UPSTREAM SCREENING AND COMMUNITY INTERVENTION FOR PREDIABETES AND UNDIAGNOSED TYPE 2 DIABETES

FINAL REPORT

2009
Prepared by:

*Diabetes Care Program of Nova Scotia (on behalf of the NS Prediabetes Project Team)*

*November 2009*

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Finally, we would like to thank the Public Health Agency of Canada (PHAC) and the Nova Scotia Department of Health (DoH) for the funding that made this important project possible. We also acknowledge the in-kind support of the study sponsor, DCPNS.

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<thead>
<tr>
<th>Provincial Team</th>
<th>AVH Team</th>
<th>GASHA Team</th>
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<tr>
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<td>● Tricia Cochrane, <em>AVH VP Community Health</em></td>
<td>● Madonna MacDonald, <em>GASHA VP Community Health</em></td>
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<td>● Diane Kennedy, <em>GASHA Nurse Manager</em></td>
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<td>● Robert Russell, <em>SMRH, Laboratory Manager</em></td>
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* Provincial/Local (DHA) Project Managers
## Glossary

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>AVH</td>
<td>Annapolis Valley Health</td>
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<td>BMI</td>
<td>Body Mass Index</td>
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<tr>
<td>CBG</td>
<td>Capillary blood glucose</td>
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<tr>
<td>CDA</td>
<td>Canadian Diabetes Association</td>
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<tr>
<td>CDE</td>
<td>Certified Diabetes Educator</td>
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<td>DC</td>
<td>Diabetes Centre</td>
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<td>DCPNS</td>
<td>Diabetes Care Program of Nova Scotia</td>
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<tr>
<td>DHA</td>
<td>District Health Authority</td>
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<tr>
<td>DM</td>
<td>Diabetes mellitus</td>
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<tr>
<td>DoH</td>
<td>Department of Health</td>
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<td>DPP</td>
<td>Diabetes Prevention Program</td>
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<tr>
<td>DPS</td>
<td>Diabetes Prevention Study</td>
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<tr>
<td>FP</td>
<td>Family physician</td>
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<tr>
<td>FPG</td>
<td>Fasting plasma glucose</td>
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<tr>
<td>GASHA</td>
<td>Guysborough Antigonish Strait Health Authority</td>
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<tr>
<td>GDM</td>
<td>Gestational diabetes</td>
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<tr>
<td>DoHPP</td>
<td>Department of Health Promotion &amp; Protection</td>
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<tr>
<td>IFG</td>
<td>Impaired fasting glucose</td>
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<tr>
<td>IGT</td>
<td>Impaired glucose tolerance</td>
</tr>
<tr>
<td>IWK</td>
<td>Isaac Walton Killam Health Centre</td>
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<tr>
<td>LPM</td>
<td>Local project manager</td>
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<tr>
<td>MB</td>
<td>Manitoba</td>
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<tr>
<td>NB</td>
<td>New Brunswick</td>
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<tr>
<td>NDSS</td>
<td>National Diabetes Surveillance System</td>
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<tr>
<td>NS</td>
<td>Nova Scotia</td>
</tr>
<tr>
<td>OGTT</td>
<td>Oral glucose tolerance test</td>
</tr>
<tr>
<td>PE</td>
<td>Prince Edward Island</td>
</tr>
<tr>
<td>PHAC</td>
<td>Public Health Agency of Canada</td>
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<tr>
<td>PreDM</td>
<td>Prediabetes</td>
</tr>
<tr>
<td>REB</td>
<td>Research Ethics Board</td>
</tr>
<tr>
<td>SD</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>SK</td>
<td>Saskatchewan</td>
</tr>
<tr>
<td>SMRH</td>
<td>St Martha’s Regional Hospital</td>
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<tr>
<td>Sn</td>
<td>Sensitivity</td>
</tr>
<tr>
<td>Sp</td>
<td>Specificity</td>
</tr>
<tr>
<td>VRH</td>
<td>Valley Regional Hospital</td>
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<tr>
<td>2hPG</td>
<td>2-hour plasma glucose</td>
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Executive Summary

The Diabetes Care Program of Nova Scotia (DCPNS) partnered with Annapolis Valley Health (AVH), the Guysborough Antigonish Strait Health Authority (GASHA), the NS Department of Health (DoH), Dalhousie Family Medicine, Cardiovascular Health NS (CVHNS), and the NS Department of Health Promotion and Protection (DoHP) to help validate the Canadian Diabetes Risk Assessment Questionnaire (CANRISK) for identifying individuals at high risk of developing type 2 diabetes (DM) and to develop and implement two community-based programs that promoted lifestyle changes known to prevent or delay the onset of type 2 DM among individuals with prediabetes (PreDM). The NS Prediabetes Project was conducted in the towns of Kentville and New Minas (AVH) and the county of Antigonish (GASHA), with central coordination through DCPNS.

The DCPNS and its partners received funding for the NS Prediabetes Project from the Public Health Agency of Canada (PHAC) in October 2007. A total of 417 participants enrolled in the project between May/June and Nov/Dec 2008.

- 84% had normal blood glucose
- 13% had PreDM
- 3% had previously undiagnosed DM

The 16-item CANRISK was designed to assess an individual’s 10-year risk for developing type 2 DM. There was a significant association between participants’ glycaemic status and six CANRISK items:

- Body Mass Index
- History of high blood sugar
- Waist circumference
- Education
- History of hypertension
- Perceived health status

Although not significant, trends in the expected direction were observed for six additional items.

The majority of participants (62%) completed a 6-item feedback form evaluating the NS Prediabetes Project. Respondents provided valuable insights about their prior knowledge of PreDM, their concern about having PreDM or DM, and their reasons for taking part in the study as well as the effectiveness of the community awareness activities and the clarity of the CANRISK and the oral glucose tolerance test (OGTT) preparation instructions.

A 3-item feedback form was distributed to 115 family physicians (FPs) from the two project sites. Approximately 22% of FPs completed the feedback form, indicating the impact that the CANRISK screening process had on their work, whether the CANRISK should be used to screen for DM in their community, and their awareness of community-based programs promoting positive lifestyle choices.

Each partner community developed a Prediabetes Lifestyle Program that included 5 core components: an Introductory Education Session, Goal Setting Session, Nutrition Session, Physical Activity Session, and Stress Management Session. Of the 54 individuals invited to take part in a community-based Prediabetes Lifestyle Program, 19 (35%) participated.

Overall, the NS Prediabetes Project was a very positive experience. The successful completion of this project would not have been possible without the many hours of dedicated work by the various volunteer committee members, the local and provincial project managers, and the DCPNS Advisory Council. There were a number of valuable lessons learned about various aspects of the CANRISK screening process and the delivery of the Prediabetes Lifestyle Program.
Chapter 1: Background for the Nova Scotia Prediabetes Project

Introduction

The Diabetes Care Program of Nova Scotia (DCPNS), Annapolis Valley Health (AVH), and Guysborough Antigonish Strait Health Authority (GASHA) are pleased to present this final report about Nova Scotia’s participation in a national initiative to examine the practical aspects of screening for prediabetes (PreDM) and undiagnosed type 2 diabetes (DM) among adults aged 40-74 years and to test the feasibility of using the Canadian Diabetes Risk Assessment Questionnaire (CANRISK) for identifying individuals at high risk for developing type 2 DM. The NS Prediabetes Project, *Upstream Screening and Community Intervention for Prediabetes and Undiagnosed Type 2 Diabetes*, was conducted in the towns of Kentville and New Minas (AVH) and the county of Antigonish (GAHSA), with central coordination through DCPNS. This project was one of eight Prediabetes Projects funded by the Public Health Agency of Canada (PHAC):

- Wave 1: New Brunswick (NB), Prince Edward Island (PE), and Saskatchewan (SK)
- Wave 2: Manitoba (MB) and Nova Scotia (NS)
- Wave 3: Mississauga, Ontario (ON); Vancouver, British Columbia (BC); and Lamèque, NB

The DCPNS and its many partners saw this project as a great opportunity to explore and build sustainable partnerships through the identification and management of this at-risk population, an objective in keeping the province’s evolving Chronic Disease Management Strategy and interest in at-risk populations. The NS Prediabetes Project was designed not only to assist with the validation of the CANRISK, but also to guide the development and delivery of two community-based programs promoting lifestyle changes known to prevent or delay the onset of type 2 DM. Once developed, these lifestyle programs could be used as the basis for addressing other at-risk populations.

This report provides some background information to situate the NS Prediabetes Project within a broader context – both provincially and nationally (Chapter 1), the methodology (Chapter 2) and results (Chapter 3) for the NS Prediabetes Project, the lessons learned (Chapter 4), and next steps (Chapter 5). Appendix A provides a detailed account of the burden of DM and PreDM in NS as well as in AVH and GASHA using data derived from the National Diabetes Surveillance System (NDSS) and the DCPNS Registry.

Statement of Need

Burden of Diabetes and Prediabetes in Nova Scotia

NS has one of the highest rates of DM in Canada¹ with a crude prevalence of approximately 8.7% of the adult population aged 20 years and up² (see Appendix A for detailed account of DM and PreDM in NS). A diagnosis of DM confers high rates of comorbidity including heart disease, stroke, vision loss, amputation, and kidney failure. Despite the serious complications resulting from DM and the importance of early detection and treatment, research suggests that under optimal conditions the delay between disease onset and diagnosis ranges between 2-7 years.³ This situation has not gone unnoticed.
A key message from the Health Council of Canada is to “invest in greater preventive care for people at high risk of developing diabetes.”

In Canada, the term PreDM was formally introduced in the 2003 Canadian Diabetes Association (CDA) Clinical Practice Guidelines; although, impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) were recognized and reported on much earlier (IFG since 1998, and IGT many years before).

PreDM is characterized by glucose levels that are elevated but not yet in the range of DM.

Three different conditions make up the PreDM classification (see Table 1): isolated IFG, isolated IGT, and IFG & IGT combined. Not all people with PreDM will develop type 2 DM, but they do have a 6-12 times higher risk of developing the disease than those without PreDM. Individuals with a diagnosis of IGT also may be at increased risk of developing cardiovascular disease.

### Table 1: Classification of Diabetes & Prediabetes

<table>
<thead>
<tr>
<th>Classification</th>
<th>Fasting Plasma Glucose (FPG)</th>
<th>2-hour plasma glucose (2hPG)</th>
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<tbody>
<tr>
<td>Normoglycaemia</td>
<td>&lt;6.1 mmol/L</td>
<td>&lt;7.8 mmol/L</td>
</tr>
<tr>
<td>Isolated IFG*</td>
<td>6.1-6.9 mmol/L</td>
<td>&lt;7.8 mmol/L</td>
</tr>
<tr>
<td>Isolated IGT*</td>
<td>&lt;6.1 mmol/L</td>
<td>7.8-11.0 mmol/L</td>
</tr>
<tr>
<td>IFG &amp; IGT*</td>
<td>6.1-6.9 mmol/L</td>
<td>7.8-11.0 mmol/L</td>
</tr>
<tr>
<td>Diabetes</td>
<td>≥7.0 mmol/L</td>
<td>≥11.1 mmol/L</td>
</tr>
</tbody>
</table>

Using models derived from the National Health and Nutrition Examination Survey (NHANES), PHAC estimated that PreDM affects approximately 20% of Canadians aged 40-74 years (October 2006). Findings from the first wave of PreDM projects support this claim. Of the 995 participants who took part in the first wave projects, approximately 16% were identified as having PreDM, and an additional 5% were identified as having previously undiagnosed type 2 DM. If the PHAC model holds true for Nova Scotia, approximately 84,000 adults between the ages of 40 and 74 years have prediabetes based on population figures from the 2006 Census (see Appendix B for breakdown by project site).

### Diabetes and Prediabetes Care in Nova Scotia

The earliest Diabetes Centres (DCs) in the province can be traced back to the 1960s. There are currently 39 full- and part-time DCs in NS, including two offered through federally funded sites: Eskasoni First Nation and Canadian Forces Atlantic. DCs provide programs and services to people with DM and their family members. Depending on location, DCs may be referred to as Diabetes Education Centres, Diabetes Management Centres, Diabetic Clinics, or Diabetes Day Care Centres.

As depicted in Figure 1, broad access to full- and part-time DCs including home facilities and satellite sites from across the province offers great advantage for both persons with DM and generalist and specialist physicians.

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All DCs in NS are staffed with specialized nurse and dietitian teams (Certified Diabetes Educators - CDEs) and have a Medical Advisor appointed by their facility/DHA. These DC teams access other disciplines (e.g., social worker, psychologist/trained mental health therapist, pharmacist, foot care clinic/specialist, etc. as available) for individuals in need and promote linkage to valuable community service providers and programs.

DC staffs provide referring physicians with access to complementary multidisciplinary teams. This team approach is essential for helping individuals with DM manage their disease. From the early 1990s to 2005/06, the number of new referrals made annually to the province’s DCs increased by over 75%, and the number of individuals started on insulin therapy annually increased by over 300%. DC staffs report a rising number of referrals for PreDM (at-risk individuals) as well as a for increasingly complex DM cases characterized by the presence of multiple comorbidities and more complex treatment plans (insulin pumps, multiple daily injections, combinations of insulin and oral agents, etc.). DC staffs are instrumental in influencing provider and patient practices. Enhanced communication and routine reporting to referring and specialist physicians provide added insight into the recommended treatment plan and suggested modifications to improve outcomes. In keeping with chronic disease management, the DCs focus on self-care and patient empowerment to help activate individuals living with DM to expect and request consistent, quality DM care.
Services and programs provided by the province’s DCs include:

- **Individual assessment**: Using a patient/family-centred approach, DC staff assist physicians in developing, monitoring, and revising individualized treatment plans. All DCs use standardized documentation forms including patient flow sheets to assess and guide care over time.

- **Individual and group education**: Most DCs provide a core educational program followed by topic-specific educational modules. Self-management education focuses on the knowledge, skills, and behaviours required to live well with DM. DCs address all metabolic abnormalities associated with DM (dysglycaemia, hyperlipidemia, and hypertension) and provide specialized counselling in the presence of progressive complications (e.g., nephropathy, gastroparesis, etc.).

- **Motivational counselling**: DC staffs promote realistic goal setting and problem solving to assist with behaviour change with short- and long-term follow up to provide much needed motivation.

- **Initial and ongoing monitoring for DM complications development and progression**.

- **Promoting and facilitating adherence to recommended Clinical Practice Guidelines**: This approach to care includes the introduction and reinforcement of metabolic targets, routine testing, and annual assessments.

- **Initiating insulin**: This service is provided following receipt of a physician order.

- **Adjusting insulin**: This service is provided if the diabetes educators have been certified according to approved provincial DCPNS policy and guidelines as a delegated medical function.

- **Foot Assessments**: DC nurses conduct annual foot assessments (more frequently as required) using a standardized approach/form.

- **Prediabetes programming**: This service component (individual and/or group) introduces the at-risk individual to DM (signs, symptoms, and risk factors) and reinforces the role of lifestyle modification in prevention.

- **Linkage to available community programs and services (e.g., walking trails, grocery store tours, recreation programs, etc.)**: This natural extension of programming encourages sustainable behaviour change.

In NS, the approach to care and education has been standardized with the assistance of the DCPNS. The DCPNS ensures that DCs promote self-care, survey for and monitor the development/progression of DM complications, and follow national and provincial guidelines for optimal care. The DCPNS supports all DCs with activities focused on knowledge transfer, networking in support of best/better practice, and standardization aimed at quality/equitable care.

Currently, there are no formalized national guidelines governing the approach to care for individuals with PreDM. The 2008 CDA Clinical Practice Guidelines support the need for early identification and reinforce lifestyle and pharmacotherapy for this group of at-risk individuals, but no statements have been made with regards to targets and recommended approaches. As a result, the standard of care in NS and across Canada is highly variable. Some “at-risk” individuals may be referred to local DCs for education and management; others may be managed as if they have type 2 DM, a regime that often includes medication and self-monitoring of blood glucose. Some individuals may attend a specialized PreDM program designed by local healthcare providers with the content and approach based on consensus. Still, many others may be identified by their physician but not referred to a DC and,

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b Some DCs provide insulin pump therapy services (initiation, education, and follow-up) in conjunction with the referring physician.
therefore, receive little or no formalized information about managing their health and preventing the onset of type 2 DM.

To address the critical gap in Clinical Practice Guidelines, the DCPNS released PreDM Guidelines for NS in 2008, intending to help standardize the approach to identification and intervention. Recognising the growing body of literature about the benefits of lifestyle change for individuals with PreDM, these guidelines stress the importance of PreDM programming aimed at preventing or delaying the onset of type 2 DM through modest weight reduction, healthful eating, physical activity, stress reduction/management, and the modification of cardiovascular risk factors such as hypertension and dyslipidemia.

It is well recognized that the volume of at-risk individuals (those with PreDM and others) could easily overwhelm the health care system; as such, these guidelines promote the need for community-based lifestyle programming aimed as self-care and linkage to existing community supports and programs. For this at-risk population, the DCPNS supports self-management programming in the community guided by experts but potentially delivered by consumers or other community partners.

**Nova Scotia Prediabetes Project Objectives**

According to PHAC estimates, as many as 84,000 Nova Scotians between the ages of 40 and 74 years have PreDM. The identification of this “at-risk” population provides an opportunity to intervene before type 2 DM and its related complications develop. Research suggests that adopting positive lifestyle behaviours can delay or even prevent this progression.

The DCPNS and its partners sought to help validate the CANRISK for identifying individuals at high risk of developing type 2 DM (i.e., those with PreDM) and to develop and implement two community-based programs that promote lifestyle changes known to prevent or delay the onset of type 2 DM among individuals with PreDM. The specific objectives were as follows:

**Short-term objectives**

1. To explore the practical aspects of using the CANRISK for population-based screening for PreDM and undiagnosed type 2 DM among adult (40-74 years) residents of two rural NS communities
2. To determine how well the CANRISK performs at identifying rural Nova Scotians with PreDM and undiagnosed DM
3. To determine the rates of PreDM and undiagnosed DM for two rural NS communities
4. To explore the perceptions of participants and healthcare providers about the population-based DM screening process using the CANRISK and OGTTs
5. To explore, develop, describe, and implement a community-based lifestyle program for individuals who are newly identified as having PreDM

**Long-term objective**

1. To pool NS study data with data collected from sites in other Canadian provinces to validate the CANRISK for a rural NS population and for the Canadian population.
Nova Scotia Prediabetes Project Timeline

The following is a brief overview of the work leading up to the NS Prediabetes Project as well as the major milestones achieved throughout the course of the project. This overview will help to situate the NS Prediabetes Project within a broader context.

In the fall of 2006, the PHAC invited representatives from the provinces and territories to gather in Ottawa to discuss PreDM in Canada. By year’s end, PHAC launched a call for letters of intent to develop pilot projects that would explore the practical aspects of screening for PreDM and undiagnosed type 2 DM among adults aged 40-74 years. This work would help test the feasibility of using the CANRISK to identify individuals at high risk for developing type 2 DM. NS consciously declined participation in the first wave projects, asking for reassurance about a number of conditional concerns. Recognizing the amount of work in a 12-month project and the need for as much standardization as possible across sites, the DCPNS requested that PHAC provide central coordination to assist with the following:

- Development of the screening research protocol including standard questionnaires (patient and provider satisfaction), consent forms, communication/letters to accompany mailings, etc.
- Preparation of a draft Research Ethics Board (REB) submission for use by the provinces and District Health Authorities (DHAs) to secure ethics approval
- Development of a data collection template (essential elements)
- Coordination of anonymized data transfer and analysis of a pooled dataset
- Development of an economic evaluation tool for use by the provinces to estimate the cost implications of the screening intervention

The DCPNS recognized that delayed ethics submissions and approvals could dramatically alter completion dates for all subsequent phases of the project. As such, PHAC was asked to re-evaluate its timelines depending on the date that the completed products (as noted above) became available to the provinces.

Following reassurance by PHAC that a number of the conditional concerns would be addressed and that experiences of the first wave projects would be shared, and after securing partnership with two of three interested DHAs (AVH and GASHA), the DCPNS, on behalf of its partners, submitted a full proposal to PHAC in March 2007. The DCPNS hired a Provincial Project Manager in June 2007 in anticipation that funds would soon be released. PHAC approved and released the funds in October 2007 with the expectation that the project would close in October 2008.

One provincial and two local advisory committees were established by December 2007, and by January 2008, AVH and GASHA hired the local project managers. The provincial project manager worked closely with the two local project managers as well as the local advisory committees to draft REB applications. These were submitted in February 2008 and approved in April 2008 (AVH) and May 2008 (GASHA). A third application was submitted to Capital Health, the DHA within which DCPNS resides.

The first wave of CANRISK surveys was mailed and OGTTs began in Antigonish County and the town of Kentville in May/June 2008. This delay reflected the reality of the project logistics—the activation of local advisory committees and hiring of local Project Managers, the need to
systematically increase community and provider awareness, and the need to submit and await approval from three REBs. The loss of the spring months negatively impacted recruitment efforts with the number of enrolled participants falling below the target of 500 per site (n=122 in AVH; n=213 in GASHA). Although the NS Prediabetes Project was to end by mid-October 2008, all partners agreed that recruitment through November would offer additional cases to the pooled data set. In AVH, renewed recruitment increased the target population to include the town of New Minas; in GASHA, emphasis was placed on recruiting participants from the First Nations community of Paq’tnkek by hand delivering study packages to 100 homes. By mid-December, both project sites closed enrolment; at this time, OGTTs were completed for 82 additional participants (n=64 in AVH; n=18 in GASHA). Extra funding was secured through PHAC in recognition of this extra effort as well as for the provision of additional data about PreDM in NS as derived from the DCPNS Registry (see Appendix A).

Throughout the project, PHAC provided opportunities for sharing across project sites and through direct feedback to the PHAC Technical Advisory Group. In January 2008, and again in March 2009, representatives from Wave 1 and Wave 2 project sites, and in the more recent meeting, the Wave 3 sites, gathered to share lessons learned and progress to date. Two of the first wave projects (PE & SK) signed additional agreements with PHAC and are continuing efforts to recruit additional study participants and explore more formalized lifestyle intervention programs.

The CANRISK continued to evolve with advice from various project sites based on participant feedback. The version used by the third wave sites is considerably different than that used by the earlier sites. NS was the first to improve the look of the survey significantly and to provide standardized information with regards to OGTT preparation (see Appendix C).
Chapter 2: Methodology

Project Sites

The two project sites were located in rural NS – one in AVH and one in GASHA (see Figure 2). At the beginning of the project, the AVH site was restricted to the town of Kentville; however, by the end, the study area was expanded to include the adjoining town of New Minas. Both of these towns are located in the heart of the Annapolis Valley. Based on 2006 Census estimates, the total population for these towns is approximately 14,400 with about 5,400 residents being between the ages of 40 and 74 years. The majority of the population is English speaking only (99%); a small proportion of the population is African Nova Scotia or Aboriginal. The main industry of the area is farming, farm product processing, and other manufacturing industries. Kentville is also home to AVH’s regional hospital, the Valley Regional Hospital (VRH). There are 27 family physicians practicing in the area and 65 specialists associated with VRH.

At the time of the original proposal, the GASHA site was intended to be the town of Antigonish; however, by the time the funding was approved, the GASHA site was expanded to all of Antigonish County. Antigonish County is located in northeastern NS. Based on the 2006 Census, the estimated population for Antigonish County is 18,800 – 2,100 of which live in the town of Antigonish. Approximately 8,000 residents are between the ages of 40 and 74 years. Again, the majority of the population is English speaking only (99%); and a small proportion of the population is African Nova Scotia or Aboriginal. Antigonish is considered to be a service centre, with the largest employers being St. Martha’s Regional Hospital (SMRH) and St. Francis Xavier University. Other major employers include a call centre and the Canada Post National Philatelic Centre. There are 19 full- and part-time family physicians in Antigonish and 22 specialists who have district health responsibilities.

Figure 2: NS Prediabetes Project Sites

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**Project Participants**

A total of 417 adults aged 40-74 years living in AVH (n = 186, 44.6%) or GASHA (n = 231, 55.4%) participated in the NS Prediabetes Project. Approximately 69% of participants were female (n=289), and 95% reported having only white ancestry (n=397). For the 411 participants who reported year of birth, the average age was approximately 57 years (males = 58 yrs; females = 56 yrs).

**Inclusion and Exclusion Criteria**

A major objective of the NS Prediabetes Project was to determine whether the CANRISK would be useful for identifying PreDM and undiagnosed type 2 DM among adults. As such, adult residents of Antigonish County and the towns of Kentville and New Minas aged 40-74 years were targeted for participation. The lower age limit of 40 years corresponds with the recommended age for the initiation of DM screening as per the 2003 Clinical Practice Guidelines of the CDA. The upper age limit of 74 was selected for the following reasons: 1) the upper age limit for the CANRISK is 74 years, 2) the validation of the CANRISK requires the ascertainment of DM status 10 years after completing the survey thus the oldest participants would be in their 84th year, and 3) research shows there may be limited benefit and potential harm associated with the aggressive treatment of DM in the presence of multiple comorbidities among elderly patients.

Individuals who self-reported having a current diagnosis of DM or PreDM were excluded. In addition, women who were pregnant were excluded from the study as screening for gestational diabetes (GDM) is a routine part of prenatal care. The study protocol included a 75g OGTT; it would be unnecessary, unethical, and potentially harmful (e.g., could induce symptoms of hyperglycaemia such as thirst, blurred vision, dizziness, etc.) to require individuals to consume a 75g glucose drink if they already have a diagnosis of PreDM, DM, or GDM.

**Screening Protocol**

There were four main components to the NS Prediabetes Project (see Figure 3):

1. The CANRISK
2. An OGTT
3. Participant and physician feedback about the CANRISK screening process
4. A community-based lifestyle program for education about managing one’s health and preventing the onset of type 2 DM (only for participants identified as having PreDM)
LPM made reminder calls to SPs
LPM reminded SPs about OGTT appointment & preparation instructions
OGTT appointment at Hospital Laboratory or Health Centre – administrative tasks
LPM explained the study protocol, obtained written consent, collected the completed CANRISK, & verified that SPs prepared appropriately for OGTT

Participants volunteered for study
Potential study participants (SPs) contacted local project manager (LPM) by phone

SPs enrolled in study by LPM
LPM confirmed SPs’ eligibility, obtained oral consent to proceed, recorded personal information, responded to & documented problems SPs had with CANRISK items, & booked the oral glucose tolerance test (OGTT)

LPM made reminder calls to SPs
LPM reminded SPs about OGTT appointment & preparation instructions

CBG > 7.0mmol/L
Stop
SP referred to physician for follow-up blood tests

CBG ≤ 7.0mmol/L

Initial blood tests
FPG: phlebotomist drew venous blood sample
CBG: phlebotomist tested capillary blood sample (involved finger prick with lancet)

75g OGTT & 2hPG
SP drank 75g glucose drink
2hPG: 2 hours later phlebotomist drew venous blood sample

Documentation & dissemination of results & follow-up
LPM provided blood test results to SPs via letter or phone as per SP’s choice; mailed SPs and physicians a brief feedback form; & securely transferred de-identified CANRISK surveys, blood test results, & feedback forms to DCPNS for analysis

SPs’ family physician also received a copy of the blood test results

Normoglycaemia
FPG < 6.0 & 2hPG < 7.8
Chronic disease prevention literature included with follow-up letter

New diagnosis of PreDM
Isolated IFG: FPG = 6.1–6.9 & 2hPG < 7.8
Isolated IGT: FPG < 6.1 & 2hPG = 7.8–11.0
IFG & IGT: FPG = 6.1–6.9 & 2hPG = 7.8–11.0
Refer to locally community-based PreDM program & track attendance

New diagnosis of DM
FPG ≥ 7.0 or 2hPG ≥ 11.1
Refer to family physician for usual standard of care
The CANRISK

The PHAC adapted the CANRISK from a validated instrument – the FINDRISC – used in Finland (see Figure 4). The FINDRISC was developed with two goals in mind: 1) to identify individuals at high risk for developing type 2 DM and 2) to increase awareness about modifiable risk factors. Based on a 10-year follow-up, the FINDRISC was shown to have a sensitivity (Sn) of 0.78 and a specificity (Sp) of 0.77 for identifying individuals who would develop DM over a 10-year period. The sensitivity and specificity of the FINDRISC changed little when it was used cross-sectionally to identify individuals with elevated FPG and/or 2hPG levels (Sn = 0.77; Sp = 0.77). Previous research has shown that these values do not necessarily translate to other populations. As such, PHAC is supporting multiple sites across Canada to collect the diverse data necessary to validate the CANRISK for the Canadian population.

The FINDRISC includes a scoring system that allows respondents to calculate a risk score for developing type 2 DM within the next 10 years. The first wave projects used the Finnish risk scores for the first 8 items of the CANRISK. The advisory committees in the two project sites in NS decided against using the Finnish scores for the following reasons:

1. The Finnish scoring system has not been validated for the Canadian population and, therefore, may not reflect accurately the 10-year risk of DM for Canadian respondents
2. The CANRISK contains eight items that do not appear in the FINDRISC, and these items have no corresponding risk score
3. NS participants self-administered the CANRISK rather than completing it in the presence of a study team member; thus, participants with low numeracy skills could have difficulty calculating the score
4. Participants could have difficulty interpreting the risk score by themselves

Figure 4: The FINDRISC
During the initial recruitment phase of the NS Prediabetes Project, a study package containing the 16-item CANRISK (see Figure 5 and Appendix C) and supporting documents was distributed to every household in the town of Kentville and the county of Antigonish through the regular postal service. The household mailings were staggered so that the blood collection labs would not be overwhelmed by a high volume of participants scheduling appointments all at one time. A total of 335 participants enrolled during the initial recruitment phase.

During the second recruitment phase, a flyer inviting residents to participate in the NS Prediabetes Project was distributed to all households in the towns of Kentville and New Minas. In GASHA, complete study packages were hand delivered to residents of the Paq’tnkek First Nations Community. An additional 82 participants enrolled as a result of extending the recruitment period beyond October 2008.

In total, 17,691 study packages were distributed over the course of the study at a cost of approximately $0.43 per package (see Table 2). The cost per enrolled participant was approximately $18.13.

<table>
<thead>
<tr>
<th>Mailing</th>
<th>Contents</th>
<th>Site</th>
<th>Dates</th>
<th>Number</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Round</strong></td>
<td>• Invitation – 1 pg&lt;br&gt;• Information and Consent – 7 pg&lt;br&gt;• CANRISK – 16 pg&lt;br&gt;• Measuring Tape</td>
<td>Antigonish</td>
<td>May 26 – Aug 28</td>
<td>6,500</td>
<td>$3,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kentville</td>
<td>Jun 02 – Jul 07</td>
<td>3,700</td>
<td>$2,430</td>
</tr>
<tr>
<td><strong>Second Round</strong></td>
<td>• Flyer inviting residents to participate&lt;br&gt;• Diabetes fact sheet:</td>
<td>Kentville &amp; New Minas</td>
<td>Oct 02 – Nov 05</td>
<td>7,391</td>
<td>$2,130</td>
</tr>
<tr>
<td></td>
<td>• Invitation – 1 pg&lt;br&gt;• Information and Consent – 7 pg&lt;br&gt;• CANRISK – 16 pg&lt;br&gt;• Measuring Tape</td>
<td>Paq’tnkek</td>
<td>Sep 29</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total Cost ($0.43/household)</strong></td>
<td></td>
<td></td>
<td>17,691</td>
<td>$7,560</td>
</tr>
</tbody>
</table>

Participants completed the CANRISK at home and brought the completed survey to their OGTT appointment. When booking the OGTT appointment, the local project manager documented any difficulties participants had completing the CANRISK items. For example, one participant had difficulty calculating Body Mass Index (BMI) because he/she did not have a scale at home.
Oral Glucose Tolerance Testing

Figure 6: OGTT Preparation Instructions

InNS, there is variable practice for determining eligibility for a 75g OGTT. At the VRH in Kentville, all patients complete the 75g OGTT after the FPG sample is drawn. However, at SMRH in Antigonish, a fasting capillary blood glucose (CBG) sample is tested to determine if patients are eligible to complete a 75g OGTT; only those patients with a CBG reading <7.0 mmol/L complete the 75g OGTT. For the purpose of the NS Prediabetes Project, the latter protocol was used by both sites.

To enhance comparability between sites, OGTT preparation instructions were printed on the last page of the CANRISK (see Figure 6). The project manager reviewed these instructions with participants when booking their OGTT appointment and when making a reminder call three days before their appointment.

When participants arrived at the blood collection laboratory, the project manager explained the purpose of the NS Prediabetes Project, reviewed the informed consent form, and answered any questions participants had about the study. Then, participants signed the consent form and handed in their CANRISK.

Participants had a 4ml venous blood sample drawn (i.e., FPG) and had their CBG tested by a trained phlebotomist or certified lab technician. For the CBG test, a single drop of blood was collected from the participant using a lancet and tested with a CBG meter.

Participants who had a fasting CBG reading of ≥7.0 mmol/L did not complete the 75g OGTT and were referred to their FP for follow-up blood tests and appropriate care. These participants were given a special laboratory requisition form to be completed by their FP when ordering follow-up blood tests. Participants were reassured that a CBG reading was not sufficient to confirm a diagnosis of PreDM or DM.

Participants who had a CBG reading of less than 7.0 mmol/L were eligible to complete a 75g OGTT. These participants drank 10oz of a sweet orange drink (about the size of a medium coffee) and then waited at the blood collection site for two hours. At the end of the 2-hour period, participants had a 4ml venous blood sample drawn (i.e., 2hPG). After the blood sample was drawn, participants were offered fruit juice and a snack and then were free to leave.

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Identifies the patient as a study participant so that the FPG and 2hPG results are forwarded to the project manager.
There was considerable discussion among project team members regarding the use of the CBG as a screen for OGTT eligibility. For this reason, CBG values were compared to the corresponding FPG values (see Table 3). The majority of CBG readings were within 10% of the FPG value. However, 6% of CBG in AVH and 11% in GASHA exceeded the industry standard of 20% variance. The absolute difference in CBG readings versus FPG values was between 0 mmol/L to 1.75 mmol/L for AVH and between 0 mmol/L to 2.90 mmol/L for GASHA. The maximum percent difference between CBG and FPG values was 31% for AVH and 49% for GASHA.

Table 3: Percent difference between CBG and FPG values by NS Prediabetes Project site

<table>
<thead>
<tr>
<th>% difference</th>
<th>AVH n (%)</th>
<th>GASHA n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No difference</td>
<td>7 (3.8%)</td>
<td>13 (5.7%)</td>
<td>20 (4.8%)</td>
</tr>
<tr>
<td>&lt;10.0%</td>
<td>113 (60.8%)</td>
<td>124 (53.9%)</td>
<td>237 (57.0%)</td>
</tr>
<tr>
<td>10.0%-14.9%</td>
<td>36 (19.4%)</td>
<td>38 (16.5%)</td>
<td>74 (17.8%)</td>
</tr>
<tr>
<td>15.0%-19.9%</td>
<td>19 (10.2%)</td>
<td>29 (12.6%)</td>
<td>48 (11.5%)</td>
</tr>
<tr>
<td>≥20.0%</td>
<td>11 (5.9%)</td>
<td>26 (11.3%)</td>
<td>37 (8.9%)</td>
</tr>
</tbody>
</table>

Note: CBG reading was taken but not recorded for 1 participant.

The local project managers and each participant’s FP received a copy of the blood test results directly from the laboratory information system. The local project managers sent a personalized letter to each participant with his/her blood test results as well as the appropriate recommendation based on these results (see Appendix D):

- **Normal:** Participants were encouraged to be screened for DM every three years if no risk factors for DM were present and every year if risk factors for DM were present.
- **Prediabetes:** Participants were invited to take part in a community-based lifestyle program specifically tailored for PreDM. Participants also were encouraged to see a physician to be screened for DM as clinically indicated.
- **Diabetes:** Participants were reassured that their blood test suggested, but did not confirm, that they may have type 2 DM and were referred to their FP to receive appropriate follow-up care.

### Participant and Physician Feedback

Participants were asked to describe their experience with the NS Prediabetes Project by responding to an anonymous feedback form that was mailed to them (see Appendix E). The feedback form addressed participants’ awareness of the project, their prior knowledge of PreDM, their ability to understand the CANRISK and the OGTT preparation instructions, their concern about having PreDM/DM before and after participation, and their reason for participating in the NS Prediabetes Project.
Physicians practicing in each of the two NS Prediabetes Project sites were requested to share their thoughts about the project by responding to an anonymous feedback form (see Appendix F). The feedback form was mailed to them with a brief letter informing them that the data collection phase of the project was complete and that local and provincial level results would be released within a few months. The 3-item feedback form addressed physicians’ perception of how the PreDM screening impacted their work, their thoughts about whether the CANRISK should be used to screen for PreDM/DM, and their awareness of community-based programs promoting healthy lifestyle choices.

**Community-based Prediabetes Lifestyle Program**

A major objective of the NS Prediabetes Project was to explore, develop, and implement a community-based lifestyle program for “at risk” individuals, including those with PreDM. Working groups and local committees comprised of community partners were envisioned to help scope the lifestyle program. It was hoped that a “real world” program reflective of community realities and partners would be developed by identifying and mobilizing available community resources. It was intended that the community-based lifestyle program would become part of the standard of care within the community and serve as a template for the development of similar programs across the province. This type of programming would be of value to individuals at risk for a variety of chronic diseases, not just PreDM.

The Prediabetes Lifestyle Programs developed as part of the NS Prediabetes Project included five core components addressing various lifestyle factors known to prevent or delay the development of type 2 diabetes among “at risk” individuals (i.e., those with prediabetes):

**Prediabetes Education**

This component focused on the importance of making healthy lifestyle choices to prevent or delay the onset of DM. Information was presented about the risk factors for developing DM, criteria used to diagnose DM, prevention and treatment of DM, and healthy eating.

- **AVH:** Presented by a CDE at VRH
- **GASHA:** Presented by a CDE at Health Connections, a community space designated for health-related education and programs

**Goal Setting**

This component focused on factors that help people effect change, challenges to meeting goals, and setting SMART goals. Participants were given the opportunity to set an achievable and meaningful goal.

- **AVH:** Presented by a professional psychologist at VRH
- **GASHA**: Presented by a health motivator at Health Connections

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*Goal Setting and Stress Management were delivered as a combined session in GASHA*
Nutrition

This component focused on information about how to read labels and choose healthier foods. Topics such as sodium, fats, and fibre were discussed.

- AVH: Presented by a community Dietitian at VRH
- GASHA: Presented by a Public Health Dietitian at Health Connections

Physical Activity

This component focused on exercise suitable for those who may have been inactive for some time. Participants learned about the value of walking and were instructed how to use a pedometer.

- AVH: Presented by a professional Kinesiologist/trained Exercise Instructor at VRH (Cardiac Rehab)
- GASHA: Presented by the Director of the Antigonish Recreation Department at Health Connections

Stress Management

This component focused on how people can tell if they are stressed (stress symptoms), what stresses them (stressors), and how to develop a healthy lifestyle (stress management).

- AVH: Presented by a professional psychologist at VRH
- GASHA*: Presented by a health motivator at Health Connections

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*f Initially, this session was to be delivered by a dietitian from one of the local grocery stores; however, by the time the session was delivered, the grocery chain had laid-off all their staff dietitians in many rural locations.

* Goal Setting and Stress Management were delivered as a combined session in GASHA
Chapter 3: Results

Participants Completing Project Protocol

Of the 417 participants who took part in the NS Prediabetes Project, 416 completed all or part of the CANRISK, 417 completed a FPG test and a CBG reading, and 399 completed an OGTT (see Figure 7). Just over 5% of participants (n=22) had a CBG over 7.0 mmol/L at their initial OGTT appointment and, thus, were not eligible to receive the 75g Trutol drink at that visit; four of these participants returned on a different day to complete the study protocol. One additional participant was unable to retain the Trutol drink at the initial OGTT appointment but returned on a different day to complete the testing.

Figure 7: Participants completing NS Prediabetes Project protocol

Diabetes and Prediabetes Case Ascertainment

Glycaemic status (i.e., normal, PreDM, DM) was determined using the most complete data possible. FPG and 2hPG readings were combined to derive glycaemic status for 399 participants (95%) as per the CDA’s Clinical Practice Guidelines. For the remaining 18 participants, glycaemic status was derived on the basis of FPG only.

Approximately 84% of participants had normal blood glucose levels, 13% (n=54) had blood glucose in the PreDM range, and 3% (n=13) had blood glucose in the DM range (see Table 4). The percentage of participants with blood glucose in the PreDM range varied across the project sites. Approximately 10% of participants residing in AVH (n=18) were found to be in the PreDM range compared to 16% in GASHA (n=36).
Table 4:  Case ascertainment and mean OGTT results for NS Prediabetes Project

<table>
<thead>
<tr>
<th>Glycaemic Status</th>
<th>Number (%)</th>
<th>FPG (mmol/L) Mean (min, max)</th>
<th>2hPG (mmol/L) Mean (min, max)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>350 (83.9%)</td>
<td>5.16 (3.80, 6.00)</td>
<td>4.91 (1.40, 7.70)</td>
</tr>
<tr>
<td>Prediabetes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated IFG</td>
<td>26 (6.2%)</td>
<td>6.40 (6.10, 6.90)</td>
<td>5.64 (4.10, 7.40)</td>
</tr>
<tr>
<td>Isolated IGT</td>
<td>22 (5.3%)</td>
<td>5.35 (4.40, 6.00)</td>
<td>9.08 (7.80, 10.70)</td>
</tr>
<tr>
<td>IFG &amp; IGT</td>
<td>6 (1.4%)</td>
<td>6.32 (6.10, 6.50)</td>
<td>8.97 (8.00, 10.90)</td>
</tr>
<tr>
<td>All PreDM</td>
<td>54 (12.9%)</td>
<td>5.96 (4.40, 6.90)</td>
<td>7.77 (4.10, 10.90)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>13 (3.1%)</td>
<td>6.63 (5.00, 7.40)</td>
<td>9.03 (2.90, 13.50)</td>
</tr>
</tbody>
</table>

Note:  A summary of cases by site cannot be presented due to low cell counts

Compared to the first wave sites in NB, PE, and SK, NS had a slightly higher percentage of participants with normoglycaemia: 79% versus 84% respectively. This finding may reflect the fact that Antigonish and Kentville/New Minas were “well-doctored” with all participants having a FP at the time they enrolled in the study. Both sites are home to a regional hospital; thus, participants had increased access to FPs and specialists compared to other regions in the province. Furthermore, the DC at each project site offers PreDM programming aimed at delaying or preventing the development of type 2 DM.

The distribution of participants within the PreDM group also differed for NS compared to the first wave sites. In NS, the percentage of isolated IFG and isolated IGT cases within the PreDM group were quite similar at 48% and 41% respectively, compared to 29% and 59% for the first wave sites. The percentage of IFG/IGT cases within the PreDM group was similar for NS and the first wave sites at 11% and 12% respectively.

Participant Risk Profile

The CANRISK was adapted from the FINDRISC – a previously validated instrument. The FINDRISC currently is used nationwide in Finland for population-based DM screening. The CANRISK included all eight items that appear in the FINDRISC as well as eight additional items that could prove to be important predictors of DM risk for a Canadian population.

On the pages that follow, participants’ responses to the CANRISK items are presented as a function of glycaemic status (i.e., normal, PreDM, and DM). Recall that glycaemic status was determined using the most complete data possible; both FPG and 2hPG were used for 399 participants (95%) and FPG alone was used for 18 participants.
As you get older, your risk of developing diabetes goes up.

Age

Approximately 70% of participants enrolled in the NS Prediabetes Project were between 45 and 64 years of age. Although none of the participants between 40-44 years had blood glucose levels in the DM range (see Figure 8), there was no significant association between age group and glycaemic status (p=0.45).

Body shape and size can affect your risk of diabetes.

Body Mass Index

Approximately 32% of participants had a BMI below 25, 42% had a BMI between 25 and 30, and 26% had a BMI over 30. There was a significant association between BMI and glycaemic status ($\chi^2 = 18.8; p = 0.001$). Compared to those with blood glucose in the PreDM and DM ranges, a higher percentage of participants with normal blood glucose reported having a healthy BMI of less than 25 (see Figure 9).
Of the 415 participants who reported BMI group, 411 also reported their actual height and weight measurements. There was a significant difference in average BMI across the glycaemic status groups \((F = 11.1; p < 0.001)\). The average BMI and corresponding 95% confidence interval for the three groups were as follows:

- Normal: 27.5 (26.9, 28.0)
- PreDM: 31.1 (29.4, 32.8)
- DM: 30.9 (26.5, 35.2)\(^b\)

**Waist Circumference**

Overall, 61% of women had a waist circumference in the highest risk group (>35 inches).

For women, there was a significant association between waist circumference and glycaemic status \((\chi^2 = 21.7; p < 0.001)\), owing mostly to the disproportionately high percentage of women with blood glucose in the PreDM range who reported having a waist circumference over 35 inches (see Figure 10a).

Compared to women, a lower percentage of men (42%) had a waist circumference in the highest risk group (i.e., > 40 inches) while 30% had a waist circumference in the lowest range (< 37 inches).

Compared to those with blood glucose in the PreDM and DM ranges, a higher percentage of males with normal blood glucose reported having a waist circumference below 37 inches (see Figure 10b); however, the association between waist circumference and glycaemic status among males was not significant \((p=0.33)\). This lack of association may reflect a lack of power due to the small sample size \((n=126)\).

**Figure 10: Distribution of waist circumference range by glycaemic status**

\(^b\) The wide 95% confidence interval reflects the small number of participants with blood glucose in the DM range \((n=13)\)
Your level of physical activity and what you eat can affect your risk of developing diabetes.

Daily Physical Activity

Overall, 60% of participants reported that they usually engaged in some type of moderate physical activity for 30 minutes or more each day.

Compared to those with blood glucose in the PreDM and DM ranges, a slightly higher percentage of participants with normal blood glucose reported that they engaged in daily physical activity (see Figure 11); however, the association between daily physical activity and glycaemic status was not significant (p=0.10).

Daily Fruit and Vegetable Consumption

Overall, approximately 85% of participants indicated that they ate fruit or vegetables every day.

Compared to those with blood glucose in the normal and PreDM ranges, a slightly lower percentage of participants with blood glucose in the DM range reported that they ate fruit and vegetables daily (see Figure 12); however, the association between daily consumption of fruit and vegetables and glycaemic status was not significant (p=0.21).
High blood pressure and high blood sugar are associated with diabetes.

History of Hypertension

Approximately, one third of participants reported having a history of high blood pressure.

There was a significant association between having a history of high blood pressure and glycaemic status ($\chi^2 = 15.1; p = 0.005$). Only 28.7% of those with normal blood glucose levels reported a history of hypertension (see Figure 13). This percentage was 53% and 54% respectively for those with blood glucose values in the PreDM and DM ranges.

History of High Blood Glucose

Only 10% of participants reported having a history of high blood glucose. It was anticipated that this percentage would be low because individuals with a previous diagnosis of DM or PreDM were not eligible to participate in the NS Prediabetes Project.

There was a significant association between history of high blood glucose and glycaemic status ($\chi^2 = 23.9; p < 0.001$). Only 7.2% of those with normal blood glucose indicated that they had had high blood glucose during an illness or pregnancy, this percentage was 17.6% for those with blood glucose in the PreDM range, and 38.5% for those with blood glucose in the DM range (see Figure 14).
Some types of diabetes run in families.

Family History of Diabetes

Participants indicated their family history of DM by checking Yes, No, or Don’t Know for a series a family members. Of all CANRISK items, this one had the greatest non-response rate ranging from 8.1% for siblings to 16.7% for children (see Table 5). A further 2.6% of participants indicated that the item for children was not applicable.

Table 5: Frequency of responses for the CANRISK item assessing family history of DM (n=417)

<table>
<thead>
<tr>
<th>CANRISK Item</th>
<th>Response Options (options with * were added by participant)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Mother</td>
<td>106</td>
</tr>
<tr>
<td>Father</td>
<td>95</td>
</tr>
<tr>
<td>Sibling</td>
<td>109</td>
</tr>
<tr>
<td>Children</td>
<td>10</td>
</tr>
<tr>
<td>Other</td>
<td>179</td>
</tr>
</tbody>
</table>

Rather than look at each relationship individually, responses to the family history of DM items were collated to generate the number of first-degree relatives with DM for each participant. Options left blank or those added by participants (i.e., GDM, PreDM, etc.) were recoded as No. Overall, 55% of participants reported having at least one first-degree relative with DM.

Compared to those with blood glucose in the PreDM and DM ranges, a higher percentage of participants with normal blood glucose indicated that they had no first-degree family members with DM (see Figure 15); however, the association between number of first-degree family members with DM and glycaemic status was not significant (p=0.10). This lack of association may reflect a lack of power due to the small sample size.

Figure 15: Distribution of number of first-degree relatives with DM by glycaemic status
Certain ethnic groups are at a higher risk of developing diabetes.

Ethnicity

There was very little ethnic diversity among study participants – over 95% of participants reported having only white ancestry.

Education

Overall, 40% of participants had a university degree. This high percentage is not reflective of the NS population as a whole for which approximately 20% of the working age adults (20-64 yrs) has a university degree.\(^1\) This disparity is due in part to the fact that the project sites are both university towns.

There was a significant association between educational attainment and glycaemic status ($\chi^2 = 13.2; p = 0.04$). Approximately 43% of participants with blood glucose levels in the normal range had a university degree compared to 30% of those in PreDM range and 8% of those in DM range (see Figure 16).

Self-perceived Health Status

Participants self-rated their current health status on a 5-point scale that ranged from excellent to poor health. Overall, 55% of participants felt their health was very good to excellent.

There was a significant association between perceived health and glycaemic status ($\chi^2 = 36.3; p < 0.001$). Approximately 60% of participants with blood glucose levels in the normal range reported very good to excellent health compared to 34% of those with blood glucose in the PreDM range and 23% of those with blood glucose in the DM range (see Figure 17).

Sex

Approximately 70% of participants were female. Compared to males, a slightly lower percentage of females had blood glucose levels in the PreDM and DM ranges (see Figure 18); however, the association between sex and glycaemic status was not significant ($p=0.52$).

Figure 17: Distribution perceived health status by glycaemic status

![Figure 17: Distribution perceived health status by glycaemic status](image)

Figure 18: Distribution of glycaemic status by sex

![Figure 18: Distribution of glycaemic status by sex](image)
Some women develop diabetes in pregnancy.

History of Gestational Diabetes

Approximately, 7% of participants indicated that they had a history of GDM – almost double the 3.7% reported by the CDA for non-aboriginal women.16

Compared to those with blood glucose in the PreDM and DM ranges, a slightly lower percentage of women with normal blood glucose reported having a history of GDM (see Figure 19); however, the association between history of GDM and glycaemic status was not significant (p=0.40).

History of Giving Birth to Large Babies

Overall, 17% of women reported giving birth to a baby weighing nine pounds or more (see Figure 20).

Compared to those with blood glucose in the PreDM and DM ranges, a slightly lower percentage of women with normal blood glucose reported giving birth to a baby weighing more than nine pounds (see Figure 20); however, the association between giving birth to a baby weighing nine pounds or more and glycaemic status was not significant (p=0.72).
Summary of CANRISK Profile

There was a significant association between the CANRISK items listed in Table 6 and glycaemic status.

Table 6: CANRISK items that were significantly associated with glycaemic status

<table>
<thead>
<tr>
<th>Item</th>
<th>Significant Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body Mass Index (BMI)</td>
<td>Compared to those with normal blood glucose, a lower percentage of participants with blood glucose in the PreDM/DM ranges had a BMI in the healthy range (&lt;25)</td>
</tr>
<tr>
<td>Waist Circumference</td>
<td>Compared to those with normal blood glucose, a higher percentage of female participants with blood glucose in PreDM/DM ranges had waist circumference over 35 inches. The association was not significant for males.</td>
</tr>
<tr>
<td>History of hypertension</td>
<td>Compared to those with normal blood glucose, a higher percentage of participants with blood glucose in PreDM/DM ranges reported a history of hypertension.</td>
</tr>
<tr>
<td>History of high blood glucose</td>
<td>Compared to those with normal blood glucose, a higher percentage of participants with blood glucose in PreDM/DM ranges reported a history of high blood glucose.</td>
</tr>
<tr>
<td>Education</td>
<td>Compared to those with normal blood glucose, a lower percentage of participants with blood glucose in PreDM/DM ranges reported holding a post-secondary diploma or university degree.</td>
</tr>
<tr>
<td>Perceived health status</td>
<td>Compared to those with normal blood glucose, a lower percentage of participants with blood glucose in PreDM/DM ranges reported being in very good to excellent health.</td>
</tr>
</tbody>
</table>
Although not reaching significance, there was a trend in the expected direction for the CANRISK items listed in Table 7. A larger sample size may have provided the power necessary to reach significance, highlighting the importance of pooling data from the various project sites across Canada.

**Table 7: CANRISK items that showed a trend in the expected direction**

<table>
<thead>
<tr>
<th>Item</th>
<th>Trend (failed to reach significance)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily physical activity</td>
<td>Compared to those with normal blood glucose, a lower percentage of participants with blood glucose in the PreDM/DM range reported engaging in daily physical activity.</td>
</tr>
<tr>
<td>Daily fruit &amp; vegetable</td>
<td>Compared to those with normal blood glucose, a lower percentage of participants with blood glucose in the PreDM/DM range reported eating fruit and vegetables every day.</td>
</tr>
<tr>
<td>consumption</td>
<td></td>
</tr>
<tr>
<td>Family history of DM</td>
<td>Compared to those with normal blood glucose, a lower percentage of participants with blood glucose in the PreDM/DM range reported having no family members with DM.</td>
</tr>
<tr>
<td>History of GDM</td>
<td>Compared to those with normal blood glucose, a higher percentage of female participants with blood glucose in the PreDM/DM range reported having a history of gestational diabetes.</td>
</tr>
<tr>
<td>History of high birth weight</td>
<td>Compared to those with normal blood glucose, a higher percentage of female participants with blood glucose in the PreDM/DM range reported giving birth to a large baby (&gt;9 pounds).</td>
</tr>
<tr>
<td>babies</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Compared to males, a lower percentage of female participants had blood glucose in the PreDM/DM range.</td>
</tr>
</tbody>
</table>
Participant Feedback

Shortly after completing the OGTT, participants received their blood test results and a 6-item Participant Feedback Form through the mail. Of the 417 participants who took part in the study, 257 (62%) returned the feedback form, with the response rate varying between the two project sites: AVH = 75%, GASHA = 51%.

Community Awareness

The effectiveness of community awareness activities was evaluated by asking participants whether they had heard about the NS Prediabetes Project before the study package arrived in the mail. Of the 257 participants who completed a feedback form, 109 (42%) indicated that they had heard about the project before the study package arrived in the mail. The most commonly cited sources of information about the study were the newspaper, work, friends and family, and the radio (see Figure 21). Less effective means of creating awareness included notices in doctor’s offices, community boards, grocery store flyers, church bulletins, and community television ads.

Figure 21: Percentage of respondents who were aware of the NS Prediabetes Project prior to receiving the CANRISK study package (n=109) by community awareness activity

Prior knowledge of PreDM

The term PreDM was officially introduced in the 2003 Canadian Diabetes Association Clinical Practice Guidelines for the Prevention and Management of Diabetes in Canada. However, IGT has been recognised and tracked by the DCPNS since 1992. Approximately 53% of the 257 participants who completed the feedback form indicated that they knew what PreDM was prior to receiving the study package in the mail (n=136). This finding is surprising in light of the high level of education reported by study participants. It is likely that the percentage of people in the general population who understand the term PreDM is much lower.
This lack of understanding about PreDM underscores the importance of educating the population about PreDM and its implications for long-term health outcomes. Recognising that the risk for adverse health outcomes is higher among those who do not access healthcare services on a regular basis, NS opted to use a mail-out approach to participant recruitment. In this way, a broad population was reached with educational literature about PreDM and its risk factors. Every household in the two project sites received a study package, regardless of the residents’ eligibility to take part in the study.

**Participants’ ability to complete the CANRISK Survey**

Nearly all participants (n=252, 98%) who completed the feedback form reported that they were able to complete the CANRISK on their own. This finding likely reflects the high level of educational attainment achieved by study participants as well as the considerable enhancements to formatting that the NS Prediabetes Project team made to improve readability. The NS Prediabetes Project teams adopted a booklet format for the CANRISK that incorporated a clear typeface with ample white space to facilitate reading.

Of the four participants who required help to complete the CANRISK, two received help from the project manager, one from a friend, and one from some other source. One of these individuals had trouble answering the item about BMI as he/she did not have scales at home to get a weight measurement. Another individual reported that he/she misunderstood one of the items. Finally, one individual suggested that the “yes/no” response option was not always suitable.

**Understanding of OGTT instructions**

Currently, there is variable practice in NS with regard to OGTT protocol. To maintain comparability between the two NS project sites, a single set of OGTT protocol was adopted for study participants. To enhance further site-to-site comparability, the CANRISK booklet contained written OGTT preparation instructions, and the project managers reviewed these instructions with each participant at the time of study enrolment and when making the OGTT reminder call.

All 257 participants who completed the feedback form agreed that the OGTT instructions were not difficult to understand, with 85% of respondents rating the OGTT instructions as very easy to understand (see Figure 22).
Concern about PreDM/DM

One of the ethical concerns with the NS Prediabetes Project was that participants might worry about having PreDM/DM after taking part in the study. This situation was assessed using a two-part question: “Were you worried that you might have diabetes or prediabetes before the Prediabetes Study package arrived in the mail?” and “Were you worried that you might have diabetes or prediabetes after you completed the CANRISK Survey and had the special blood test (oral glucose tolerance test)?”

Approximately 63% of the participants (n=160) who completed the feedback form indicated that they were not worried about having PreDM/DM either before or after taking part in the study (see Table 8).

Table 8: Self-reported worry about having PreDM/DM by time

<table>
<thead>
<tr>
<th>Worried about having PreDM/DM before study package arrived</th>
<th>Worried about having PreDM/DM after completing the CANRISK &amp; OGTT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Worried about having PreDM/DM before study package arrived</td>
<td>Yes</td>
</tr>
<tr>
<td>No</td>
<td>26</td>
</tr>
<tr>
<td>Total</td>
<td>78</td>
</tr>
</tbody>
</table>

Of the 38% of participants (n=96) who reported that they worried about having PreDM/DM at some point:

- 73% (n=70/96) were worried before the study package arrived
  - 74% (n=52/70) of theseparticipants continued to worry after completing the CANRISK and OGTT, and 26% (n=18/70) stopped worrying
- 27% (n=26/96) were not worried before the study package arrived, but started to worry after completing the CANRISK and the OGTT

Reasons for taking part in study

Nearly all of the participants (n=252, 98%) who completed the feedback form responded to the open-ended question about why they took part in the NS Prediabetes Project. Overall, there were three major reasons why people took part in the study:

- 48% (n=124) wanted to be tested
- 41% (n=106) wanted to help the study
- 41% (n=106) had a family history of DM
Physician Feedback

The DCPNS values collaboration, inclusiveness, and accountability. For this reason, it was critical to partner with local area physicians to carry out the NS Prediabetes Project. Family practitioners provide the majority of care to individuals with diabetes; and as such, it is vital that they be aware of research initiatives that have the potential to affect their work or change standards of care.

Local area physicians were consulted at all stages of the project, from the drafting of the proposal through to the preparation of the final report. The project managers at the two project sites sent regular updates about the study to local area FPs. In addition, two physician champions from partner community participated directly in the project as members of the local advisory committee. These representatives of the larger FP community had multiple roles:

- to guide the development and implementation of the study protocol,
- to update local area FPs about the project, and
- to help shape the lifestyle intervention program.

At the close of the data collection phase of the NS Prediabetes Project, a 6-item Physician Feedback Form was sent to 115 local area FPs (n=40 for AVH and n=74 for GASHA). Approximately 22% of FPs (n=25) returned a feedback form (33% in AVH and 16% in GASHA). The results are presented below.

Impact of CANRISK screening process on FPs’ work

Of the 25 responding FPs, 40% (n=10) indicated that the CANRISK screening process had no impact on their work, 52% (n=13) indicated that there was a minimal impact, and 8% (n=2) indicated a moderate impact. When asked how the CANRISK screening process impacted their work, FPs cited numerous examples (see Table 9).

Table 9: Ways in which the CANRISK screening process affected FPs’ work

<table>
<thead>
<tr>
<th>How CANRISK screening process impacted work (n=15)</th>
<th>#</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provided an opportunity to speak about positive lifestyle changes with patients</td>
<td>7</td>
<td>(47%)</td>
</tr>
<tr>
<td>Identified previously undiagnosed cases of PreDM/DM</td>
<td>6</td>
<td>(40%)</td>
</tr>
<tr>
<td>More office visits</td>
<td>5</td>
<td>(33%)</td>
</tr>
<tr>
<td>Patients asked more informed questions about PreDM/DM</td>
<td>4</td>
<td>(27%)</td>
</tr>
<tr>
<td>Encouraged patients take charge of their health behaviours</td>
<td>2</td>
<td>(13%)</td>
</tr>
<tr>
<td>More phone calls</td>
<td>1</td>
<td>( 7%)</td>
</tr>
<tr>
<td>Other: Had to explain about false positive results</td>
<td>1</td>
<td>( 7%)</td>
</tr>
<tr>
<td>Patient let FP know about participating in study</td>
<td>1</td>
<td>( 7%)</td>
</tr>
<tr>
<td>Raised patient awareness about PreDM</td>
<td>1</td>
<td>( 7%)</td>
</tr>
</tbody>
</table>
Feasibility of the CANRISK as a population level screening tool

Approximately half of the responding FPs (n=13) indicated that the CANRISK Survey should be used to screen for DM in their community. Seven FPs (28%) noted that the CANRISK Survey should not be used for community screening purposes and five FPs (20%) were undecided or did not respond to the item. The reasons for using or not using the CANRISK Survey as a population level screening tool for DM are listed below (see Table 10).

**Table 10: Reasons for using or not using the CANRISK for diabetes screening in the community**

<table>
<thead>
<tr>
<th>Reasons for using the CANRISK (n=13)</th>
<th>#</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To detect cases/detect cases earlier/detect undiagnosed cases</td>
<td>6</td>
<td>(46%)</td>
</tr>
<tr>
<td>To alter prognosis</td>
<td>3</td>
<td>(23%)</td>
</tr>
<tr>
<td>To increase awareness/reach patients without an FP</td>
<td>1</td>
<td>(8%)</td>
</tr>
<tr>
<td>To screen population</td>
<td>1</td>
<td>(8%)</td>
</tr>
<tr>
<td>No response</td>
<td>4</td>
<td>(31%)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Reasons for NOT using the CANRISK (n=7)</th>
<th>#</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need more information about the correlation between the CANRISK and improved DM identification</td>
<td>1</td>
<td>(14%)</td>
</tr>
<tr>
<td>Already screen aggressively</td>
<td>1</td>
<td>(14%)</td>
</tr>
<tr>
<td>Need to allocate all resources to GPs for primary care</td>
<td>1</td>
<td>(14%)</td>
</tr>
<tr>
<td>Lots of paperwork</td>
<td>1</td>
<td>(14%)</td>
</tr>
<tr>
<td>No response</td>
<td>2</td>
<td>(29%)</td>
</tr>
</tbody>
</table>

FPs’ awareness of community programs that promote healthy lifestyle choices

The majority of responding FPs (n=21, 84%) indicated that they were aware of programs in the community that promote healthy lifestyle choices; only three FPs were not aware of any such programs and one did not respond to the item. All FPs who were aware of these programs indicated that they recommended them to their patients with PreDM/DM (see Table 11 for a list of recommended programs).
### Table 11: Healthy lifestyle programs recommended by FPs to their patients with PreDM/DM

<table>
<thead>
<tr>
<th>FP recommended programs that promote healthy lifestyle choices (n=21)</th>
<th>#</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Centres/Diabetes Educators</td>
<td>8</td>
<td>(38%)</td>
</tr>
<tr>
<td>Dietitians</td>
<td>7</td>
<td>(33%)</td>
</tr>
<tr>
<td>Gym or fitness class</td>
<td>7</td>
<td>(33%)</td>
</tr>
<tr>
<td>Cardiac Rehab/Heart Health</td>
<td>4</td>
<td>(19%)</td>
</tr>
<tr>
<td>Walking program</td>
<td>3</td>
<td>(14%)</td>
</tr>
<tr>
<td>Weight Watchers</td>
<td>3</td>
<td>(14%)</td>
</tr>
<tr>
<td>Cycling club</td>
<td>1</td>
<td>(5%)</td>
</tr>
<tr>
<td>Seniors Health</td>
<td>1</td>
<td>(5%)</td>
</tr>
<tr>
<td>Paediatric program</td>
<td>1</td>
<td>(5%)</td>
</tr>
<tr>
<td>Addiction Services</td>
<td>1</td>
<td>(5%)</td>
</tr>
<tr>
<td>VON Chronic Diseases</td>
<td>1</td>
<td>(5%)</td>
</tr>
<tr>
<td>Health Connections – community space for health education/programs</td>
<td>1</td>
<td>(5%)</td>
</tr>
</tbody>
</table>
Chapter 4: Lessons Learned

Partnerships

Having a strong project team contributed to the success of the NS Prediabetes Project.

- Key stakeholders at the local and provincial level were engaged very early in the process – at the PHAC proposal stage. This early contact ensured that the realities of each community were reflected in the project submission and design.
- The local advisory committees provided critical local context pertaining to the design and delivery of the PreDM screening and community-based lifestyle programs.
- The provincial advisory committee provided overall guidance for the NS Prediabetes Project, facilitated joint decision-making between the two project sites, and helped to build capacity to conduct applied research.

Another key to success was the physician champions from each partner community. These dedicated individuals used various venues to discuss the project and promote it among their colleagues and within the community. In the rural communities where the NS Prediabetes Project took place, residents hold physicians in high esteem. Each time these project ambassadors engaged in community awareness activities, the community responded and enrolment increased. One of the most effective community awareness activities was a newspaper article that featured some local physicians and DHA personnel holding a bridge game during the 2-hour waiting period for the OGTT.

The support and guidance of the lab director/manager in each DHA helped the NS Prediabetes Project team to understand the potential burden of this type of screening on both available space and lab personnel. The lab director/manager also ensured that the OGTT protocols were consistent across the sites and that the OGTT screening was carried out in a timely fashion. The lab director/manager for each project site was a member of the local advisory committee. In addition, one of the local project managers was a lab technician with considerable expertise in laboratory procedures as well as the laboratory database system. She was instrumental in setting up access to the laboratory information system for both local project managers.

A positive relationship between the project managers (local and provincial) and the various REBs facilitated the REB application process. A staff person at each REB office reviewed a draft REB application and provided valuable feedback that was integrated into the final submission. In all cases, only minor revisions and clarifications were required before final approval was granted by the respective REBs.

Finally, the DCPNS Advisory Council provided sound advice regarding the potential reach of the NS Prediabetes Project. The Council prompted the NS Prediabetes Project team to think about the broader implications of the project and its importance for NS and the DHAs. Two presentations were made to the Council – one at the mid-point of the project and one at the end – both of which were very well received. The Council was instrumental in securing the NS Prediabetes Project team an audience with the joint VPs, including Medicine, Community Health, and Clinical Care, for all nine DHAs and the IWK.
One difficulty that was encountered over the course of the NS Prediabetes Project was turnover in key personnel at the NS DoH and DoHPP: two DoH Directors (Acute and Tertiary Care and Primary Health Care), a Primary Health Care Senior Policy Consultant, and the Coordinator, Chronic Disease Prevention, DoHPP. The loss of corporate memory, vision, and foundational partnerships proved to be a challenge for ongoing decision-making and continued championing at the Ministry level.

**Time Lines**

One of the key learnings from this project was that the 12-month funding window was not long enough to develop the necessary partnerships, study materials, and Prediabetes Lifestyle Program. Future projects should be aware that the REB process alone can take up to 6 months. With the exception of a draft CANRISK, all of the required study materials were prepared by the NS Prediabetes Project team. The first wave project teams graciously provided their study materials for reference. Although this guidance helped to expedite the process in NS, much work was required to synthesise and adapt these early protocols to fit the NS context. More assistance from PHAC as per the conditional concerns (see p.8) would have been welcome; it would have saved time, improved standardization, and allayed some of the concerns later expressed by members of the Technical Advisory Group.

**Procedure**

A major strength of the NS Prediabetes Project was the standardization of OGTT protocol. Despite variable practice across the province, the two project sites agreed to use a standard protocol and strictly adhered to it. In AVH, all OGTTs were completed by a single lab technician and in GASHA 85% were completed by the project manager, with the remaining 15% competed by one other lab technician. The OGTT preparation instructions were printed on the back page of the CANRISK Survey and were orally communicated to participants by the project managers on two separate occasions. All participants remained at the blood collection lab during the 2-hour interval between the collection of the FPG and the 2hPG.

During the 2008 Information Exchange held by PHAC, the first wave project teams noted that there was an unexpected problem with participants having low blood glucose post-OGTT at their sites. As such, the NS sites provided fruit juice and a snack to all participants. Interestingly, low blood sugar was not a problem at either NS site. This finding may reflect the value of providing clear preparation instruction to participants.

One procedural barrier that was beyond the control of the NS Prediabetes Project team was the lengthy letter of Information and Consent required by the REBs in each of the partner DHAs. This 7-page letter contained very detailed information about the project so that participants could make a truly informed decision about whether or not to participate. However, anecdotal accounts suggest that many participants opted not to read this letter in great detail; others may have been overwhelmed and, thus, decided not to participate at all. Perhaps a short letter with only the most pertinent information would have been more effective. This concern was communicated with an REB review panel and will be shared with each of the REBs at the close of the study (when analyses are complete and data are archived).
CANRISK

The NS Prediabetes Project team made a controversial decision regarding the CANRISK – the scoring system was dropped. As mentioned previously, there were several reasons underlying this decision:

1. The Finnish scoring system has not been validated for the Canadian population
   - The Finnish score might not be accurate for Canadian respondents
   - An inaccurate score could cause participants to worry needlessly

2. Not all CANRISK items have a corresponding risk score
   - Participant might ascribe more importance to items with a score, dismissing the others
     - GDM, a known risk factor for type 2 DM, is one of the items without a risk score

3. NS participants self-administered the CANRISK rather than completing it in the presence of study team member
   - Participants with low numeracy skills could have difficulty calculating the score
   - Participants could have difficulty interpreting the risk score by themselves

Analysis of the CANRISK Survey responses highlighted a few areas where improvements might be required:

Waist Circumference Item
Approximately 11% of participants (n=46) recorded their waist circumference range but not their actual waist circumference measurement. Clearly, this item is sensitive for many people. Future REB submissions should note the sensitive nature of this question in the section addressing potential harm to participants. Alternatively, the actual measurement could be omitted from future version(s) of the CANRISK. Risk is assigned based on the waist circumference range, so the actual measurement is not required.

Family History of DM Item
The greatest non-response rate for a CANRISK item was observed for the item addressing family history of DM. The item requires that participants check yes, no, or don’t know for five different familial relationships: mother, father, siblings, children, and other. The only response that adds to ones risk score is yes; no and don’t know have no associated points. Perhaps the problem of non-response could be simplified by requesting the participant to check the family members that have DM much the same way they would for the ethnicity item:

Have any of your blood relative ever been diagnose with DM

<table>
<thead>
<tr>
<th>Choice</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>No / Don’t know</td>
<td>0 pt</td>
</tr>
<tr>
<td>Mother</td>
<td>5 pt</td>
</tr>
<tr>
<td>Father</td>
<td></td>
</tr>
<tr>
<td>Sibling</td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>3 pt</td>
</tr>
</tbody>
</table>
**Gestational Diabetes Item**

In total, 11 (4%) female participants did not respond to the GDM item, 8 of these women indicated that the item was not applicable. There are two reasons why this item might not apply. First, some women have never been pregnant. As it is written now, the item about GDM subtly implies that female respondents must have been pregnant at some time as there are only two answer options: yes or no. A third option would alleviate this problem and make the item more sensitive to women who have not had children. A second reason why this item might not apply is because some women have never been tested for GDM, especially in the older age groups. In NS, universal screening for GDM at 24-28 gestation was introduced in 1994. Prior to 1994, women would have been screened at the discretion of their doctor.

**Large Baby Item**

A similar problem regarding sensitivity toward women who have not had children exists for this item. Again, a simple fix would be to include a “not applicable” option.
Chapter 5: Next Steps

Expanding on NS Prediabetes Project

Recently, AVH partnered with Acadia University, the Kids Action Program, Capital District Health Authority Behaviour Change Institute, CVHNS, and DCPNS to submit a proposal to develop and evaluate a comprehensive and sustainable Community-based Lifestyle Program for people with PreDM, other “at risk” populations (e.g., individuals with ≥1 of the following risk factors: over 40 years of age, overweight/obese, sedentary, hypertension, a family history of DM, a history of gestational DM/giving birth to a baby >9lb, etc.), and individuals in the early stages of chronic disease. AVH, as with the rest of NS, has high rates of obesity, physical inactivity, and stress as well as high rates of DM, heart disease, and high blood pressure – conditions that can be delayed or prevented through appropriate lifestyle choices. If successful, AVH will use the funding to develop a new district-wide, integrated Community-based Lifestyle Program that can be offered on an ongoing basis throughout the Annapolis Valley by primary health care teams.

The DCPNS has mission to improve, through leadership and partnerships, the health of Nova Scotians living with, affected by, or at risk of developing diabetes. Peggy Dunbar, DCPNS Coordinator, will participate in this project as a member of the Advisory Group, lending her many years of experience guiding the development of standards of care for DM. In addition, Pam Talbot, DCPNS Diabetes Surveillance/Project Consultant, will provide expertise in the area of project management and evaluation. The DCPNS will use the DCPNS Newsletter, the provincial DCPNS Workshop, and the DCPNS Advisory Council meetings as venues to promote the sharing of lessons learned and to advance community-based programming of this sort across the province.

Sharing Results

Plans are underway for the NS Prediabetes Project team to prepare a manuscript for the Fall 2010 issue of Chronic Diseases in Canada. This article will be part of a series submitted by PHAC and other Prediabetes Project sites across Canada.
References


APPENDICES
Appendix A: Diabetes and Prediabetes in Nova Scotia

Diabetes in Nova Scotia

According to the 2008 report based on the National Diabetes Surveillance System (NDSS), Nova Scotia (NS) has one of the highest rates of diabetes (DM) in the country – second only to Newfoundland.\(^1\) However, a previous report showed that the all-cause mortality rate ratio among Nova Scotians with DM compared to those without was below the Canadian average.\(^2\)

As of March 2006, approximately 67,000 adult Nova Scotians (≥20 years) were identified as living with DM using the NDSS methodology.\(^3\) This number represents a 19% increase in the crude prevalence rate over a 5-year period from 7.3% in 2001/02 to 8.7% in 2005/06. This rate varied considerably across the province’s nine district health authorities (DHAs) from 7.2% to 10.8%.

The two DHAs where the NS Prediabetes Project was conducted, Annapolis Valley Health (AVH) and Guysborough Antigonish Strait Health Authority (GAHSA), fall in the middle with regard to crude prevalence: 9.0% in AVH and 9.9% in GASHA.\(^3\) Standardizing for differences in the underlying population structure greatly reduced the variation in prevalence rates across the DHAs, suggesting that the differences were in part attributable to differences in the age and sex distributions of the DHAs. The age-sex standardized prevalence rates for NS, AVH, and GASHA were 7.3%, 7.2%, and 7.8% respectively.

Unlike prevalence, the provincial incidence rates for DM have been stable across time at approximately 7.6 per 1,000 population.\(^3\) With one exception, crude incidence rates also were stable across the DHAs. For 2004/05, the crude incidence rates ranged from 6.6 to 10.7 per 1,000, with the NS average being 7.6 per 1,000. Again, when differences in the underlying population were taken into account, the variations between DHAs were negligible. The age-sex standardized incidence rates for NS, AVH, and GASHA were 6.6%, 5.9%, and 6.8% respectively.

It is important to note that the prevalence and incidence figures above include type 1 and type 2 cases. Although, the NDSS methodology is useful for generating nationally comparable figures, it cannot be used to differentiate between the types of DM. About 90% of NDSS cases are derived from physician billings records; thus, lack sufficient detail to distinguish type of DM.

References


5-year Trends for Diabetes and Prediabetes Referrals to Nova Scotia Diabetes Centres – An Analysis of DCPNS Registry Data

**Data Source**

The DCPNS Registry captures information about all attendees to Nova Scotia’s Diabetes Centres (DCs)—new referrals and long-standing follow-up cases. As the Registry is based on referral and access to DCs, it is known to under represent the broader DM population (e.g., the frail elderly, the institutionalized, etc.). However, internal validation work indicates that the Registry captures nearly 100% of paediatric DM cases and approximately 70% of adult (≥20 years) cases. In 2007/08, DM and prediabetes (PreDM) type (e.g., type 1, type 2, gestational, IFG, IGT, etc.) were captured in the Registry for 99% of all newly diagnosed cases, and 95% of all prevalent cases. It is important to keep this information in mind when interpreting the 5-year trends that follow, as missing information about type in the prevalent data will influence some rates.

**Five-year Trends for Diabetes Centre Referrals**

On average, the number of prevalent cases increased by approximately 5,000 cases per year for each of the last five years (see Figure A1). These new cases were comprised of newly diagnosed (incident) cases and not newly diagnosed cases (diagnosed with diabetes >12 months, but not previously seen in a DC). There were, on average, 3,800 newly diagnosed DM/PreDM cases in each year. The number of newly diagnosed cases increased slightly through to 2005/06, and then declined in both 2006/07 and 2007/08.

*Figure A1: 5-year trend for number of prevalent and newly diagnosed DC cases in Nova Scotia, 2003/04 – 2007/08*
As expected, the majority of cases in the DCPNS Registry were type 2 DM (75-80%). However, the percentage of PreDM cases increased steadily across the 5-year period from 5.8% of the total prevalent cases in 2003/04 to 8.2% in 2007/08 (see Figure A2a). During this same period, the percentage of newly diagnosed cases with type 2 DM decreased from 74.4% to 68.7% while the percentage with PreDM increased from 11.4% in 2003/04 to 22.2% in 2007/08 (see Figure A2b).

**Figure A2:** 5-year trend for percentage of prevalent and newly diagnosed DC cases by DM type in Nova Scotia, 2003/04 – 2007/08

In the two DHAs where the NS Prediabetes Project was conducted, the percentage of newly diagnosed cases with PreDM was higher than the provincial average (see Figure A3). In AVH, new PreDM cases ranged from 23.3% to 27.8% of all newly diagnosed cases in 2003/04 and 2007/08, respectively. In GASHA, this figure ranged from 21.9% to 25.3% in 2003/04 and 2007/08, respectively.

**Figure A3:** 5-year trend for percentage of newly diagnosed DC cases by DM type and DHA in AVH and GASHA, 2003/04 – 2007/08
For NS as a whole, the estimated number\(^j\) of PreDM diagnoses made using an OGTT (i.e., IGT or IGT/IFG) almost tripled from an average of 82 for 2003/04–2004/05 to an average of 240 for 2006/07–2007/08 (see Table A1).

Table A1: Number of newly diagnosed DC cases by diagnosis type in Nova Scotia, 2003/04 – 2007/08

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>2003/04</th>
<th>2004/05</th>
<th>2005/06</th>
<th>2006/07</th>
<th>2007/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of newly diagnosed DC cases</td>
<td>3,357</td>
<td>3,965</td>
<td>4,114</td>
<td>4,066</td>
<td>3,632</td>
</tr>
<tr>
<td>Total number of newly diagnosed PreDM cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGT*</td>
<td>45</td>
<td>71</td>
<td>112</td>
<td>121</td>
<td>129</td>
</tr>
<tr>
<td>IFG</td>
<td>338</td>
<td>357</td>
<td>588</td>
<td>717</td>
<td>564</td>
</tr>
<tr>
<td>IGT/IFG*</td>
<td>0</td>
<td>48</td>
<td>91</td>
<td>115</td>
<td>115</td>
</tr>
<tr>
<td>Total</td>
<td>383</td>
<td>476</td>
<td>791</td>
<td>953</td>
<td>808</td>
</tr>
<tr>
<td>% of newly diagnosed cases with PreDM</td>
<td>11.4%</td>
<td>12.0%</td>
<td>19.2%</td>
<td>23.4%</td>
<td>22.2%</td>
</tr>
</tbody>
</table>

*Requires an OGTT for diagnosis

For prevalent type 2 DM cases, the number of males exceeded the number of females. The reverse was true for the prevalent PreDM cases; compared to males, a greater number of females had a diagnosis of PreDM. This pattern held for the newly diagnosed cases as well (see Figure A4).

Figure A4: 5-year trend for number of newly diagnosed DC referrals by DM type and sex in Nova Scotia, 2003/04 – 2007/08

\(^j\) Note this number is just an estimate; the actual number of OGTT diagnoses could have been higher, as an IFG diagnosis may result from this test as well
The number of prevalent type 2 DM and PreDM cases in the DCPNS Registry increased with time for all age groups (see Figure A5a), with the number of PreDM cases among the population over 45 years of age doubling in a five year period (see Figure A5b).

**Figure A5:** 5-year trend for the number of prevalent DC cases with type 2 DM and PreDM by age group in Nova Scotia, 2003/04 – 2007/08

The 5-year trends for the newly diagnosed type 2 DM and PreDM cases were less consistent than the trends for total prevalent cases. The number of newly diagnosed type 2 DM cases increased across all ages for the first two years; from 2005/06 onward, the trend varied depending on age group (see Figure A6a). The number of newly diagnosed PreDM cases for those aged 45 years and over increased consistently from 2003/04 to 2006/07 and then declined in the last year (see Figure A6b). For the youngest age group (20-39 years), the number of newly diagnosed PreDM referrals increased across all years.
The average age at diagnosis remained relatively constant across time, sex, and DM type for newly diagnosed DC cases (see Table A3).

**Table A3:** Mean age (years) at diagnosis for newly diagnosed DC cases by DM type and sex in Nova Scotia, 2003/04 – 2007/08

<table>
<thead>
<tr>
<th>DM Type</th>
<th>2003/04</th>
<th>2004/05</th>
<th>2005/06</th>
<th>2006/07</th>
<th>2007/08</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Type 2</td>
<td>56</td>
<td>56</td>
<td>56</td>
<td>58</td>
<td>56</td>
</tr>
<tr>
<td>IGT</td>
<td>60</td>
<td>57</td>
<td>59</td>
<td>59</td>
<td>59</td>
</tr>
<tr>
<td>IFG</td>
<td>57</td>
<td>56</td>
<td>57</td>
<td>58</td>
<td>59</td>
</tr>
<tr>
<td>IGT/IFG</td>
<td>61</td>
<td>58</td>
<td>62</td>
<td>58</td>
<td>59</td>
</tr>
</tbody>
</table>
### Appendix B: Estimated Population with Prediabetes

<table>
<thead>
<tr>
<th></th>
<th>AVH</th>
<th>GASHA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Estimated total population</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kentville</td>
<td>9,312</td>
<td>5,096</td>
</tr>
<tr>
<td>New Minas</td>
<td>5,056</td>
<td>13,739</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14,368</td>
<td>18,835</td>
</tr>
</tbody>
</table>

| **Estimated population 40-74 years less those already diagnosed with PreDM/DM (10-15%)** |           |           |
| Kentville              | 4,018     | 2,110     |
| - 402                  | - 603     | - 211     |
| **Total**              | 3,616     | 1,899     |

| New Minas              | 2,359     | 7,255     |
| - 236                  | - 354     | - 726     |
| **Total**              | 2,123     | 6,529     |

| **Estimated population (40-74 years) with PreDM (20%)** |           |           |
| Kentville              | 724       | 380       |
| New Minas              | 425       | 1,306     |
| **Total**              | 1,149     | 1,686     |
Appendix C: CANRISK – Nova Scotia Version

Front Cover

CANRISK SURVEY
The Canadian Diabetes Risk Assessment Questionnaire

The questions in this booklet will help you to find out if you are at risk of developing type 2 diabetes.

Knowing your risk of having diabetes later in life can help you to make healthy choices now that will reduce your risk or even prevent you from developing diabetes.

You will be asked questions about important risk factors for diabetes. These include
- your age,
- family history of diabetes,
- ethnicity,
- and other factors.

Please answer as honestly and completely as you can. If you wish, a friend or family member can help you to complete this survey.

This survey is intended for adults aged 40 to 74 years.
As you get older, your risk of developing diabetes goes up.

1. **Select your age group (mark with an X)**
   - [ ] 40–44 years
   - [ ] 45–54 years
   - [ ] 55–64 years
   - [ ] 65–74 years

Body shape and size can affect your risk of diabetes.

2. **How much do you weigh?**
   - I weigh _____ pounds.
   - OR
   - I weigh _____ kilograms.

   **How tall are you without shoes on?**
   - I am _____ feet and _____ inches tall.
   - OR
   - I am _____ centimetres tall.

---

**Use the Height and Weight Table in the centre of this booklet (pages 7–9) to find your Body Mass Index (BMI).**

Find the point where your height crosses with your weight and mark below which shaded-area you fall into.

For example, if you were 5 feet 2 inches tall (or 157.5 cm) and weighed 163 pounds (or 74 kg), you would check the "grey-shaded area (BMI 25–30)" box.

- [ ] unshaded white area (BMI under 25)
- [ ] grey-shaded area (BMI 25–30)
- [ ] black-shaded area (BMI over 30)
3. Using a tape measure, please measure around your waist at the level of your belly button.

Measure after breathing out (do not hold your breath) and write your results below and then check the box that contains your measurement.

<table>
<thead>
<tr>
<th>Waist Circumference</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>inches</td>
<td></td>
<td>inches</td>
</tr>
<tr>
<td>OR cm</td>
<td></td>
<td>OR cm</td>
</tr>
</tbody>
</table>

- Less than 94cm OR 37 inches
- Between 94–102cm OR 37–40 inches
- Over 102cm OR 40 inches

Your level of physical activity and what you eat can affect your risk of developing diabetes.

4. 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

5. How often do you eat vegetables or fruits?

- Every day
- Not every day
Some types of diabetes run in families.

1. Have any of your blood relatives ever been diagnosed with diabetes? (check ALL that apply)
   - Mother
     - Yes
     - No
     - Don't know
   - Father
     - Yes
     - No
     - Don't know
   - Brother or Sister
     - Yes
     - No
     - Don't know
   - Children
     - Yes
     - No
     - Don't know
   - Other
     - Yes
     - No
     - Don't know

Height & Weight Table
for The CANRISK SURVEY

Instructions:
Find the point where your height crosses with your weight
Then, check the box on page 3 that matches the shaded-area that you fall into

Example:
If you were 5 feet 2 inches tall (or 157.5 cm), AND you weighed 163 pounds (or 74 kg)
You would fall into the grey shaded, SO you would check the box next to “grey-shaded area (BMI 25–30)”

Go to page 10 for next question
## Height and Weight Table (Body Mass Index)

<table>
<thead>
<tr>
<th>Height (feet &amp; inches)</th>
<th>Weight (kg)</th>
<th>Weight (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6'0&quot;</td>
<td>110-119</td>
<td>240-260</td>
</tr>
<tr>
<td>6'1&quot;</td>
<td>115-124</td>
<td>250-275</td>
</tr>
<tr>
<td>6'2&quot;</td>
<td>120-130</td>
<td>260-285</td>
</tr>
<tr>
<td>6'3&quot;</td>
<td>125-135</td>
<td>270-300</td>
</tr>
<tr>
<td>6'4&quot;</td>
<td>130-140</td>
<td>280-320</td>
</tr>
<tr>
<td>6'5&quot;</td>
<td>135-145</td>
<td>290-340</td>
</tr>
<tr>
<td>6'6&quot;</td>
<td>140-150</td>
<td>300-360</td>
</tr>
<tr>
<td>6'7&quot;</td>
<td>145-155</td>
<td>310-380</td>
</tr>
<tr>
<td>6'8&quot;</td>
<td>150-160</td>
<td>320-400</td>
</tr>
<tr>
<td>6'9&quot;</td>
<td>155-165</td>
<td>330-430</td>
</tr>
<tr>
<td>6'10&quot;</td>
<td>160-170</td>
<td>340-480</td>
</tr>
<tr>
<td>6'11&quot;</td>
<td>165-175</td>
<td>350-500</td>
</tr>
<tr>
<td>7'0&quot;</td>
<td>170-180</td>
<td>360-600</td>
</tr>
</tbody>
</table>

---

**Note:**
- **Weight (kg)**: Calculated as weight (in pounds) / 2.2
- **Weight (pounds)**: Weight (in kg) * 2.2
High blood pressure and high blood sugar are associated with diabetes.

1. Have you ever been told by a doctor or nurse that you have high blood pressure OR have you ever taken high blood pressure pills?
   - [ ] Yes
   - [ ] No
   - [ ] Don’t know

2. 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
   - [ ] Don’t know

Go to page 10 for next question

Certain ethnic groups are at a higher risk of developing diabetes.

Please check off which of the following ethnic groups your biological (blood) parents belong to:

9. Mother
   - [ ] 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>
<thead>
<tr>
<th>Mother</th>
<th>□ Yes</th>
<th>□ No</th>
<th>□ Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Father</td>
<td>□ Yes</td>
<td>□ No</td>
<td>□ Don’t know</td>
</tr>
<tr>
<td>Brother or Sister</td>
<td>□ Yes</td>
<td>□ No</td>
<td>□ Don’t know</td>
</tr>
<tr>
<td>Children</td>
<td>□ Yes</td>
<td>□ No</td>
<td>□ Don’t know</td>
</tr>
<tr>
<td>Other</td>
<td>□ Yes</td>
<td>□ No</td>
<td>□ Don’t know</td>
</tr>
</tbody>
</table>
1. Using a tape measure, please measure around your waist at the level of your belly button. Measure after breathing out (do not hold your breath) and write your results below and then check the box that contains your measurement.

**Waist Circumference**

- **Men**
  - Less than 94cm (37 inches)
  - Between 94–102cm (37–40 inches)
  - Over 102cm (40 inches)

- **Women**
  - Less than 80cm (31.5 inches)
  - Between 80–88cm (31.5–35 inches)
  - Over 88cm (35 inches)

12. What is the highest level of education that you have completed?

- Some high school or less
- High school diploma
- Some college or university
- University degree

13. In general, would you say your health is...

- Excellent
- Very good
- Good
- Fair
- Poor

14. Are you male or female?

- Male
- Female
As you get older, your risk of developing diabetes goes up.

1. Select your age group (mark with an X)
   - 40–44 years
   - 45–54 years
   - 55–64 years
   - 65–74 years

Body shape and size can affect your risk of diabetes.

2. How much do you weigh?
   - I weigh pounds.
   - OR
   - I weigh kilograms.

   How tall are you without shoes on?
   - I am feet and inches tall.
   - OR
   - I am centimetres tall.

How to prepare for your blood work (an oral glucose tolerance test)

Three days before the test
- Eat as usual for the three days before your blood test
  - No food is off limits
  - You can even eat dessert

The night before the test
- Fast for 8 hours before your blood test
  - Do not eat or drink anything during this time
  - You can have sips of water

The morning of the test
- Do not eat or drink anything the morning of your test
- A sample of your blood will be taken soon after you arrive at the hospital
- Then, you will be given a sweet orange drink & asked to wait at the hospital for 2 hours
  - You might want to bring a book
- A second sample of your blood will be taken 2 hours after you finish the drink

Some women develop diabetes in pregnancy. (If male, please skip these questions)

15. If you are female, have you ever been told that you have diabetes related to pregnancy (gestational diabetes)?
   - Yes
   - No

16. Have you ever given birth to a large baby weighing 9 pounds or more (4.1 kg)?
   - Yes
   - No

Thank you for completing the CANRISK SURVEY

Please bring the completed CANRISK Survey with you when you come to the hospital for your blood work.
Thank you for taking the time to fill out the CANRISK Survey. Your responses will help us to learn whether the CANRISK Survey is useful for finding people who have high blood sugar (prediabetes or diabetes).

If the CANRISK Survey works, it may be used provincially or nationally to find people who are at high risk for diabetes.

If you have questions about the CANRISK Survey or the Prediabetes Study, please feel free to contact the local project manager:

[Project Manager]: (902) ####-####

You can find information about how to prepare for the blood work (oral glucose tolerance test) on page 15 of this booklet. The blood work will be done at [Local hospital].

Study ID: ____________
Appendix D: Blood Test Results

Blood glucose in normal range

Dear [Name],

First, we want to thank you again for taking the time to fill out a CANRISK Survey and coming to the hospital to have your blood glucose (or sugar) tested. Without your help, this study would not have been possible.

The purpose of this letter is to tell you the results of your blood test and to explain what the results mean for you.

- Your Fasting Blood Glucose was [results]
- Your 2-hour Blood Glucose (after the orange drink) was [results]

As you can see from the chart below, you have normal blood glucose levels.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Fasting Blood Glucose (mmol/L)</th>
<th>2-hour Blood Glucose (mmol/L) (after orange drink)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Less than 6.1 and Less than 7.8</td>
<td></td>
</tr>
<tr>
<td>Prediabetes</td>
<td>Impaired Fasting Glucose (IFG)</td>
<td>6.1-6.9 and Less than 7.8</td>
</tr>
<tr>
<td></td>
<td>Impaired Glucose Tolerance (IGT)</td>
<td>Less than 6.1 and 7.8-11.0</td>
</tr>
<tr>
<td></td>
<td>Both IFG and IGT</td>
<td>6.1-6.9 and 7.8-11.0</td>
</tr>
<tr>
<td>Diabetes</td>
<td>7.0 or more and 11.1 or more</td>
<td></td>
</tr>
</tbody>
</table>

To help keep your blood glucose levels in the normal range, we encourage you to eat a variety of healthy foods and to be active on a regular basis.

We also encourage you to talk with your family doctor about risk factors for diabetes. If you have any of the following risk factors for diabetes, you should have your blood glucose measured at a hospital lab every year:

- Close family member with type 2 diabetes (parent, brother, or sister)
- Aboriginal, African, Asian, or Hispanic descent
- History of gestational diabetes or gave birth to a large baby (over 9 pounds)
- High blood pressure and/or high cholesterol
- Overweight, especially around the waist
- Not very active

If you do not have any of these risk factors, you still should have your blood glucose measured at a hospital lab every three years.
Dear [Name],

First, we want to thank you again for taking the time to fill out a CANRISK Survey and coming to the hospital to have your blood glucose (or sugar) tested. Without your help, this study would not have been possible.

The purpose of this letter is to tell you the results of your blood tests and to explain what the results mean for you.

- **Your Fasting Blood Glucose was** [results]
- **Your 2-hour Blood Glucose (after orange drink) was** [results]

As you can see from the chart below, you have prediabetes. Prediabetes is not a disease itself, but it is a risk factor for developing type 2 diabetes.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Fasting Blood Glucose (mmol/L)</th>
<th>2-hour Blood Glucose (mmol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Less than 6.1 and</td>
<td>Less than 7.8</td>
</tr>
<tr>
<td>Prediabetes</td>
<td>Impaired Fasting Glucose (IFG)</td>
<td>6.1-6.9 and</td>
</tr>
<tr>
<td></td>
<td>Impaired Glucose Tolerance (IGT)</td>
<td>Less than 6.1 and</td>
</tr>
<tr>
<td>Diabetes</td>
<td>Both IFG and IGT</td>
<td>6.1-6.9 and</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7.0 or more</td>
</tr>
</tbody>
</table>

We have sent a copy of your results to your family doctor, and we strongly encourage you to make an appointment with your doctor to discuss your results.

We would like to invite you to take part in a community-based **Prediabetes Lifestyle Program**.

- 6-sessions to help you learn how to lower your risk of developing diabetes
  - Prediabetes Education Session
  - Goal Setting Session
  - Healthy Eating: Grocery Store Tour
  - Physical Activity Session
  - Stress Management Session
  - Smoking Cessation

- If you would like to take part in this Prediabetes Lifestyle Program, please read the Letter of Information and Consent included in this package.

If you have any questions, please contact the project manager, [Name] (902.###.####).
Dear [Name],

First, we want to thank you again for taking the time to fill out a CANRISK Survey and coming to the hospital to have your blood glucose (or sugar) tested. Without your help, this study would not have been possible.

The purpose of this letter is to tell you the results of your blood test and to explain what the results mean for you.

- Your Fasting Blood Glucose was [results]
- Your 2-hour Blood Glucose (after orange drink) was [results]

As you can see from the chart below, you may have diabetes. However, a second test may be required to confirm the results.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Fasting Blood Glucose (mmol/L)</th>
<th>2-hour Blood Glucose (mmol/L) (after orange drink)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Less than 6.1 and Less than 7.8</td>
<td>Less than 7.8</td>
</tr>
<tr>
<td>Prediabetes</td>
<td>Impaired Fasting Glucose (IFG)</td>
<td>6.1-6.9 and Less than 7.8</td>
</tr>
<tr>
<td></td>
<td>Impaired Glucose Tolerance (IGT)</td>
<td>Less than 6.1 and 7.8-11.0</td>
</tr>
<tr>
<td></td>
<td>Both IFG and IGT</td>
<td>6.1-6.9 and 7.8-11.0</td>
</tr>
<tr>
<td>Diabetes</td>
<td>7.0 or more and 11.1 or more</td>
<td>or 11.1 or more</td>
</tr>
</tbody>
</table>

We have sent a copy of your results to your doctor.

- You should make an appointment with your family doctor to discuss your results.
- He/she may want to do another test to confirm the results.

Your doctor will talk with you and determine the best treatment for you. He/she may send you to a Diabetes Centre where you can learn how to live well with diabetes.
Appendix E: Participant Feedback

Prediabetes Study
Participant Feedback

Project title: Prediabetes Study – Screening and Community-based Lifestyle Program

We would like to thank you again for taking part in our research study. Your participation in the Prediabetes Study will help us to learn whether the CANRISK Survey is useful for finding people who have high blood sugar (prediabetes or diabetes).

Now, we would like to know how you felt about taking part in the Prediabetes Study. We invite you to fill out this feedback form and return it in the envelope provided. We do not need to know your name. Please do not put your name or any other identifying information (such as your phone number or health card number) on this feedback form.

Please remember that you do not have to complete this feedback form. Whether you complete and return this feedback form is for you to decide - your participation is voluntary. Your access to healthcare services will not be affected by whether you choose to return this feedback form or not.
A few weeks ago, you took part in our Prediabetes Study by filling out a CANRISK Survey and having a special blood test (oral glucose tolerance test).

Now, we would like to know how you felt about taking part in the Prediabetes Study.

1. Did you hear about the Prediabetes Study before the study package arrived in the mail?
   - Yes
   - No
   If yes, how did you hear about the study:
     - Newspaper
     - Doctor’s office
     - Grocery Store flyer
     - Radio
     - At work
     - Community Board
     - TV
     - At Church
     - Friend/family
     - Other:

2. Did you know what prediabetes was before the Prediabetes Study package arrived in the mail?
   - Yes
   - No

3. Were you able to fill out the CANRISK Survey on your own?
   - Yes
   - No
   If no, who helped you fill out the CANRISK Survey:
     - Family
     - My doctor
     - The project manager
     - Friend
     - A co-worker
     - Other

How could the CANRISK Survey have been made easier?
4. Did you understand how to prepare for the blood test (oral glucose tolerance test) used to test for diabetes or prediabetes? Please circle the number that best describes your feelings about the instructions that explained how to prepare for the blood test.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>very easy to understand</td>
<td>easy to understand</td>
<td>somewhat easy to understand</td>
<td>hard to understand</td>
<td>very hard to understand</td>
</tr>
</tbody>
</table>

5. Were you worried that you might have diabetes or prediabetes before the Prediabetes Study package arrived in the mail?

- Yes
- No

Were you worried that you might have diabetes or prediabetes after you completed the CANRISK Survey and had the special blood test (oral glucose tolerance test)?

- Yes
- No

6. Why did you decide to take part in the Prediabetes Study?

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
Appendix F: Physician Feedback

Project title: Prediabetes Study – Screening and Community-based Lifestyle Program

As you are aware, we have been conducting a Prediabetes Study in Kentville. We have completed the screening phase of the project and would like to know how the screening process affected your practice. If you are willing, please provide your anonymous feedback by filling out this form and returning it in the envelope provided.

Please be aware that you do not have to complete this feedback form - your participation is voluntary. If you return this feedback form, we will assume you are giving your consent for us to use your responses to help evaluate our Prediabetes Study.

We will combine your responses with those of other physicians in the area and then explore the collective dataset for meaningful themes. These will be discussed in the context of population screening for chronic disease in rural Nova Scotia.

**Please do not put your name or any other identifying information on the feedback form.**

1. Did the CANRISK screening of your patients for diabetes risk impact your work?

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<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
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If yes, to what extent

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<tr>
<th></th>
<th>Minimally</th>
<th>Moderately</th>
<th>Excessively</th>
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If yes, in what way

<table>
<thead>
<tr>
<th></th>
<th>More phone calls</th>
<th>More office visits</th>
<th>Office visits were longer</th>
</tr>
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<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Identified previously undiagnosed cases of prediabetes/diabetes</th>
<th>Provided an opportunity to speak about positive lifestyle changes with my patients</th>
</tr>
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<td></td>
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<table>
<thead>
<tr>
<th></th>
<th>Encourage patients to take charge of their health behaviours</th>
<th>Patients asked more informed questions about prediabetes/diabetes</th>
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<td></td>
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<table>
<thead>
<tr>
<th></th>
<th>Other:</th>
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<td></td>
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<p>| | |</p>
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</table>
2. Should the CANRISK Survey be used to screen for diabetes as a standard of care in your community?

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<tbody>
<tr>
<td>Yes</td>
<td>Why:</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Why not:</td>
<td></td>
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</tbody>
</table>

3. Are you aware of programs in your community that promote healthy lifestyle choices?

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<tbody>
<tr>
<td>Yes</td>
<td>Do you recommend these programs to your patients with diabetes or prediabetes?</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Which ones:</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Why not:</td>
<td></td>
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