

PRIMARY PREVENTION OF TYPE 2 DIABETES IN FIRST NATIONS: EXPERIENCES OF THE KAHNAWAKE SCHOOLS DIABETES PREVENTION PROJECT

Ann C. Macaulay MD, Gilles Paradis MD, Louise Potvin PhD, Edward J. Cross MEd, Chantal Saad-Haddad PDT, Alex M. McComber MEd, Serge Desrosiers MSc and Rhonda Kirby BA

A B S T R A C T

Primary prevention of Type 2 diabetes in First Nations: Experiences of the Kahnawake Schools Diabetes Prevention Project

OBJECTIVE: Kahnawake Schools Diabetes Prevention Project (KSDPP) is one of the first primary prevention programs for Type 2 diabetes in a First Nations community in Canada. It targets elementary school children, parents, teachers and the entire Mohawk community of Kahnawake, Quebec. The long-term goal is the primary prevention of diabetes. The short-term goals are to improve healthy eating habits and increase physical activity throughout the community, with a focus on elementary school children aged 6 to 12 years.

METHODS: From 1994 to 1996, direct observation of school canteens and semi-structured staff interviews were conducted twice each year. Classroom teachers recorded nutrition and exercise activities in calendar logbooks. Awareness of and agreement with KSDPP community activities were measured by questionnaires to parents and a random-sample community telephone survey.

RESULTS: School canteens offered new healthy foods. Teachers added 4 to 12 activities per month with peaks coinciding with KSDPP community events. Eighty-five percent of community residents agreed with KSDPP objectives.

CONCLUSION: A Type 2 diabetes prevention program is feasible, generating numerous school and community activities, and high levels of awareness and participation.

R É S U M É

La prévention primaire du diabète de type 2 chez les Premières Nations : expériences menées dans le cadre du Projet de prévention du diabète dans les écoles de Kahnawake

Le Projet de prévention du diabète dans les écoles de Kahnawake (PPDEK) est l'un des premiers programmes de prévention primaire mis sur pied dans une collectivité des Premières Nations au Canada. Il s'adresse aux enfants du primaire, aux parents, aux instituteurs et à toute la collectivité Mohawk de Kahnawake (Québec). L'objectif à longue échéance est la prévention primaire du diabète. À plus brève échéance, il s'agit d'améliorer les habitudes alimentaires et de promouvoir l'activité physique dans toute la collectivité, l'accent étant mis sur les enfants du primaire âgés entre six et douze ans.

De 1994 à 1996, les cantines scolaires ont fait l'objet d'observation directe et le personnel a été soumis à des entrevues plus ou moins structurées, à raison de deux fois l'an. Les instituteurs ont enregistré mensuellement tous les détails relatifs à la nutrition et à l'exercice physique. Au moyen de questionnaires distribués aux parents et d'un sondage téléphonique effectué auprès des résidents de Kahnawake, on a pu savoir dans quelle mesure la collectivité était au courant du PPDEK et approuvait les activités qui s'y rapportaient.

Les cantines scolaires ont offert aux élèves des aliments nouveaux et meilleurs pour la santé. Les instituteurs ont inscrit entre quatre et douze activités de plus par mois, les pointes coïncidant avec les événements communautaires liés au PPDEK. Les résidents de Kahnawake ont dit, dans une proportion de 85 pour cent, qu'ils étaient d'accord avec les objectifs du PPDEK.

Il est possible de réaliser un projet de prévention du diabète de type 2 en mettant sur pied de nombreuses activités scolaires et communautaires et en mettant l'accent sur l'information et la participation.

INTRODUCTION

The etiology of Type 2 diabetes is complex, with genetic and environmental factors playing important roles. Primary prevention of diabetes was first proposed after epidemiological studies demonstrated that the modifiable environmental factors of obesity and sedentary lifestyle are important independent risk factors in the etiology of diabetes, with dietary habits playing a lesser role.^{1,2}

Today, Type 2 diabetes has reached epidemic proportions in First Nation communities in Canada; screening programs in individual communities have shown the age-adjusted rate to be as high as 19 to 26%.³⁻⁶ National surveys have shown that diabetes causes increased rates of death and high levels of end-stage renal disease.^{7,8} Type 2 diabetes has been diagnosed in First Nations children as young as 8 years.^{9,10} It is therefore not surprising that the early community-based diabetes primary prevention programs have originated at the request of First Nation communities attempting to reduce this high burden of disease.¹¹ Community-based primary prevention programs have emerged as an important strategy because of the limitations inherent to screening and diabetes management programs, which, at best, can only delay the onset of diabetes complications.

Primary prevention programs are highly suited to small communities where integrated, multifactorial interventions, targeting multiple aspects of community life as well as individuals, act synergistically to enhance community awareness, knowledge, attitudes and behaviours.¹² This approach is also congruent with Native beliefs that wellness depends on extended family and community support and the physical, emotional, mental and spiritual strengths represented in the four directions of the traditional medicine wheel.

The Kahnawake Schools Diabetes Prevention Project (KSDPP), in the Mohawk community of Kahnawake, is one of the first community-based primary prevention programs for Type 2 diabetes. This paper highlights the intervention and documents some results of process evaluation in the elementary schools and in the community.

OBJECTIVES

The long-term goal is the primary prevention of diabetes. The short-term goals are to improve healthy eating habits and increase physical activity throughout the community, with a focus on elementary school children aged 6 to 12 years. The KSDPP began as a three-year (1994-1997) NHRDP-funded intervention and evaluation project. At the request of the community the program has been extended and is now entering its fifth year.

METHODOLOGY

The detailed intervention and evaluation design and baseline results have been previously reported.¹³ In brief, KSDPP is a participatory research project involving the Mohawk community of Kahnawake (population 7000, 15 km southwest of Montreal) in a partnership with community and academic researchers.¹⁴ The intervention program

is comprised of school and community-wide activities targeting children, teachers and parents. In addition, KSDPP aims to change social norms as well as the physical environments at school and in the community.¹⁵ The comparison Mohawk community of 2000 inhabitants is 400 km southwest of Montreal.

The main outcomes of this project are the anthropometric, behavioural and fitness changes of elementary school children. Because children mature quickly and because of a possible strong cohort effect, a comparison group was necessary to ensure proper inference of the effect of the program. The Mohawk community most similar to Kahnawake had already started a separate diabetes prevention program, so the comparison community for this project is a smaller, more rural Mohawk community which also shares many features with Kahnawake.¹⁶ From 1994 to 1997 there was no active diabetes prevention program in that community.

ELEMENTARY SCHOOL INTERVENTIONS

In the elementary schools, the major focus of KSDPP is a culturally relevant Health Education Program, developed by the dietitian and community health nurses from the community hospital centre. This program, for grades 1 through 6, incorporates nutrition, fitness, understanding the human body and diabetes in 10 lessons of 45 minutes each. The lessons use interactive learning, a hands-on approach together with visual, spatial and perceptual modes of learning to ensure congruence with traditional Native learning styles.¹⁷ Initially, the health professionals delivered the program in the presence of classroom teachers. Teachers subsequently received training and by year three were delivering the program themselves.¹³ The Kahnawake Education System introduced a Nutrition Policy which banned junk food, ensured nutritious foods in the canteen and stipulated that children bring only healthy food to school. The canteen operators had always avoided selling junk foods, but following the introduction of the Nutrition Policy, consulted with the dietitian to increase the selection of foods with moderate fat and sugar content.

In addition classroom teachers were asked to incorporate new healthy eating and physical exercises into class activities. Teachers recorded these additional activities and incentives were given for their participation. One popular activity was running or walking around the school yard before classes or at recess.

COMMUNITY WIDE INTERVENTIONS

In the first three years KSDPP introduced 63 supporting interventions in the community including: (i) creation of a Community Advisory Board (CAB) that met monthly throughout the project; (ii) information dissemination through the local newspaper and radio station; (iii) activities promoting healthy nutrition; and (iv) activities promoting active lifestyles. These interventions aimed to increase knowledge and awareness of the project's objectives and to encourage parents, elders and extended families to engage in healthy lifestyles and thus become role models for the chil-

dren. First of all, KSDPP supported other organizations whose activities matched those of the project such as Health Fairs and sporting events. The KSDPP then developed fun, family-oriented activities which included healthy meals, cooking demonstrations, line dancing, winter walks and gymnastic clubs. Interventions also resulted in durable developments such as a new 2 km recreation path.

Through the CAB, the community has been the dominant force in the planning, development and implementation of the program. The CAB is composed of 40 community members and was formed especially for KSDPP. It has provided advice and direction to both the intervention and evaluation teams. The intervention and evaluation protocols were discussed every month and sometimes modified before approval by the CAB. A Code of Research Ethics, developed collaboratively by the CAB and researchers in the first 8 months of the project, outlines the obligations of all parties throughout the research process from design to dissemination of all results, including those in scientific publications.¹⁴

The intervention team is staffed by two full-time community members, chosen for their extensive community and organizational links, their positive reputations as well as their abilities to be agents for change and role models for a healthy lifestyle. Community and academic researchers acted as consultants to the CAB and staff.

EVALUATION

The study was a cohort of children, who in 1994 attended grades 1 and 2, nested in repeated cross-sectional surveys of all children in 2 elementary schools in Kahnawake and 1 school in a comparison Mohawk community. Grades 1 to 6 in the experimental (458) and comparison (199) schools were invited to complete baseline measurements in September 1994, before the intervention started.¹³ Children were reassessed in grades 2 and 3 in 1995 (the cohort) and grades 1 to 6 in 1996. Endpoints were the outcome variables of obesity, fitness, eating habits and physical activity, and the intermediate variables of self efficacy and perceived parental support.

This paper reports on aspects of process evaluation in Kahnawake from 1994 to 1997, which monitored changes in the elementary schools and the community.

School Process Evaluation

Information was collected from parents, teachers, administrators and canteen operators through observation, record-keeping and informal, semi-structured and in-depth interviews. Canteen activities were monitored by visiting the canteens of the 2 elementary schools in Kahnawake on randomly selected days in September, February and May in year 1 and in February and May in years 2 and 3. At each visit a list was made of foods both offered and actually sold. Once per year canteen operators were interviewed informally to

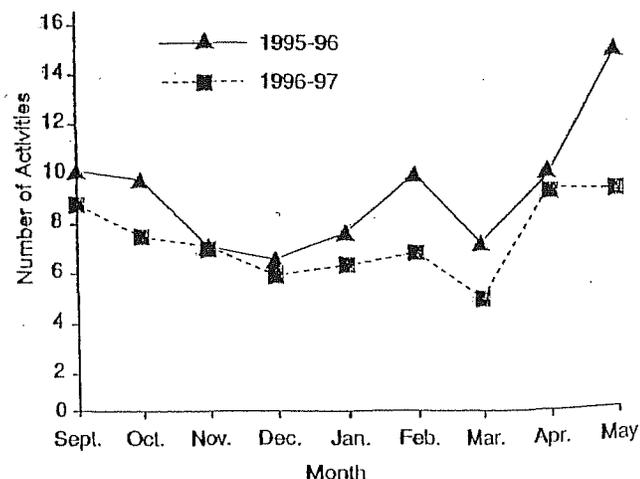
assess popular food items and new snacks.

Extra classroom activities were monitored by asking classroom teachers to record these in a log book. In year 1, teachers refused to keep log books, stating it was too much extra work. Instead the data were collected by an interview administered through a structured questionnaire at the end of the school year. For years 2 and 3, a monthly calendar was developed which also had healthy lifestyle ideas such as "fat-buster tips". An intervention agent distributed and collected the calendars from each classroom teacher at the beginning and end of each month. Small incentives were given to the teachers for their participation. Evaluation of teachers' knowledge of diabetes and agreement with the objectives of the project was made through annual semi-structured interviews with 10 randomly selected teachers. Parents were very reluctant to be interviewed. After many phone calls 3 parents were interviewed during the first year, but this evaluation was discontinued because parents found it intrusive and threatening.

Community Process Evaluation

Information from parents was collected from the take-home questionnaire used to gather data for the children in grades 1, 2 and 3 in both Kahnawake and the comparison community.¹³ The parents' section of the questionnaire, which took about 10 minutes to complete, was 3 pages long with 9 direct and 2 open-ended questions. There were questions on the importance of diabetes, if and how parents had heard of KSDPP, knowledge of and agreement with the objectives of the project, level of personal physical activity, any participation in KSDPP activities and two open-ended questions for comments and recommendations for future events. Additional community data was gathered through a telephone survey in Kahnawake in May 1995. The Community Advisory Board recommended that data should be collected by a telephone survey (as opposed to a written questionnaire) and they participated in the development of the questions, the pretest and conduct of the actual survey. The initial telephone number was

Figure 1
Mean number of activities reported by teachers in Kahnawake by school year



Please address all correspondence to:
Dr. Ann C. Macanlay
Kahnawake Schools Diabetes Prevention Project, P.O. Box 1000
Kahnawake, Quebec, Canada J0L 1B0
e-mail: macan@musica.mcgill.ca

Table 1

Food available at the two elementary school canteens in Kainawake, by year

ITEMS	1994	1995	1996	COMMENTS	
Milk & milk products					
Milk	N/A	0.50¢	0.50¢	Does not sell well Children not interested	
Yoplait	N/A	0.75¢	0.75¢		
Yoghurt	0.70¢	N/A	N/A		
Cheese & crackers	0.85¢	0.70¢	0.70¢		
Juices and beverages					
V-8 juice (340 ml)	N/A	\$1.00	\$1.00	Did not sell well	
Large juice	—	0.85¢	0.85¢		
Small juice	0.65¢	0.65¢	0.65¢		
Fruits and Vegetables					
Apple sauce	N/A	0.50¢	0.50¢	Did sell well but could not keep large amount	
Fruit	N/A	0.35¢	0.35¢		
Fruit salad	N/A	0.75¢	0.75¢		
Carrot sticks with dip	N/A	N/A	0.75¢		
Banana day (Monday only)	N/A	0.50¢	N/A		
Other items					
Muffin	0.60¢	0.60¢	0.60¢	Very popular	
Pizza	\$1.00	\$1.00	\$1.00		
Trail mix	0.60¢	0.60¢	0.60¢		
Sunflower seeds	0.70¢	0.70¢	0.70¢		
Cereal square	0.75¢	0.75¢	N/A		
Peanut butter and crackers	0.70¢	0.70¢	0.70¢		
Granola bar	0.75¢	0.75¢	0.75¢		
Party mix	N/A	0.60¢	0.60¢		
Cookies	0.50¢	0.50¢	N/A		Stop selling
Nutri classic	N/A	0.60¢	0.60¢		Was a big seller
Pudding	0.75¢	N/A	N/A		
Special of the month item					
Water bottle	N/A	N/A	0.85¢	Good	

randomly selected from the first 6 numbers of the community telephone directory, which has an alphabetical listing of private and business numbers. Thereafter every sixth number in the directory was contacted without replacement for a commercial number. For each household one adult respondent was randomly selected from all adults living there. If the time was not convenient, another appointment was made. Households were phoned a maximum of 15 times, including evenings and weekends, before a non-response was recorded. The questionnaire had 18 questions, including 2 open-ended questions similar to those asked of the teachers and took about 15 minutes to complete.

RESULTS

Schools

Canteen sales (see Table 1) indicated positive changes with the successful introduction of new items, such as fruits and

vegetables, and elimination of less healthy snacks, such as puddings. Figure 1 shows the extra healthy-lifestyle activities added by the teachers in the classrooms. Sixty percent of all elementary school teachers completed the calendars each month. The peaks in activities coincided with KSDPP-supported community events which were the "Mohawk Miles" races in September, the schools snow sculpture contest in February and school races in June which annually attract 800 elementary school children from the surrounding Mohawk communities. Additional changes which were initiated by the schools, independently of KSDPP interventions, included the addition of one physical education class each week in one school and, in the other school, reduction of school buses for short distances, so that children now walked to other locations during school hours.

Community

Table 2 shows the results obtained from parental respons-

Table 2

Agreement with the project objectives from Kahnawake

	Home Questionnaire Sept. 1995 (parents) n = 93 %	Telephone Survey May 1995 (community) n = 188 %	Home Questionnaire Sept 1996 (parents) n = 122 %
Diabetes is a major problem in Kahnawake			
Yes	90.0	85.1	90.9
No	10.0	2.1	9.1
Don't know	0.0	12.8	0.0
Agreement with the physical activity objective			
Agree a lot	86.9	97.8	89.2
Agree a little	12.1	2.2	10.0
Disagree a little	1.1	0.0	0.8
Disagree a lot	0.0	0.0	0.0
Agreement with decreasing obesity objective			
Agree a lot	87.0	98.9	87.3
Agree a little	10.9	1.1	11.9
Disagree a little	1.1	0.0	0.0
Disagree a lot	1.1	0.0	0.8
Like to see the project continue after June 1997			
Definitely yes	—	78.9	57.8
Probably yes	—	19.3	42.2
Probably no	—	1.8	0.0
Definitely no	—	0.0	0.0

es to the questionnaires sent home with the children in grades 1 to 3 in 1994 and 1996, and from a community survey in 1995. In the schools the response rates were 65% in 1994 and 55% in 1996. For the community telephone survey in Table 2, 287 numbers were randomly selected from the telephone directory, 52 were business numbers or invalid, 34 refused to participate, 9 had other reasons or non-participation, 3 were rescheduled but not completed and 2 were unanswered. Thus 188 or 65% completed the survey, which represents 5% of all Kahnawake households. The results show high awareness of the importance of diabetes in the community, agreement with the KSDPP objectives and a desire to see the project continue after the end of research funding.

CONCLUSIONS

The initial request for this diabetes primary prevention project came from the elders of Kahnawake who wanted to spare their children and grandchildren the high burden of diabetes. The project was designed by community-based researchers in health and education, community members and academic experts from neighbouring universities.

All aspects of process evaluation were first discussed with the Community Advisory Board to ensure cultural relevance. When necessary, the evaluation was modified to respect local values and to avoid a perceived concern for

passing judgement on lifestyle habits. Some of the environmental changes noted are a direct result of the KSDPP intervention activities. Others such as the Nutrition Policy, additional physical education time and reduction of school bus use were initiated by the schools, which indicates their support of the project. In the schools, the Nutrition Policy ensures healthy food choices, teachers are comfortable teaching the Health Curriculum, role modelling healthier behaviors and engaging the children in additional healthy lifestyle classroom activities. This is consistent with the ecological model of health promotion, which postulates that social and environmental changes promote the adoption of healthy behaviors.¹⁸

The community telephone survey and home questionnaires showed that adults are aware that diabetes is a major health problem. In June 1997, the high level of agreement with the program's objectives resulted in the community providing funds to enable the project to continue after research funds ended. In 1997 and 1998, at the request of Kahnawake, the project expanded to include preschool children, their teachers and parents, and adolescents attending the community high school. During the last 6 months of research funding, KSDPP trained a healthcare worker from the comparison community to enable them to start their own diabetes primary prevention project.

This project demonstrates that health promotion for the primary prevention of diabetes is feasible and well accepted. The reasons for the project's effectiveness have included building on pre-existing community strengths. The existence of other community-based organizations in recreation and health meant that there were many activities in place that could be supported, enhanced and repackaged to include messages of diabetes prevention and wellness. A holistic approach to the development of new integrated interventions for physical activities and healthy eating events resulted in occasions that were fun, family-oriented and filled with relevant information. Effective use of the local media and public displays to publicize these events and to provide relevant information was useful in attracting people to participate. The provision of incentives for participation and achievement in community activities contributed to high attendance.¹³ Participatory research methodology has made the community an equal partner in this endeavor. One challenge was to ensure adequate representation on the CAB; lack of representation from some community organizations led to some inconsistency in transmission of KSDPP information. Another challenge has been the groundwork needed to overcome the memories of previous negative research experiences so common in First Nation communities. This is the first time that a community-based, participatory approach was used in Kahnawake; it has taken a significant amount of time to share information and positions in order to blend the skills and develop a team whose members have worked well with each other and with the community.

Use of participatory research together with the leadership taken by the CAB has, in our view, been essential. It has ensured the incorporation of Mohawk culture and enabled the community and researchers to acquire skills that will serve for future health planning.¹⁹ We believe that this model of holistic community-based intervention and evaluation for health promotion and the primary prevention of diabetes is suited for adaptation by other communities, both Native and non-Native.

ACKNOWLEDGEMENTS

The authors sincerely thank the community of Kahnawake, the Community Advisory Board, Kateri Memorial Hospital Centre for the Health Education Program and Sandra Schurman.

FOR FURTHER INFORMATION

For elementary school Health Education Program contact: Community Health Unit, Kateri Memorial Hospital Center, P.O. Box 10, Kahnawake, PQ J0L 1B0 (450) 638-3930

For Code of Research Ethics and 25-minute video documenting implementation of KSDPP contact: Kahnawake Schools Diabetes Prevention Project, Kahnawake Education Center, Box 1000, Kahnawake, Quebec J0L 1B0, Canada (450) 635-4374

REFERENCES

1. Tuomilehto J, Knowlert WC, Zimmet P. Primary prevention of non-insulin dependent diabetes mellitus. *Diabetes Metab Rev* 1992;8(4):339-353.
2. Harris MI. Epidemiologic studies on the pathogenesis of non-insulin dependent diabetes mellitus. *Clin Invest Med*. 1995;18(4):231-239.
3. Bobet E. *Diabetes among First Nations people: Information from the 1991 Aboriginal peoples survey*. Medical Services Branch, Health Canada, 1997.
4. Young TK, O'Neil J, Elias B, Reading J, McDonald G and the First National and Inuit Regional Health Survey National Steering Committees and Technical Committees. *Chronic diseases among Aboriginal people in Canada: Literature review and analysis of the First Nation and Inuit regional health surveys*. Conference proceedings National Aboriginal information and Research Conference, Ottawa, 1998.
5. Delisle HF, Rivard M, Ekoe J. Prevalence estimates of diabetes and of other cardiovascular risk factors in the two largest Algonquin communities of Quebec. *Diabetes Care*. 1995;18(9):1255-1259.
6. Harris SB, Gittelsohn J, Hanley A, Barnie A, Wolever TM, Gao J, et al. The prevalence of NIDDM and associated risk factors in Native Canadians. *Diabetes Care* 1997;20(2):185-7.
7. Mao Y, Morrison H, Semenciw R, Wigle D. Mortality on Canadian Indian Reserves 1977-1982. *Can J Public Health*. 1986;77:263-8.
8. Young TK, Kaufert JM, McKenzie JK, Hawkins A, O'Neil J. Excessive burden of end-stage renal disease among Canadian Indians: A national survey. *Am J Public Health*. 1989;79(6):756-758.
9. Dean HJ, Mundy RL, Moffatt M. Non-insulin-dependent diabetes mellitus in Indian children in Manitoba. *CMAJ*. 1992;147(1):52-7.
10. Harris SB, Perkins BA, Whaler-Brough E. Non-insulin-dependent diabetes mellitus among First Nations children: New entity among First Nations people of northwestern Ontario. *Can Fam Physician*. 1996;42:869-76.
11. Daniel M, Gamble D. Diabetes and Canada's aboriginal peoples: the need for primary prevention. *Int J Nurs Stud*. 1995;32(3):243-59.
12. Rose G. Sick individuals and sick populations. *Int J Epidemiol*. 1985;14:32-8.
13. Macaulay AC, Paradis G, Potvin L, Cross EJ, Saad-Haddad C, McComber A, et al. The Kahnawake Schools Diabetes Prevention Project: Intervention, evaluation, and baseline results of a diabetes primary prevention program with a Native community in Canada. *Preventive Medicine*. 1997;26:779-790.
14. Macaulay AC, Delormier T, McComber A, Cross EJ, Potvin L, Paradis G, et al. Participatory research with Native community of Kahnawake creates innovative code of research ethics. *Can J Public Health*. 1998;89(2):105-108.
15. Ottawa Charter for Health Promotion. *Can J Public Health*. 1986;77:425-30.
16. Hood VI, Kelly B, Martinez C, Shuman S, Secker Walker R. A Native American community initiative to prevent diabetes. *Ethnicity and Health*. 1997;2(4):277-285
17. More AJ. Native Indian learning styles: a review for researchers and teachers. *J Am Indian Educ*. 1987;Oct:17-29.
18. Green LW, Richard L, Potvin L. Ecological foundations of health promotion. *Am J Health Promot*. 1996;10:270-81.
19. Green LW, George MA, Daniel M, Frankish CJ, Herbert CJ, Bowie WR, et al. *Study of participatory research in health promotion*. The Royal Society of Canada, 1994.