
Piloting the CANRISK tool in Vancouver Coastal Health

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Abstract

Introduction: Vancouver Coastal Health Authority's Healthy Living Program implemented this pilot study to test and validate the Canadian Diabetes Risk Assessment Questionnaire (CANRISK) developed by the Public Health Agency of Canada as a screening tool for undiagnosed type 2 diabetes mellitus (DM) and prediabetes. Key objectives were to test the feasibility and acceptability of screening urban ethnic groups using the CANRISK, increase awareness of risk factors for DM and preDM and develop resources for lifestyle change.

Methods: The study recruited participants through community groups and churches, intraorganizational emails, primary care clinics and word of mouth. They completed the CANRISK and an oral glucose tolerance test (OGTT) either individually or as part of a group. Groups received a brief diabetes prevention information session. Documents to support lifestyle change were distributed to all participants.

Results: Participants (n = 556) were recruited among East Asian, Caucasian, South Asian and Latin American ethnic groups. Of these, 17% had OGTT results in the preDM range and 3% in the DM range. Over 90% of participants reported that the CANRISK wording was clear and that they had received useful information about lowering their diabetes risk.

Conclusion: The benefit of using an OGTT was in identifying 11% of the sample of participants who had impaired glucose tolerance (IGT) and did not show abnormal fasting plasma glucose (FPG) results. All participants with abnormal laboratory results were provided with follow-up educational interventions in their own language.

Keywords: diabetes, prediabetes, patient recruitment, oral glucose tolerance test, OGTT, ethnicity, prevention

Introduction

This provincial pilot study aims to test and validate the Canadian Diabetes Risk Assessment Questionnaire (CANRISK)* developed by the Public Health Agency of Canada (PHAC) as a screening approach for undiagnosed type 2 diabetes mellitus (DM) and prediabetes (preDM).¹ The pilot was implemented by the Vancouver Coastal Health Authority's (VCH) Healthy Living Program (HLP). The Program

provides health promotion and chronic disease prevention services for adults who are well, at-risk for chronic diseases or recently diagnosed with a chronic disease. Their life circumstances include one or more of the following: low income; low level of education; immigrant; Aboriginal ancestry; and social isolation and/or marginalization. Strategies used to identify and support these individuals include screening, health promotion and self-management support.

The objectives of the pilot study were to

- test the feasibility and acceptability of screening urban ethnic groups using the CANRISK;
- identify, develop and provide resources to support lifestyle changes;
- enhance partnerships and collaborate with community organizations to increase awareness and screen for DM and preDM;
- develop partnerships and linkages with family physicians;
- evaluate satisfaction and acceptability of screening activities among the target groups and health care providers; and
- increase research participants' knowledge of risk factors for preDM and DM and provide resources for lifestyle change.

Methods

Participants

Pilot study participants were aged 30 to 74 years, able to provide informed consent, and neither pregnant nor diagnosed with DM. At the request of PHAC, the pilot study targeted members of the following ethnic communities: East Asian (Chinese, Vietnamese, Filipino); South Asian (Punjabi); Latin American; and sub-Saharan African, though Caucasians and urban Aboriginals were also approached to participate. At the Vancouver site, we broadened the CANRISK survey's age range (40 to 74 years) to include those aged 30 to 39 years as several of the targeted ethnic groups have a higher genetic risk of developing DM^{2,3} compared with Caucasians. This was also based on the Canadian Diabetes Association's (CDA's) recommendation

* This version of the questionnaire is available online from: <http://www.diabetes.ca/documents/for-professionals/NBI-CANRISK.pdf>.

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that those with one or more of the 13 risk factors be tested earlier than age 40 years.⁴

Recruitment

Once granted ethics approval by the University of British Columbia (UBC) and the VCH Research Institute (VCHRI), enrolment ran from June 2009 to May 2010. The core research team involved in the recruitment and implementation were registered professional staff (nurses or dietitians).

Documents informing potential participants about the study were developed and translated.

Several strategies were used to recruit participants. Family physicians in private practice were identified as key partners. The study team gave presentations at physician education sessions and at VCH primary health care clinic team meetings. As a result, 49 physicians, 3 residents, 4 nurse practitioners and 3 nurses working in physician offices agreed to refer patients to the study.

The study team met with key VCH leaders to discuss how best to inform VCH staff, many of whom had risk factors for diabetes, about the study. An email was sent to all VCH staff about the opportunity to participate in the study. Leaders from residential care and assisted living sites agreed to circulate study brochures and display recruitment posters in staff rooms. Leaders providing education/clinical services to adults, older adults and parents in nine locations also agreed to collaborate. A recruitment partnership was established with UBC researchers to target the Latin American community.

Partnerships with community organizations and churches that support ethnic communities or low-income populations were the most successful at recruiting study participants. As part of their ongoing work, the study team had established relationships with several community groups to collaborate in diabetes prevention events. Staff in these organizations would plan a

CANRISK group session and invite their members to participate in the pilot study or else invite the pilot study team to recruit on site during a local event.

Team members also routinely asked participants to mention the study to friends and family.

CANRISK administration

Different options were offered to complete the study protocol while meeting the varied needs and preferences of participants. The protocol included the following steps: (1) fill out the CANRISK questionnaire; (2) complete an oral glucose tolerance test (OGTT) and a hemoglobin A1C (HbA1C) test; (3) receive test results, with all necessary explanations, over the telephone from a member of the pilot study team, followed by a mailed copy of the test results. Two screening events (16 and 23 participants) combined CANRISK completion, education on preventing DM and laboratory staff performing OGTT and HbA1C testing on site. These were held in Spanish and in Vietnamese. There were 36 group events where the CANRISK was completed with a brief introduction to diabetes prevention. Participants then went individually to the laboratory for an OGTT. These groups ranged in size from 5 to 25 participants and were held in Cantonese, Mandarin, Punjabi or English in various locations including churches, municipal community centres and community organization offices. Twelve volunteers offered support with groups. Another participant subset completed the CANRISK as part of an individual appointment with a team staff member and then went to the laboratory on a different day.

Laboratory protocol for OGTT and HbA1C testing

Study funding was used towards two commercial laboratories performing the blood tests. A partner physician from the VCH Primary Care Network agreed to block order the laboratory tests. Participants were provided with a standard set of instructions on how to prepare for the OGTT. The team reviewed the

laboratories' testing and analysis protocol for conformity with the documentation provided by PHAC regarding OGTT and HbA1C. They were found to meet the requirements.

Lifestyle intervention

First, the pilot study team reviewed the documentation, health services and community supports available for future participants in making healthy lifestyle changes linked to modifiable risk factors in the CANRISK. These modifiable risk factors include weight loss, healthy diet with more fruits and vegetables and physical activity. An array of documents, resource contacts and tools were identified or developed. When available, copies of the documents were ordered in languages spoken by the target population. A two-page document on setting a healthy goal was designed by the team and translated into the various languages spoken by the participants. Participants were offered a fridge magnet plate showing healthy portion sizes and/or a pedometer with handbook on its use. HLP staff developed PowerPoint presentations on preDM and DM and their prevention for use in group sessions for study participants and others. These were then translated into Chinese, Vietnamese and Spanish in collaboration with community partners. As a follow-up to the study for research participants and others, HLP staff is offering several group session options to educate about preDM and its prevention.

Study participant and health care provider satisfaction measurement

VCH evaluation staff designed a seven-item outcome and satisfaction evaluation survey. Participants were requested to fill out this anonymous survey after they had completed the study. The evaluation survey asked about participants' overall satisfaction with both parts of the study, namely, filling out the CANRISK and the blood test. That some participants would find the 2-hour test overly long and the glucose solution's physiological effect uncomfortable was expected. A five-item satisfaction survey was emailed to eleven professionals from VCH and partner organizations.

Statistical analyses

An additional variable was created in the dataset to denote ethnic group based on the origin of biological parents[†]. Only participants with both parents of the same ethnic origin were included in the analyses that examined differences among ethnic groups. We used SPSS version 14 for Windows (IBM) for all of our analyses.

Results

The Vancouver site surpassed its goal of enrolling 300 or more participants with 556 completing the study. Table 1 summarizes the most successful participant recruitment strategies.

Baseline characteristics

Information about baseline characteristics of the ethnic groups in the sample appears in the following series of tables. Table 2 shows the ethnic composition of the study sample as compared to that of the City of Vancouver based on the 2006 Canadian census.⁵ In the study sample, the percentage of participants from three of the targeted ethnic groups exceeded their respective weight in the ethnic composition of the City of Vancouver. This was due to the Program's strong connections with East Asian, South Asian and Latin American ethnic communities.

Due to the different outreach strategies with ethnic communities, there are some marked differences in the characteristics of the sub-samples from these populations (Table 3). The Latin American sample consists of participants that are both younger than other ethnic groups (ANOVA: $p < .001$; then Tukey's test: $p < .01$) and with a more equal gender distribution (Mann-Whitney test: $p < .01$) since over 60% were recruited from a university setting. On the other hand, South Asian participants are significantly older ($p < .01$) with 48% of participants in the 65- to 74-year age group and 86% women ($p < .01$). Recruitment of this ethnic group was largely through a community group targeting senior South Asian women.

TABLE 1
Comparison of recruitment strategy outcome for CANRISK pilot study, Vancouver, Canada (N = 556)

Recruitment strategy	Participants recruited, %
Private practice physician referral	4
VCH clinician referral	4
Partnership with UBC	6
VCHRI email to staff	16
Churches	17
Community organizations	26
Word of mouth from participants	27

Abbreviations: CANRISK, Canadian Diabetes Risk Assessment Questionnaire; UBC, University of British Columbia; VCH, Vancouver Coastal Health Authority; VCHRI, Vancouver Coastal Health Authority Research Institute.

TABLE 2
Recruitment by biological ethnic group as compared to population in Vancouver in CANRISK pilot study, Vancouver, Canada (N = 571 600)

Population group	Study sample,		City of Vancouver ⁵
	n	%	%
East Asian	333	60	40.3
Caucasian	111	20	49.0
South Asian	50	9	5.7
Latin American	44	8	1.4
Other ^a	18	3	3.6
Total	556	100	100.0

Abbreviations: CANRISK, Canadian Diabetes Risk Assessment Questionnaire.

^a The "Other" category is not detailed separately in Tables 3, 5 and 6.

TABLE 3
Age and sex by biological ethnic group recruited for CANRISK pilot study, Vancouver, Canada (N = 556)

Variable	Ethnic group, %				All, % (N = 556)
	East Asian (n = 333)	Caucasian (n = 111)	South Asian (n = 50)	Latin American (n = 44)	
Sex					
Women	75	78	86	55	75
Age group, years					
30–39	5	9	4	48	10
40–44	9	15	10	11	10
45–54	33	34	12	16	30
55–64	37	31	26	16	33
65–74	16	11	48	9	17

Abbreviations: CANRISK, Canadian Diabetes Risk Assessment Questionnaire.

Note: Only participants with both parents of the same ethnic origin were included in the analyses that examined differences among ethnic groups.

[†] CANRISK Q9 and Q10: Please check off which of the following ethnic groups your biological (blood) parents [mother, father] belong to: White (Caucasian); Aboriginal (First Nations person, Métis, Inuit); Black; Latin American; South Asian (East Indian, Pakistani, Sri Lankan, etc.); East Asian (Chinese, Vietnamese, Filipino, Korean, etc.); Other.

TABLE 4
Number of CANRISK pilot study participants aged 30 to 39 years (n = 53) with risk factor for diabetes according to Canadian Diabetes Association, Vancouver, Canada

	Participants	
	n	%
CDA diabetes risk factors		
Parent or sibling with diabetes	15	28.0
Ethnicity: East/South Asian, Latin American, Aboriginal, sub-Saharan African	43	81.0
History of large birth-weight baby (> 4 kg or 9 pounds)	1	2.0
History of gestational diabetes	2	4.0
Presence of IGT or IFG ^a	4	7.5
Hypertension	6	11.0
Overweight or obesity (BMI ≥ 25 kg/m ²)	20	38.0
Waist circumference above cut-off ^b	20	38.0
Total CDA proxy risk score ^c = 0	5	9.5
Total CDA proxy risk score ^c ≥ 1	48	90.5
Total CDA proxy risk score ^c ≥ 2	32	60.0
CANRISK score, points		
< 7 (low risk)	33	62.0
7–11 (slightly elevated risk)	17	32.0
12–14 (moderate risk)	2	4.0
15–20 (high risk)	1	2.0
> 20 (very high risk)	0	0

Abbreviations: BMI, body mass index; CANRISK, Canadian Diabetes Risk Assessment Questionnaire; CDA, Canadian Diabetes Association; IGT, impaired glucose tolerance; IFG, impaired fasting glucose.

^a Reporting having had a high blood sugar result in the past in CANRISK Q7[†]. Used as proxy.

^b For women > 31.5 in/80 cm; for men > 37.0 in/94 cm.

^c A proxy risk score was calculated based on the presence or absence of the 8 CDA risk factors for which data are available in the CANRISK survey. No data are available in CANRISK on the CDA risk factors relating to: “high cholesterol or other fats in the blood” or to having “been diagnosed with any of the following conditions: polycystic ovary syndrome, acanthosis nigricans, schizophrenia.

The CDA suggests that those with one or more diabetes risk factors⁶ be tested earlier than age 40 years. The CANRISK includes questions on eight factors from the CDA list of risk factors. An analysis of these risk factors in those aged 30 to 39 years was performed to review the appropriateness of including this age group in the study. Table 4 shows the number and percentage of participants presenting with each CDA risk factor.

While 60% of those aged 30 to 39 years presented with two or more risk factors, the majority of participants in this age group (62%) were in the low risk CANRISK category. Four participants in this age group presented with either impaired fasting glucose (IFG) or impaired glucose tolerance (IGT). Their CANRISK scores were in the low risk (n = 2), slightly elevated risk (n = 1) and moderate risk (n = 1) categories.

The pilot study team were concerned that the CANRISK question on fruit and vegetable consumption[§] was not worded to include a minimum number of portions in order to obtain a zero risk point score. A comparison of the answers on this question and of the responses to the physical activity question appears in Table 5.

Case detection (diabetes and prediabetes)

An important objective of the screening was to provide an opportunity for earlier identification of people with DM and preDM through OGTT testing. Table 6 shows the laboratory testing results of the participant sample.

Our study included participants who had been previously told that they had preDM (fasting plasma glucose [FPG]: 6.1–6.9 mmol/L), and 98 participants (18%) self-reported in the CANRISK that they had had a high blood sugar result[‡]. Of these, 26.5% had elevated results (IFG, IGT or both) while 7.1% were in the DM range. Alternately, among the 82% of participants who had never been told they had an abnormally high blood sugar, our study

TABLE 5
Healthy living behaviours by biological ethnic group recruited for CANRISK pilot study, Vancouver, Canada

Behaviour	Ethnic group, %				All, % (N = 556)
	East Asian (n = 333)	Caucasian (n = 111)	South Asian (n = 50)	Latin American (n = 44)	
Eat fruits and vegetables					
Every day	90	82	86	84	87
Not every day	10	18	14	16	13
≥ 30 min physical activity daily					
Yes	60	55	82	48	60
No	40	45	18	52	40

Abbreviations: CANRISK, Canadian Diabetes Risk Assessment Questionnaire.

[‡] CANRISK Q7: Have you ever been found to have a high blood sugar (abnormal) either from a blood test, during an illness, or during pregnancy? Yes/No or don't know.

[§] CANRISK Q5: How often do you eat vegetables or fruits? Every day/Not every day.

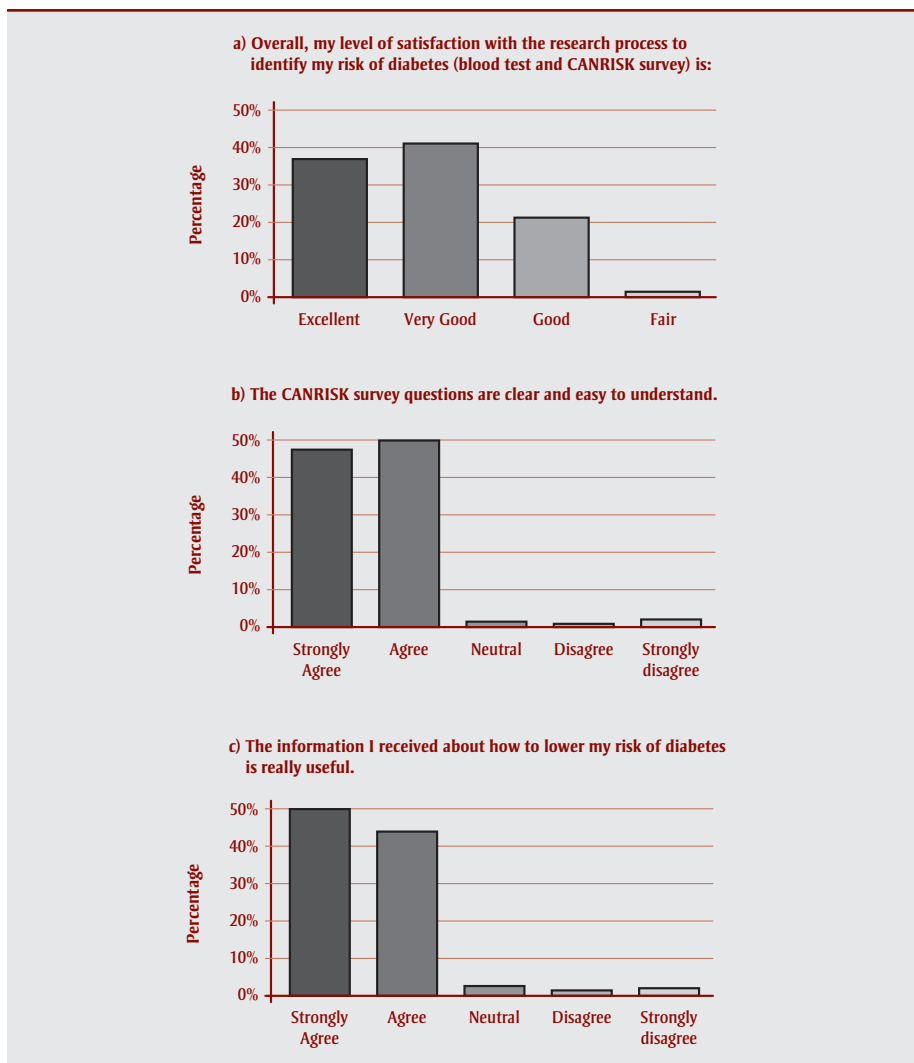
TABLE 6
Blood glucose range by biological ethnic group,
CANRISK pilot study, Vancouver, Canada

Result Category	Ethnic group								All ^a	
	East Asian (n = 333)		Caucasian (n = 111)		South Asian (n = 50)		Latin American (n = 44)		n	%
	n	%	n	%	n	%	n	%		
Normal	261	78.5	94	85.0	36	73.5	40	93.0	443	80.0
IFG only	12	3.5	2	2.0	3	6.0	1	2.5	18	3.0
IGT only	40	12.0	9	8.0	5	10.0	1	2.5	61	11.0
Both IFG and IGT	11	3.5	3	2.5	2	4.0	1	2.5	17	3.0
Diabetes range	9	2.5	3	2.5	3	6.0	0	0.0	15	3.0

Abbreviations: CANRISK, Canadian Diabetes Risk Assessment Questionnaire; IFG, impaired fasting glucose; IGT, impaired glucose tolerance.

^a Missing laboratory test data for two participants.

FIGURE 1
Overall satisfaction with the research process (CANRISK and blood test)
in response to participant evaluation survey (n = 441), Vancouver, Canada



identified 15% as having either IFG or IGT or both, and 2% of these results were in the DM range.

Evaluation of study participant and health care provider satisfaction measurement

There was a 79% response rate to the participant evaluation survey, with 441 research participants responding. The results of the quantitative evaluation questions are illustrated in Figures 1a to 1c. In answer to the question of level of satisfaction with the research process, 25% of respondents rated this as good or fair (choices were fair, good, very good and excellent) (Figure 1a). These participants may have found the OGTT particularly uncomfortable (due to pain, bruising and swelling because of the venipuncture and nausea or dizziness from the glucose solution). In comparison, 96% either agreed or strongly agreed that the survey wording was clear and easy to understand (Figure 1b). Further, 94% of respondents either agreed or strongly agreed that they had received useful information about how to lower their risk of DM (Figure 1c).

In written comments about how to improve the CANRISK, several participants suggested that the question on blood relatives with DM** was confusing and that it was difficult to add up the risk score correctly. Others suggested providing an adjustment to the waist circumference question^{††} to include the target waist circumference interval suggested for Asians by the World Health Organization⁷ (90 cm versus 94 cm for Caucasians).

Ten VCH and community group staff members who were involved in recruiting and supporting study participants filled out an evaluation survey, a response rate

** CANRISK Q8: Have any of your blood relatives ever been diagnosed with diabetes? Select from: Mother; Father; Brothers/Sisters; Children; Other.

†† CANRISK Q3: Men Waist circumference: Less than 94 cm or 37 inches/between 94–102 cm or 37–40 inches/ Over 102 cm or 40 inches; Women Waist circumference: Less than 80 cm or 31.5 inches/between 80–88 cm or 31.5–35 inches/Over 88 cm or 35 inches.

of 91%. Rating their satisfaction with the CANRISK on a scale of excellent to poor, 70% rated it as very good, 10% as good and 20% as fair. Notably, the CANRISK was rated less highly by those working with low-income immigrant communities. They noted that the survey was too long for people with low literacy levels. It was also suggested that the wording regarding ethnic groups be reviewed (e.g. replace such words as “Black” and “White”). One community partner and all the VCH professionals are planning to continue using the CANRISK in their practice.

Evaluation of lifestyle behaviour

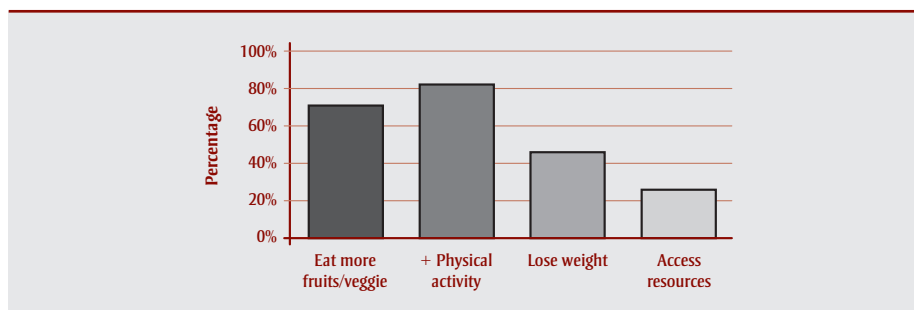
Most participants planned one or more changes in areas relating to the CANRISK questions or to accessing community resources suggested by the pilot study team, as shown in Figure 2. Only 5.7% of participants indicated that they were not thinking of adjusting their lifestyle. One professional also noted that some followed-up participants were actively making lifestyle changes as a result of participating in the study.

Discussion

The most effective strategy to recruit members of various ethnic groups was to partner with their community organizations and churches and then build on the resulting information exchange among members. For example, about 50% of East Asian participants were recruited through these channels. A few participants mentioned that they had been referred by their private practice physician. This could be due to patients not following through after the study brochure was handed-out by their physician. However, no requests for additional brochures were received from partner physicians.

A successful strategy with Caucasians was the approach through the VCH Research Institute that circulated the study email to VCH staff. Several of the approximately 90 participants thus recruited then circulated the email to relatives and friends.

FIGURE 2
Percentage of CANRISK pilot study participants thinking of making behaviour changes to lower their risk of diabetes, Vancouver, Canada



In the overall sample and in most ethnic groups, substantially more participants ate one or more fruits or vegetables every day^{††} compared to being physically active for 30 minutes every day^{§§}. Recommended targets on fruit and vegetable consumption in healthy living initiatives usually start at 5 or more portions per day.⁸ The Vancouver team suggests that the CANRISK question should be amended to mention the higher fruit and vegetable targets in accordance with the 7 to 10 daily portions recommended for adults by the *Canada Food Guide*.⁹ This would improve the usability of the CANRISK as a teaching and awareness-raising tool.

None of the participants who scored in the DM range knew of their health status prior to enrolling in the study. All gave the name of their physician, to whom the team then sent a letter with their test results. They were also referred to a Diabetes Education Centre, including the Chinese Diabetes Education Centre for Chinese speakers. A Vancouver site success is that participants with abnormal laboratory test results, who were subsequently diagnosed by their physician as having DM or preDM, were provided with timely educational interventions in their own language and linkages to community resources to support them in their self-management efforts. Due to the significant differences in age stratification and the unequal numbers in the ethnic subgroups, it is not appropriate to comment on the levels of preDM and DM detected across ethnic groups.

In terms of the cost-benefit of testing all participants with an OGTT rather than targeting those with an FPG equal or greater than 6.1 mmol/L as recommended by the CDA,⁴ we identified 61 participants (11% of the study participants) who had an isolated IGT who would not have been detected by FPG screening.

Conclusion

Overall, the recruitment and screening process was successful in the targeted ethnic communities. It resulted in identifying 15 participants (3%) with test results in the DM range, while 96 participants (17%) had results in the preDM range. Among these, 11% had IGT only which would not have been detected using only an FPG test.

It was essential to use multiple approaches for participant recruitment in order to enrol participants from the varied ethnic communities in Vancouver. Once a minimum number of individuals from a particular ethnic community had been recruited, word-of-mouth snowballed more referrals. The team is reviewing strategies to further engage with primary care physicians to increase the number of patient referrals to VCH health promotion and diabetes prevention programming. Ongoing discussions are underway about how best to integrate the CANRISK in these different primary care clinic environments based on their specific ways of working.

^{††} CANRISK Q5: How often do you eat vegetables or fruits? Every day/Not every day.

^{§§} CANRISK Q4: Do you usually do some physical activity such as brisk walking for at least 30 minutes every day? This activity can be done while at work or at home. Yes/No.

The research partnership between PHAC and HLP created synergies and furthered the program's aims. The team has formed new alliances with ethnic community leaders and groups to promote healthy living habits, increase awareness of DM risk factors and develop culturally appropriate content in several languages. The CANRISK provides an important basis for screening and teaching regarding the three pillars that are HLP's focus: healthy eating, increasing activity levels and smoking cessation.

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