healthy behaviours including low fat diet, non-smoking, physical activity, and cholesterol and blood pressure control in adults aged 18–65 years. The main study hypothesis is that important determinants of population risk are behaviours acquired and

maintained through social learning and community support. Changes in the prevalence of CVD risk factors and eventually reduction in CVD morbidity and mortality can be achieved through community wide education and the creation of an environment favourable to heart healthy behaviours.

The coeur en santé programme is grounded in social learning and behaviour change theory[16-21] and the Ottawa charter for health promotion[22] provides the framework for programme development. All interventions are planned and implemented in close collaboration with local community groups. Pilot work began in 1987. The project was funded by the National Health Research and Development Program of Health Canada in 1992 for a two year development and implementation phase, and again in 1994 for three years from September 1994 to December 1997. To date, 39 coeur en santé interventions have been developed or adapted from existing programmes and implemented in St-Henri including among others, school based smoking prevention programmes for youth, smoking cessation courses for adults, a quit and win smoking cessation contest, a heart healthy recipe contest, heart healthy nutrition courses for adults, a grocery store campaign, heart healthy menus in local restaurants, a walking club, cholesterol and blood pressure screening events, production and diffusion of heart health videos, and a weekly heart health column in the local press.[23]

The coeur en santé programme is distinguished by its careful and thorough adaptation to a low income, low education population and by its relatively small budget compared with its American and Finnish predecessors. The overall objective of the research is to evaluate the impact of the programme on the prevalence of selected mediating and behavioural risk factor outcomes. As a reference for future publications on study results, we describe in this paper the evaluation design, data collection methods, and selected results from surveys undertaken to date and we discuss the implications of decisions made to ensure that the evaluation remains within budget. It is of note that each intervention of the programme is subjected to formative, implementation and, when applicable, impact evaluation.[23] In addition, identification of barriers and facilitators to the institutionalisation of longer term survival of the interventions in local community groups and health and social service centres, is being undertaken in a substudy. However, this paper addresses only the evaluation of the impact of the overall programme of interventions.

EVALUATION DESIGN

Although case-control methodology for evaluating community based interventions has been advocated as quicker, less costly, and better suited to assess confounding by factors associated with the intervention than the more usual cohort approach,[8] there are to date, few precedents. The study design to evaluate the impact of the coeur en santé programme is modelled on the evaluation designs used in the Stanford five-city project,[13] and the Pawtucket heart health program[15] but is streamlined considerably because of budgetary constraints. The prevalences of smoking, physical inactivity, high fat diet, and behaviours to control blood pressure and cholesterol are compared in St-Henri and a nearby comparison neighbourhood called Centre-Sud, before and after implementation of the coeur en santé intervention programme. Centre-Sud was matched to St-Henri on size, geographic location, language spoken at home, level of education, income sufficiency,[24] and CVD mortality.[25] Both communities are recognised health jurisdictions and are well defined geographically by neighbourhood specific postal codes. Because the two communities are close geographically and because they share a common media market, we anticipate that exposure to any other national or provincial heart health promotion programmes during the course of the study will be equivalent. Local heart health promotion efforts in Centre-Sud and St-Henri (outside of the coeur en santé programme) are monitored through regular interviews with key contacts in the local health and social service centres.

Because of the biases inherent in longitudinal and repeat cross sectional study designs to evaluate community based health promotion programmes,[26 27] the impact of the coeur en santé St-Henri programme is assessed in both longitudinal cohort and independent sample surveys. Although it is not expected that results will be identical, observation of similar trends in the two data sets will reinforce presumption of their validity despite inherent biases. Baseline data for both surveys were obtained in June 1992 from randomly selected, population based samples in each of the intervention and comparison communities. These samples will be resurveyed in June 1997 to evaluate change in these cohorts (the longitudinal cohort survey). Only persons still living within the study communities or immediately adjacent areas will be retained in the samples, so that in St Henri, exposure to the coeur en santé programme is maximised. Also in June 1997, risk factor prevalence will be assessed in independent samples in the two communities, and compared with prevalences measured in June 1992 (the independent sample survey).

In addition to the longitudinal cohort and independent sample surveys, awareness of and participation in coeur en santé interventions are monitored in three independent sample surveys in St-Henri, because the behaviour change models on which coeur en santé St-Henri is based, suggest that these variables are important prerequisites or precursors to positive behaviour change. In addition, data on these variables provide important information on the extent of programme penetration into the community, as well as on the characteristics of the population reached by the programme. Table 1 illustrates the design of the evaluation of the coeur en santé programme.

Table 1 Design of the evaluation of the coeur en santé St-Henri programme, 1992–97

	Year					
	1992	*1993*	*1994*	*1995*	*1996*	*1997*
Longitudinal cohort sample survey	June*	→→→→	→→→→	→→→→	→→→→	June
Independent sample survey						June
Awareness and participation surveys (in St-Henri only)		Jan	Mar†	Mar†		
Coeur en santé programme						

* Baseline sample for both the longitudinal cohort and independent sample surveys.
† In addition to awareness and participation, CVD risk factor behaviour is also measured.

Evaluation methods

ASSESSMENT OF PROGRAMME IMPACT

Baseline data on the prevalence and distribution of the targeted behavioural risk factors for both the longitudinal cohort and independent sample surveys were collected in June 1992 in a telephone survey of population based random samples of adults aged 18–65 years in the intervention and comparison communities.

Selection of subjects comprised a two stage, neighbourhood cluster design.[14] The first stage entailed the random selection of 1422 households in St-Henri and 1454 in the comparison community from the May 1992 Bell Canada telephone directory lists of residential subscribers. This list provides the name, address (including postal code), and telephone number of area residents who subscribed to Bell Canada in May 1992–85–90% of all private households in the communities. The list excludes private households with confidential telephone numbers (10–15%) and all business telephone numbers. All households selected were sent a letter which described the study and informed the household occupants that an interviewer would telephone within the next two weeks, to select one adult member of the household aged 18–65 years for an interview.

In the second stage of sampling, all households selected in the first stage were telephoned by trained interviewers who requested that the individual who answered the telephone list the names and ages of all household members. One adult was then randomly selected for the interview, from among all adults aged 18–65 years living in the household. This procedure took approximately two minutes. Households located outside the study communities, those in which there were no adults aged 18–65 years, or those in which the subject selected spoke neither French nor English were excluded. If the subject selected was not available at the time of the initial contact, the interviewer made an appointment to complete the interview at a convenient time. Households were telephoned a minimum of 15 times including on evenings and weekends before a "non-response" was recorded.

Data on sociodemographic characteristics, health status, mediating psychosocial variables, and behavioural risk factors were collected in 35 minute telephone interviews, conducted in either French or English. Selection of variables studied was driven by the models underlying programme development,[23] as well as the feasibility of obtaining data in telephone interviews. Psychosocial variables, considered to be mediating variables, included behaviour specific measures of attitude, perceived self efficacy, knowledge of community resources, social support for positive behaviour change, perceived barriers to physical activity, and intentions to undertake risk reducing behaviours. These items were adapted from published measures.[28–36] Questions on past and current use of tobacco and on behaviours related to blood pressure and cholesterol control (frequency of medical check-ups, decreasing salt in diet, other changes in diet, increase in physical activity, stress control) were adapted from the Canadian heart health surveys.[37] Questions on physical activity behaviour during leisure time and at work were drawn from the 1988 Campbell's survey,[38] and high fat diet was measured using a modification of the Kristal food habits questionnaire[39] adapted for telephone administration and validated in the study population against dietary history. Briefly, a "junk food" score was obtained by summing scores for nine high fat, low nutrient food items each scored 1 to 3 depending on the frequency with which they had been consumed in the last three months. Data on sociodemographic characteristics included age, gender, marital status, level of education, principle activity in the past 12 months, language spoken at home, and number of persons in the household. In addition, an income sufficiency indicator was created by expressing total household income as a function of the number of persons in the household and then categorising income sufficiency as insufficient, sufficient, or high according to an adaptation of the 1991 Canadian census classification.[40] Questions on sociodemographic characteristics as well as height and weight were drawn from Canada's health promotion survey.[41] Data on exposure to specific coeur en santé interventions will be collected in both the longitudinal cohort and independent sample survey in June 1997, so that a measure of dose of exposure to the coeur en santé programme can be incorporated into the analysis.

BASELINE COMPARISON OF ST-HENRI AND COMPARISON COMMUNITIES

In St-Henri, 1422 households were selected from the telephone directory list. Of those contacted, 352 were ineligible for inclusion in the survey. Of the remaining 1070 households, 86

Table 2 Comparison of selected characteristics in St-Henri and the comparison community at baseline, June 1992

	St-Henri (n=849)	Centre-Sud (n=825)	P value for difference
Age (y) (mean (SD))	38·0 (12·8)	36·9 (11·7)	NS
Males (%)*	47·3	52·8	0·029
Language spoken at home (%)*:			<0·0005
French	63·7	83·0	
English	21·8	5·6	
French and English	3·9	4·0	
Other	10·6	7·5	
Education attainment (%)*:			NS
High school incomplete	27·1	22·6	
High school complete	43·6	50·3	
University complete	27·7	25·6	
Other	1·7	1·5	
Income sufficiency (%):			0·016
Insufficient	23·9	29·2	
Sufficient	22·1	24·5	
High	38·0	32·7	
Missing	13·9	15·6	
Blood pressure checked in past year (%)*	71·2	70·2	NS
Been told blood pressure high (%)*	19·0	18·7	NS
Takes blood pressure medication (%)*	4·4	4·0	NS
Cholesterol checked in past year (%)*	38·3	37·0	NS
Been told cholesterol high (%)	14·3	12·4	NS
Takes cholesterol lowering medication (%)*	2·1	1·1	NS
Current smoker (%)*	35·2	44·4	<0·0005
High fat diet (mean (SD))	9·8 (1·9)	9·9 (1·8)	NS
Physically inactive (%)*:			
In leisure time	21·1	18·0	NS
At work	57·5	58·3	NS
Body mass index (kg/m^2) (mean (SD))	23·5 (4·2)	23·2 (4·3)	NS

* Percentages were calculated excluding missing data.

(8·0%) could not be contacted; 849 persons (79·3% of 1070) completed the interview and 135 persons (12·6%) refused. In Centre-Sud, 1454 households were selected. Of those contacted, 393 were ineligible for inclusion in the survey. Of the remaining 1061 households, 70 (6·6%) could not be contacted; 825 subjects (77·8% of 1066) completed the interview and 166 persons (15·6%) refused.

Selected characteristics of subjects in the intervention and comparison communities at baseline are shown in table 2. The sociodemographic profiles of the two communities were similar to those in the 1991 Canadian census,[40] and the prevalences of the behavioural risk factors measured were consistent with recent provincial estimates.[42] The intervention and comparison communities were similar with regard to age and educational attainment but the distribution by gender, language spoken at home, and income sufficiency differed. Sociodemographic differences between the communities will need to be accounted for in analyses of programme effects on behavioural outcomes. The prevalence of behavioural risk factors was similar in the two communities with the exception of smoking.

To minimise attrition from the longitudinal cohort sample, two recontact surveys of the baseline sample are planned to update telephone numbers at which subjects can be contacted. In the baseline survey, subjects provided names, addresses, and telephone numbers of two persons to contact in the event that the subject could not be recontacted at follow up. The first recontact survey was completed in December 1992, six months after the baseline survey. At that time 6·2% of the baseline cohort could not be recontacted. Of the 1543 subjects recontacted, 142 (9·2%) had changed telephone numbers. A second recontact survey will be conducted in February 1996. Data on risk factor prevalence for the main study outcomes (that is, prevalence of smoking, physical inactivity, high fat diet, time of last blood pressure and cholesterol check) will be collected in the last recontact survey.

ANALYSIS

The main question to be addressed in the analysis of data from both the longitudinal cohort and independent sample surveys is: *Has the prevalence of the CVD risk factors of interest decreased in the community exposed to the coeur en santé programme compared with the matched comparison community?* The primary measure of study outcome is the net change in the prevalence of the behavioural risk factors of interest – that is the decrease observed in St-Henri relative to the decrease in the comparison community in the age and sex standardised prevalences of smoking, physical inactivity, high fat diet, and behaviours related to blood pressure and cholesterol control.

Because only two communities are studied, an individual based analysis will be conducted to assess the impact of the intervention programme. This kind of analysis usually violates the assumption regarding independence between units of analysis, because of a positive intraclass correlation coefficient between responses of individuals within a community. The error variance in the individual level analysis will be underestimated and the type I error rate inflated.[44] Our analyses will use the recently published intraclass correlation coefficients of the city-year component of variance as estimated in the Minnesota heart health programme for 23 variables including % regularly physically active in leisure time, % hypertensive, % currently smoking, and body mass index to obtain estimates of standard error, according to the methods suggested by Hannan *et al.*[43]

Samples for the awareness and participation surveys are selected using the same sampling strategy described above for the impact surveys. Because the telephone directory lists are updated biweekly, a new list is purchased during the month preceding the survey and samples are selected from the new lists. Data for the January 1993 and March 1994 awareness and participation surveys were collected in 10 minute, telephone administered interviews conducted in either French or English. Subjects were asked general questions about awareness of and participation in coeur en santé interventions, as well as separate questions about each of the interventions which had taken place in St-Henri in the 12 months preceding the interview. Data were also collected on sociodemographic characteristics of subjects, and, in the March 1994 survey, on selected behavioural risk factors, and stages of readiness to effect behavioural change.[35 44] Multivariate logistic regression analyses were used to identify sociodemographic characteristics associated with awareness and participation.

A total of 946 households were selected for the January 1993 awareness and participation survey. Of those contacted, 297 households were ineligible for inclusion in the survey. Of the remaining 649 households, 14·6% could not be contacted; 71% of subjects selected (n=461) completed the interview and 14·3% refused to participate.

A total of 724 households were selected for the March 1994 awareness and participation survey. Of those contacted, 154 were ineligible for inclusion in the survey. Of the remaining 570 households, 9·1% could not be contacted; 387 persons (67·9% of 570) completed the interview and 131 persons (23·0% of 570) refused to participate.

In January 1993, 64·1% of respondents had heard about one or more coeur en santé St-Henri interventions, and 21·3% had participated in one or more interventions. Fifteen months later, 72·9% had heard about one or more interventions, and 33·7% had participated in one or more interventions. Awareness of specific interventions in January 1993 ranged from 3·9% to 36·2%, and from 4·0% to 37·1% in March 1994. Participation in coeur en santé interventions ranged from 0·0% to 5·6% in January 1993 and from 0·0% to 25·6% in the March 1994 survey. Awareness and participation were higher for interventions that were easily accessible to participants such as a weekly heart health column in the local newspaper or which were available in the context of other community events in which subjects were already participating, such as heart health activities held during annual sidewalk sales by local retailers. Also, multivariate analysis suggested that awareness and participation were higher among females, persons aged 45–65 years, those with low education, and those who had lived in the community five or more years.

Discussion

A major public health challenge for the 1990s is to discover effective and cost efficient strategies to prevent the development of CVD, particularly in underprivileged communities which have higher CVD mortality than the general population and where poverty, crime, domestic violence, lack of food, drug abuse, and alcoholism are perceived by the population to be more immediate and important problems. Programme planners with limited budgets will have to draw on the lessons learned from Stanford, Pawtucket, Minnesota, North Karelia, and others to make informed decisions about strategies which are likely to be most appropriate, applicable, and cost-effective in their target populations. It is imperative that such efforts be evaluated, but again, the challenge is to discover credible methods of evaluation in times of fiscal restraint, which are able to demonstrate impact against a marked secular trend of decreasing CVD risk factor prevalence. This is particularly challenging given that previous initiatives using state of the art evaluation methodologies have failed to demonstrate remarkable impacts of community based programmes on the prevalence of CVD risk factors.

One of the first Canadian experiences of a multifactorial, community based, heart health promotion programme is the coeur en santé St-Henri programme developed for a poor, inner city neighbourhood with high levels of CVD morbidity and mortality. The strategies selected to evaluate the impact of coeur en santé represent a compromise between maintaining the cost of the evaluation within budget while attempting to optimise the scientific validity of the study design and methods. Perhaps one of the more important contributions of the coeur en santé evaluation will be the assessment of the relative advantages and disadvantages of the various evaluation strategies used – lessons that could eventually be incorporated into the routine evaluation of heart health promotion programmes by public health agencies that do not have access to research grants or large budgets for conducting complex evaluations.

The evaluation design selected to measure impact incorporates assessment of study results in both longitudinal cohort and independent sample surveys. In addition, repeated independent sample surveys measure awareness of and participation in the coeur en santé programme interventions. Choices made to limit the cost of the evaluation were (i) inclusion of one rather than multiple pairs of communities, (ii) a single rather than multiple follow up observations, (iii) use of telephone survey methodology for data collection rather than in person interviews and/or measurement of physiological and anthropometric risk factors, and (iv) exclusion of CVD morbidity and mortality as outcomes. The following paragraphs discuss these choices and their possible impact on the validity of the results.

Although the study design retains the most essential features of a community trial, there are only two communities studied. Koepsell *et al*[26] discussed the difficulties of achieving comparable study groups in community based health promotion research, when random allocation is not possible and when cost and feasibility limit the number of communities

which can be studied. In order to minimise the main problem – the increased risk of a major imbalance between groups in important known and unknown confounders – comparison groups should be selected to resemble intervention groups as closely as possible.

Similar to most community trials to date, the comparison community in this study was selected to resemble St-Henri as closely as possible according to 1986 census data, the most recently available data at the time of study design. When data from the 1991 census became available, it was apparent that although the comparison community had not changed dramatically, the population of St-Henri, which had been almost exclusively Francophone, had shifted to an Anglophone/Francophone mix, and that there had been a decrease in the proportion of persons classified as poor. These changes were reflected in the June 1992 baseline survey. Although coeur en santé offers several interventions in English, most are offered in French only. In addition, data from surveillance of awareness of and participation in the coeur en santé programme suggest that Anglophone involvement in the programme is disproportionately low. The net effect of these trends is possibly attenuation of results, since the programme's impact will have to be studied in the subgroup of Francophones only, thereby reducing study power.

Coeur en santé incorporates single rather than multiple follow up observations in the longitudinal cohort and independent sample surveys. In contrast, the three recent American studies have examined outcomes in more complex study designs. For example, the Minnesota heart health project used a cross community multiple times series model in which up to nine annual surveys in each of six communities were planned. According to Salonen *et al*[27] the effects of the intervention can be better estimated by the interaction term in a general repeated measures model that includes type of community (intervention or reference) and time of observation with regard to the hypothesised start of intervention effects. This weakness in the coeur en santé study design is mitigated to a certain degree by measurement of the outcomes of interest in the March 1994 and March 1995 awareness and participation surveys in St-Henri. Thus, depiction of trends in CVD risk factor prevalence in St-Henri, at least, is possible in four separate independent sample surveys. Also, data on risk factor behaviours will be collected in the last recontact surveys of the baseline cohort, in February 1996, providing data from three points in time for the longitudinal cohort study.

Perhaps one of the more difficult design decisions was to adopt less costly telephone survey methodology for the measurement of risk factor outcomes, even though the validity of telephone self reports of the outcomes of interest was not known. Our experience to date suggests that telephone survey methodology is feasible and can yield representative samples at low cost in low income communities where phone ownership is high. Comparison with the census data suggested that there were no important selection biases in the samples. In addition, the prevalence of behavioural risk factors were consistent with recent provincial estimates. The applicability of this methodology in communities with low phone ownership, however, is limited. Investigators studying these communities will be obliged to balance the low cost of telephone survey methodology against the possibility of important selection biases in their samples, especially in poor communities where phone ownership is directly linked to income.

The cost of conducting a telephone survey will vary with the amount of time and effort required to develop and pretest the survey instrument and methods, the availability and cost of a sampling frame, the sample size, the cost of hiring the data collection and processing staff including research assistants, interviewers, data entry clerks, and programmers, the length of the questionnaire, the desired response rate, the extent and complexity of data analysis, as well as the resources already available within the host institution. We estimate that, excluding the start up costs of developing and pretesting the survey instruments and methodology, the cost of a coeur en santé telephone survey ranges between $10 000 and $50 000 Canadian. The awareness and participation surveys fall in the lower range of this estimate (mostly because of the smaller sample sizes) while the baseline survey and its follow up surveys fall in the upper range of the estimate.

The use of telephone survey methodology necessarily excludes in person interviews and clinical measurement of anthropometric and physiological risk factors, so that validation of self reports is not possible. Recently self reports of CVD risk factors obtained by telephone survey were validated against objective measures in a non-representative rural white population.[45] Overall, the prevalence of smoking was underreported by 17%. Sensitivity for self reported smoking behaviour was 77% for men and 86% for women, indicating a moderate amount of misclassification, especially among men. Non-smokers accurately classified themselves as non-smokers. Consistency of telephone self reports of smoking among white, non-Hispanics has been reported to be high (Kappa = 0·90).[46] Our telephone measure of high fat diet was validated in the St-Henri population against diet history. Results showed a correlation of 0·49 against the percentage total calories from fat, and a test-retest Kappa coefficient of 0·90. These results are among the most promising reported to date for short dietary measures.

Our measures of physical activity and of behaviours related to blood pressure and cholesterol control have not yet been validated. However, reported consistency for telephone self reports of a recent blood pressure check and recent cholesterol check among white non-Hispanics was high (Kappa = 0·85 and 0·83, respectively).[46] Consistency of self reported measures of physical activity were lower, in the range of 0·60. Self reports of other CVD risk factors including obesity (height and weight) high blood pressure, hypercholesterolaemia,

and diabetes are obtained in the coeur en santé study. Although reported consistency among white non-Hispanics was high (hypertension Kappa = 1·00; hypercholesterolemia Kappa = 0·88; body mass index Kappa = 0·97; diabetes Kappa = 0·85),[47] sensitivities in telephone surveys were low (74%, 43%, 44%, and 75%, respectively).[45]

Risk factor misclassification is a distinct and important threat to validity in the coeur en santé study, especially if it is differential in St-Henri and Centre-Sud. Reports to date suggest that there is some evidence of moderate validity, at least for self reports of smoking, high fat diet and behaviours related to blood pressure and cholesterol control. Further validation research is required on these measures as well as on telephone self-reports of physical activity.

The coeur en santé excludes systematic assessment of changes in the environment related to the programme such as increases in the availability of healthy foods, access to smoke free areas or number of opportunities for education about heart health. It also excludes systematic assessment of the impact of the coeur en santé programme on the activities of other Montreal area agencies or groups that are concerned with heart health. Finally, the programme excludes CVD morbidity and mortality as outcomes because of the cost to set up and maintain an adequate surveillance system and because of the low power to detect change in the short term. By contrast, the Stanford five city, Pawtucket, and Minnesota projects have developed CVD morbidity and mortality criteria collaboratively to permit eventual pooling of data.[15] Exclusion of these outcomes from the coeur en santé study will not affect the validity of results on risk factor prevalence.

CONCLUSIONS

The coeur en santé St-Henri research and demonstration project is one of the first Canadian attempts to diffuse knowledge acquired from earlier community based initiatives to a low income, low education population with high rates of CVD morbidity and mortality. Evaluation of the impact of the coeur en santé programme poses special challenges in terms of making choices to optimize validity yet maintain cost. The implications of these choices must be taken into consideration in eventually interpreting the results.

This research was funded by the National Health Research and Development Program, Health Canada (grant nos 6605-3562-H and 6605-4432-201) and through a National Health Research Scholar award to J O'Loughlin. We thank Jean-François Boivin, Robert Choinière, Lucie Richard, David Peurreaux, and Mireille Paradis.

1 Puska P, Tuomilehoto J, Salonen J *et al. The North Karelia project: evaluation of a comprehensive community programme for control of cardiovascular diseases in 1972–77 in North Karelia, Finland.* Copenhagen: Public Health in Europe, WHO/EURO Monograph Series, 1981.
2 Maccoby N, Farquhar JW, Wood PD, Alexander J. Reducing the risk of cardio-vascular disease: effects of a community-based campaign on knowledge and behaviour. *J Community Health* 1977;**23**:100–14.
3 Salonen JT, Puska P, Kottke TE, Tuomilchta J. Changes in smoking, serum cholesterol and blood pressure levels during a community-based cardiovascular disease prevention program – the North Karelia project. *Am J Epidemiol* 1981;**114**:81–94.
4 Farquhar JW, Fortmann SP, Flor JA *et al.* Effects of community wide education on cardiovascular disease risk factors. The Stanford five-city project. *JAMA* 1990;**264**: 359–65.
5 Shea S, Basch CE, Lantigua R, Wechsler H. The Washington-Heights-Inwood healthy heart program: A third generation community-based cardiovascular disease prevention programe in a disadvantaged urban setting. *Prev Med* 1992;**21**:203–17.
6 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.
7 Rossouw JE, Jooste PL, Chalton DO *et al.* Community-based intervention: the coronary risk factor study (Coris). *Int J Epidemiol* 1993;**22**:428–38.
8 Rothenberg RB. Confounding in community interventions. *Am J Prev Med* 1993;**9**:372–5.
9 McCord C, Freeman HP. Excess mortality in Harlem. *New Engl J Med* 1990;**322**:173–7.
10 Shea S, Basch CE. A review of five major community-based cardiovascular disease prevention programs. Part II: Intervention strategies, evaluation methods and results. *American Journal of Health Promotion* 1990;**4**:279–87.
11 Steckler A, Goodman RM, McLeroy KR, Davis S, Koch G. Measuring the diffusion of health promotion programs. *American Journal of Health Promotion* 1992;**6**:214–25.
12 Orlandi MA, Landers C, Weston R, Haley N. Diffusion of health program innovations. In: Glanz B, Lewis F, Rimer B, eds. *Health behavior and health education: theory, research and practice.* San Franciso: Jossey Bass, 1990.
13 Farquhar JW, Fortmann SP, Maccoby N *et al.* The Stanford five-city project: design and methods. *Am J Epidemiol* 1985;**122**:323–34.
14 Jacobs DR, Luepker RV, Mittelmark MB *et al.* Community-wide prevention strategies: evaluation design of the Minnesota heart health program. *J Chronic Dis* 1986;**39**:775–88.
15 Assaf A, Banspach S, Lasater T, McKentay S, Carleton R. The Pawtucket heart health program: II. Evaluation strategies. *Rhode Island Med J* 1987;**70**:541–6.
16 Ajzen I, Fishbein M. *Understanding attitudes and predicting social behavior.* Englewoods Cliffs, NJ: Prentice Hall, 1980.
17 Azjen I, Madden T. Prediction of goal-directed behavior: attitudes, intentions and perceived behavioral control. *J Exp Soc Psychol* 1986;**22**:453–74.
18 Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychol Rev* 1977;**84**:191–215.
19 Bandura A. *Social foundations of thought and action. A social cognitive theory.* Englewoods Cliffs, NJ: Prentice-Hall, 1986.
20 O'Leary A. Self-efficacy and health. *Behav Res Ther* 1985; **23**:437–51.
21 Strecher V, McEvoy-Devells B, Becker M, Rosenstock I. The role of self-efficacy in achieving health behavior change. *Health Educ Q* 1986;**13**:73–91.
22 World Health Organization (WHO). *Ottawa charter of health promotion.* Ottawa: Canadian Public Health Association, Health and Welfare Canada, 1986.
23 Paradis G, O'Loughlin J, Elliott M *et al.* Coeur en santé St-Henri: A community-based heart health promotion program in a low income, low education urban neighbourhood. *J Epidemiol Community Health* 1995;**49**:495–504.
24 Statistics Canada. *Profile of census tracts in Montreal. 1986 Census.* Publication No 95–129 and 95–130. Ottawa: Statistics Canada, 1988.
25 Statistique Canada. *Cause de décès. La statistique de l'état civil.* Publication No 84–208. Vol IV. Ottawa: Statistique Canada, 1988.
26 Koepsell TD, Wagner EH, Cheadle AC *et al.* Selected methodological issues in evaluating community-based health promotion and disease prevention programs. *Annu Rev Public Health* 1992;**13**:31–57.
27 Salonen JT, Kottke TE, Jacobs DR, Hannan PJ. Analysis of community-based cardiovascular disease prevention studies - evaluation issues in the North Karelia project and the Minnesota heart health program. *Int J Epidemiol* 1986;**15**:176–82.
28 Kirscht J, Janz N, Becker M. Psychosocial predictors of change in cigarette smoking. *J Appl Soc Psychol* 1989;**19**: 298–308.
29 Sallis J, Pinski R, Grossman R, Patterson I. Nader P. The development of self-efficacy scales for health-related diet and exercise behaviors. *Health Education Research* 1988;**3**: 283–92.
30 Sallis J, Haskell W, Fortmann S, Vranizan K, Taylor CB, Soloman D. Predictors of adoption and maintenance of physical activity in a community sample. *Prev Med* 1986; **15**:331–41.
31 Barrios F, Niehaus J. The influence of smoker status smoking history, sex and situational variables on smoker's self-efficacy. *Addict Behav* 1985;**10**:425–29.
32 Delongis A, Folkman S, Lazarus R. The impact of daily stress on health and mood: Psychological and social resources as mediators. *J Pers Soc Psychol* 1988;**34**:986–95.
33 Dishman R, Sallis J, Orenstein P. The determinants of physical activity and exercise. *Public Health Rep* 1985;**100**: 158.
34 Glynn S, Ruderman A. The development and validation of an eating self-efficacy scale. *Cognitive Therapy Research* 1986;**10**:403–20.
35 Prochaska J, DiClemente C. Common processes of self-

change in smoking, weight control and psychological distress. In: Shiffman S, Wills TA eds. *Coping and substance use.* Orlando: Academic Press 1985;345–63.

36 Goldstein-Curry S, Marlatt G. Unaided quitters' strategies for coping with temptations to smoke. In: Shiffman S, Wills T, eds. *Coping and substance use.* Orlando: Academic Press 1985: 243–65.

37 MacLean DR, Petrasovits, A, Nargundkar M *et al.* Canadian heart health survey: A profile of cardiovascular risk. Survey methods and data analysis. *Can Med Assoc J* 1992; **146**(suppl):1969–74.

38 Stephens T, Craig CL. *The well-being of Canadians: highlights of the 1988 Cambell's survey.* Ottawa: Canadian Fitness and Lifestyle Research Institute, 1990.

39 Kristal AR, Shattuck AL, Henry HJ. Patterns of dietary behavior 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.

40 Statistics Canada. *Profile of census tracts in Montreal. 1991 Census.* Publication No 95–329 and 95–330. Ottawa: Statistics Canada, 1993.

41 Health and Welfare Canada. Rootman I, Warren R, Stephens T, Peters L, eds. *Canada's health promotion survey: technical report.* Ottawa: Minister of Supply and Services Canada, Catalogue No H39–1191, 1988.

42 Santé Québec. Gouvernement du Québec. *Faits saillants de l'enquête québécoise sur la santé cardiovasculaire 1990.* Montréal: Ministère de la Santé et des services sociaux, 1991.

43 Hannan PJ, Murray DM, Jacobs DR, McGovern PG. Parameters to aid in the design and analysis of community trials: intraclass correlations from the Minnesota heart health program. *Epidemiology* 1994;**5**:88–95.

44 DiClemente C, Prochaska J. Processes and stages of self-change: coping and competence in smoking behavior change. In: Shiffman S, Wills TA eds. *Coping and substance use.* Orlando: Academic Press 1985:319–43.

45 Bowlin SJ, Morrill BD, Nafziger AN, Jenkins PL, Lewis C, Pearson TA. Validity of cardiovascular disease risk factors assessed by telephone survey: The behavioral risk factor survey. *J Clin Epidemiol* 1993;**46**:561–71.

46 Stein AD, Lederman RI, Shea S. The behavioral risk factor surveillance questionnaire: Its reliability in a statewide sample. *Am J Public Health* 1993;**83**:1768–72.