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A stage model for assessing a community-based diabetes prevention program in Sweden

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SUMMARY

Type 2 diabetes is the most common type of diabetes, with a prevalence of at least 4% in Sweden. Aiming at primary prevention of the disease, the Stockholm Diabetes Prevention Program (SDPP) was developed as a joint program between the Departments of Endocrinology, Social Medicine and Epidemiology at the Karolinska Institute. The program was designed to include three stages, i.e. a combined baseline and aetiological study, a community-based intervention program and a follow-up study after 10 years. In 1995, the intervention program was initiated in Stockholm County with the aim of reducing the incidence of type 2 diabetes. The intervention has focused on the whole adult population in three intervention municipalities, where the local authorities have been involved in planning, initiating and implementing the program. Activities to prevent diabetes, aiming at risk factors such as obesity, low physical activity, dietary habits and tobacco use, have been initiated together with people from different fields and backgrounds, and with different ideas and approaches to health promotion and diabetes prevention. This paper provides a description and reflects upon the development and implementation process of SDPP as well as its interaction with the intervention communities. The stage model that was used for planning SDPP will be used for describing the various phases of the program. Over the period of the program, interest and responsibility has grown at the municipal authorities. The program has been a concern for the municipalities, as the program intermediate goals are also important for other health promotion issues.

Key words: process evaluation; stage model; Stockholm Diabetes Prevention Program; type 2 diabetes

INTRODUCTION

Type 2 diabetes is a disease with increasing prevalence, and high economic costs for both society and the patients (Amos *et al*., 1998; King *et al*., 1998; Henriksson *et al*., 2000). Known risk factors are genetic and lifestyle factors (Hamman, 1992). By 1988, steps had been taken for the prevention of type 2 diabetes in Stockholm County (Bjärås *et al*., 1997). The program was designed to include three stages: a combined cross-sectional baseline and aetiological study, an intervention program, and a follow-up study after 10 years. The ultimate program objectives were set to reduce the incidence of type 2 diabetes by 25% over a 10-year period, by influencing the risk factors in the population, and to reduce the prevalence of impaired glucose tolerance in the population during the same period of action.

The program strategies have addressed community development, policy advocacy, education, lifestyle changes and supportive environments. The activities/services of the program have focused on the preventable behavioural risk factors known to cause type 2 diabetes such as physical inactivity, obesity, tobacco use and a high fat/low fibre diet (Hamman, 1992; Manson *et al*., 1992; Carlsson *et al*., 1998; Persson *et al*., 2000; Vessby, 2000) A multifaceted approach,

aiming at several risk factors and strategies operating at different levels, should make the program more effective, but this also makes it difficult to determine relationships between program components and effects. To be able to assess outcomes at the end of the program, appropriate quality assurance or process evaluation is required to determine what generated the observed outcomes (Wimbush and Watson, 2000).

This review describes and reflects upon the program development and implementation process, and may provide a good base for the forthcoming evaluation of the program. In addition, we wanted to assess if the planning model of the Stockholm Diabetes Prevention Program (SDPP; Figure 1) could be used to describe the phases of development over time (Bjårås *et al*., 1997). The application of the stage model has been used to provide a structure when presenting the program development, and determining what occurred at the implementation sites and to what extent the program has been delivered as planned. The phases are presented following the model, which means therefore that they may not always be in the correct chronological order.

Theoretical models for planning, implementation and review

The construction of theories and concepts is often related to fundamental beliefs and assumptions about many issues, such as the nature of humankind, society and knowledge (Kahan and Goodstadt, 2001). In health promotion theories linked to program planning, models are used to guide the development of interventions. These theories and models assist in describing, explaining and predicting events or phenomena related to behaviours, communities, organizational settings, policies and practices (Nutbeam and Harris, 1999).

In recent decades, various models of health promotion programs have been developed. Two models often referred to are effect models (how it works) (Sanderson *et al.*, 1988; Green and Kreuter, 1991; Borland, 1992) and stage models (how to do it) (Johnston, 1988; Bracht and Kingsbury, 1990; Haglund *et al*., 1996). A detailed stage model, Figure 1, was underlying the planning and implementation of SDPP. This model was developed based on experience from heart disease, cancer and accident prevention

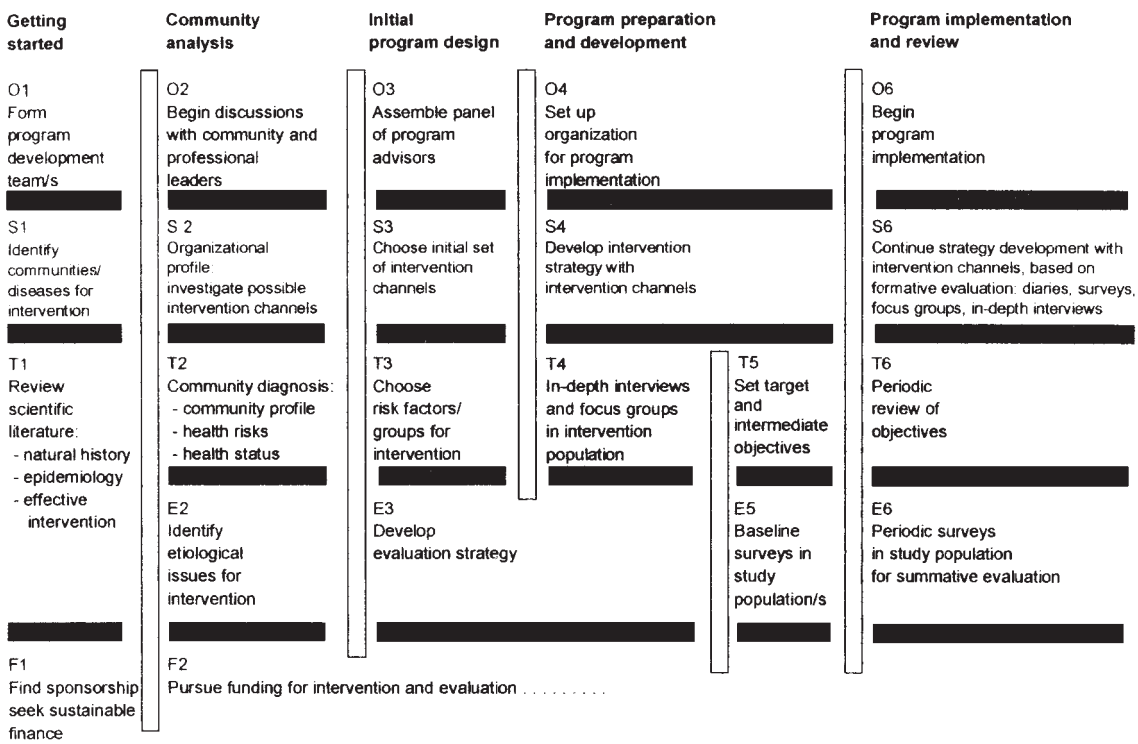

Fig. 1: A stage model for community intervention (Sanderson *et al.*, 1996).

(Sandersson *et al.*, 1996). The model's application in the planning of SDPP has been described previously in detail (Björås *et al.*, 1997).

In the model, time runs from left to right, with horizontal bands that distinguish broad categories of program development activity: O, organization (O1, O2, O3, etc.); S, strategy (S1, S2, etc.); T, targets/objectives (T1, T2, etc.); E, evaluation (E1, E2, etc.); and F, funding (F1, F2, etc.). The vertical bars mark the beginnings and ends of different phases: getting started, community analysis, initial program design, program preparation/development, and program implementation/review. The phases are not to be seen as strictly separated in time, but rather overlapping each other, and some of those phases have to be repeated several times.

THE PROGRAM, PHASE BY PHASE

Getting started

The program development team was formed, O1

The initiative to develop an interdisciplinary primary prevention program for type 2 diabetes was taken by experts from the Departments of Endocrinology and Social Medicine at the Karolinska Institute. A program development group was formed, including ~15 national and international experts with a broad knowledge base of diabetes and health promotion. The group is now reduced and includes the heads of the Departments of Endocrinology, Social Medicine and Epidemiology, and the Diabetes Prevention Unit.

Communities identified, S1

At the beginning of the 1990s, Stockholm County had a total population of 1.8 million, divided into six Health and Medical Service Districts with, together, 25 municipalities. Two Medical Service Districts were involved early on in the planning process. Five municipalities were selected: Sigtuna, Upplands-Väsby and Värmdö as intervention municipalities, and Tyresö and Upplands-Bro as control municipalities. Sigtuna and Värmdö were selected because they were already involved in a healthy diet intervention program sponsored by the County council. Upplands-Väsby was chosen since one of the Medical Service Districts wanted to have two municipalities participating in the program. The control municipalities were selected to match the intervention municipalities by size (~35 000 inhabitants each) and demographic characteristics.

Reviewed scientific literature, T1

Scientific literature on the epidemiology and risk factors of type 2 diabetes (Hamman, 1992), experiences from previous community-based intervention programs (Farquhar *et al.*, 1985; Puska *et al.*, 1985) and theories of community and behaviour change (Bandura, 1977; Rogers, 1983; Nix, 1987; Bracht and Kingsbury, 1990) were collected and used in developing program strategies.

The two main strategies applied to SDPP were community-based intervention and intervention in communities (Björås *et al.*, 1997). Community-based intervention involves a comprehensive approach, focusing on the entire community and its elements, and the 'intervention in communities' approach addresses smaller subgroups of the population in certain settings (Bracht and Kingsbury, 1990; Farquhar *et al.*, 1990; Green and Kreuter, 1991).

Financial support, F1 and F2

The boards of the two Health and Medical Service Districts decided to support and finance the program, together with Stockholm County Council, as they found that type 2 diabetes was a prevalent disease creating great health care costs, and that developing methods for primary prevention of the disease was required. External funding from research institutes has been applied for and some grants have been received to support post-graduate students engaged in evaluation research.

Community analysis

Discussions with community professionals, O2

Discussions were undertaken with the executive boards of the municipalities to establish political legitimacy to support the program. The municipalities' executive boards decided on participating in the local diabetes prevention work and to have a representative in the program central steering group.

Community diagnosis, S2 and T2

A community diagnosis with demographic and socio-economic characteristics of the municipalities, health and behavioural profiles, health services profiles and organizational profiles of all five municipalities were collected from regional

and local statistical reports. Interviews with key persons in the intervention municipalities were conducted to identify policy makers, professional leaders, potential collaborating organizations, practitioners and the organizational basis for activities. As a result of these interviews, residential areas, work sites, food suppliers and restaurants were identified as settings of interest for intervention.

Aetiological issues for intervention were identified, E2

Based upon previous studies, poor dietary habits, physical inactivity and obesity were identified as aetiological issues for intervention. Studies available showed that it was possible to prevent type 2 diabetes on the individual level, but that there was limited knowledge about primary prevention aimed at populations (Hamman, 1992; Tuomilehto *et al.*, 1992). However, experiences could be drawn from primary prevention of cardiovascular disease aiming at similar risk factors (Puska *et al.*, 1985; Farquhar *et al.*, 1990).

The design of SDPP also included an aetiological baseline study and a follow-up study, which provided information about risk factors for type 2 diabetes to be used in the intervention. The baseline study was conducted among ~8000 subjects (3129 men and 4821 women, aged 35–54 years) in both interventions and control municipalities. The baseline study on men showed that the prevalence of diabetes and impaired glucose intolerance increased with family history of type 2 diabetes, low birth weight, obesity, physical inactivity and heavy use of cigarettes, oral snuff or alcoholic drinks, and in several instances a combination of these factors exerted synergistic effects (Carlsson *et al.*, 1998; Carlsson *et al.*, 1999; Grill *et al.*, 1999; Carlsson *et al.*, 2000; Persson *et al.*, 2000). Preliminary results from studies on both men and women indicate an important link between psychosocial stress and risk of diabetes. However, these novel findings have not yet been used as a basis for intervention.

Initial program design

Assembled a panel of program advisors, O3

A panel of program advisors, with expertise in the fields of physical activity, obesity, diet and tobacco, was established. Meetings with the advisors, the managers of the Diabetes Prevention Unit and the project leaders have taken place once or twice a year. The advisors have provided results of the latest research in the fields.

Intervention channels were chosen, S3

According to the organizational profile and interviews in each municipality, the main organizations and channels of intervention were recognized to be the municipalities' administrations for recreation/sport, environment and planning, but also mass media, health care and several non-governmental organizations (NGOs). Community leaders and professionals in various key sectors were mobilized to participate in the planning, organization and implementation of the interventions in the municipalities.

Risk factors and groups for intervention were chosen, T3

At first the program chose to focus on three risk factors: physical inactivity, obesity and poor dietary habits. Tobacco use was added as a fourth risk factor since the aetiological study indicated an association between both cigarette smoking and uses of oral moist snuff, and the development of type 2 diabetes (Persson *et al.*, 2000). The whole adult population in the three intervention municipalities was selected as target group for the intervention.

An evaluation strategy was developed, E3

Two evaluation strategies, a summative and a process evaluation, were developed and presented in two reports (Persson *et al.*, 1997; Tillgren *et al.*, 1997). The aetiological follow-up-study, which will start 10 years after initiation of the baseline study, will assess intervention effects on lifestyle and glucose tolerance. For the process evaluation, a monitoring system was developed to follow the everyday practice in each municipality. Diaries, minutes, and monthly and annual reports have been collected, and media coverage has proceeded since 1995. Interviews with professionals and stakeholders have been carried out. A series of reports, from SDPP, presenting plans for and reviews of ongoing activities have been produced.

Program preparation and development

Organization for program implementation was set up, O4

The program organization has included a Diabetes Prevention Unit, a scientific committee, a steering group, a coordination group, a panel of

program advisors and local steering groups. In 1995, a Diabetes Prevention Unit was established at the Karolinska Hospital, with experts in endocrinology and social medicine. The Diabetes Prevention Unit's primary task has been to coordinate the organization of the program and the implementation. The scientific committee, including the heads of the Departments of Endocrinology, Social Medicine and Epidemiology, and the Diabetes Prevention Unit, have met approximately four times a year for organizing research and evaluation strategies.

The intervention is governed by a steering group with eight members: the two directors of the cooperating Health and Medical Service Districts; the Chief Physician of the Department of Endocrinology and Diabetology; the Chairman of Stockholm County Diabetes Association; and Heads of the local authorities in the three intervention municipalities. The Diabetes Prevention Unit has acted as secretariat. The group has met four times a year. The three project leaders have participated in the steering group since 1998.

The coordination group included the members of the three local steering groups, and the purchasers of public health care from each Medical Health District and the Diabetes Prevention Unit. The organizational representation in the local steering groups has varied between the municipalities, but has included local health planners, civil servants from municipal departments, and organizations. In the Värmdö municipality, the local organization for SDPP was cut down during 1998 and a new organization was not established until late 1999. The main intervention work on the local level has been carried out by the project leaders and the local steering groups in cooperation with local and regional organizations, as follows.

- Municipal agencies/authorities: Municipal Head, Environmental Health Department, Social Welfare Department, Department of Culture and Recreation, Department of Building and Planning;
- county authorities: primary health care;
- local non-governmental and regional organizations: sport and fitness organizations, occupational health care, social insurance office, unemployment board; and
- private sectors: providers of food, restaurants, local mass media, businesses, industries.

Intervention strategies with intervention channels developed, S4

Strategies for program activities were designed to meet the intermediate objectives (T5) and health outcomes. An effect model of the basic assumptions about how the program was expected to achieve its objectives is shown in Figure 2. The program's intention was to influence healthy behaviours as well as healthy environments by developing intervention strategies with intervention channels on different levels in the municipalities. On the political level, the main strategy has been to influence the local authorities to create supportive policies. On the administrative

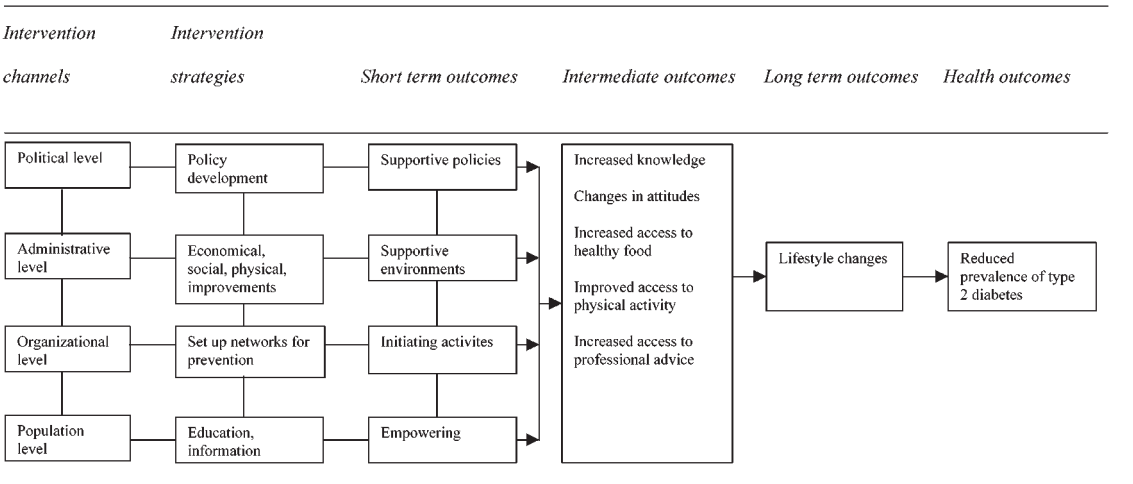

Fig. 2: An effect model of the health promotion process of SDPP.

level, the main strategy has been to facilitate intersectoral collaborations to create supportive environments by improving economic, social and physical conditions. Local organizations were encouraged to participate in creating supportive networks and enabling implementation and maintenance of physical activity, dietary, and quit-smoking interventions. On the population (individual and group) level, education and information about the health gains of healthy lifestyles was offered to the public. The aim was to empower the public to assimilate skills and motivation to change their lifestyles.

Set target, T5

The intermediate objectives were:

- to increase knowledge about risk factors such as inappropriate diet, obesity, tobacco use and lack of physical activity;
- to change attitudes toward the consumption of low-fat, and fibre- and starch-rich food in the population;
- to increase access to healthy food in households, shops and caterered venues;
- to facilitate access to physical activities in the community;
- to increase access to professional advice on dietary habits, weight and tobacco reduction.

Baseline surveys in study populations, E5

The program was supposed to develop strategies for 'interventions in the community', targeting subgroups of the population, which could be disseminated to other populations. Different types of interventions were to be tested within occupational and residential settings. Before implementing these interventions, baseline studies were conducted to obtain information about physical activity, diet and smoking habits in selected target groups, i.e. professional drivers, inhabitants in residential areas and personnel at work sites. Other studies, using interviews and questionnaires, yielded information on how interested or motivated management boards of companies, sport and fitness organizations and restaurants were to collaborate.

Implementation and review

This section describes the local implementation phase and reflects upon the progress of different strategies to reach the intermediate- and long-term outcomes of the program (Figure 2). Data are aggregated from documentation within the program, and local governmental reports and records.

Program implementation, O6

Program implementation on a local level started in 1996, when the project leaders were assigned to a program and located in each municipality's administration. Regular meetings and education have been offered to the project leaders, but also to other collaborators. The program has focused more on physical inactivity than the other risk factors. This was motivated by novel data from the aetiological baseline study showing the obvious benefit of exercise, and also the benefit in the presence of other diabetes risk factors. In addition, physical activity has been shown to have an effect on many diseases as well as mental health and quality of life (Physical activity and health, 1996; Vouri, 1998; Blair and Brodney, 1999). The implementation of strategies for the community-based intervention included information, policy development, economic, social and physical improvements, and setting up networks for prevention.

Policy development

Creating supportive policies has taken a lot of time. However, interest in the program and the community-based strategy has grown on a political level in local government and among civil servants in decision-making positions. For some issues, the program has managed to mobilize political as well as financial support.

Public health issues have arisen more and more frequently on the local government agenda. Municipal annual reports and financial plans give some information regarding health promotion issues, and local health plans have been developed in the municipalities. The Health and Medical Service Boards now have written goals and some health plans for their health promotion work. Through Agenda 21, political decisions have assimilated environmental work in all three municipalities. One of the municipalities has met the WHO 'Healthy City' criteria to work with health promotion and became a 'Healthy Community' in 1999.

Environmental improvements

On an administrative level, the overall planning and realization of the program goals were made through the municipal departments. Some local investments have improved access to physical activities and the conditions for lifestyle changes

in the population. Interventions have included efforts towards creating supportive environments that invite outdoor activities, recreation and exercise. One example of encouraging healthy behaviour was the Sli (the healthy path), which has been realized in the municipalities. This concept is very much built on local government's goodwill, cooperation, investment and maintenance of the environmental changes. The communities have also prepared new tracks for walking and cycling, and supplied financial support to sports organizations, which afford people easier and cheaper access to local sport and recreation facilities.

Set up network for prevention

Collaborating organizations had varied between the municipalities. Some of the formal and informal organizations involved on the local level are listed above, in section O4. The local steering groups are characterized by intersectoral involvement but, temporarily, taskforces with other organizations have also been established when implementing activities relating to physical activity, dietary change, weight reduction or tobacco use cessation.

Initiating activities

Many activities have taken place to meet the intermediate objectives for lifestyle changes (see below). Several initiatives have been made to increase public awareness of the risk of being sedentary and to encourage people to incorporate physical activity into their daily life. Project leaders have functioned as key persons for building local networks on all levels, and for initiating and planning activities.

Increasing knowledge and changing attitudes to risk factors

Public information has been delivered in many different ways. Posters, folders, pamphlets, exhibitions, demonstrations and internet homepages have all been developed. The local media have covered program activities and given information to the public about planned and ongoing activities. Efforts have been made to tailor educational interventions to persons with long-term sickness, unemployment or sedentary occupations. This education has aimed to bring about knowledge, skills, and motivation for health gains and healthy lifestyles.

Until now we have known rather little about how well we have reached the adult population and whether the information provided gives them skills and empowers them to improve and protect their health. However, some studies have been conducted that have shown that more information and education are needed to increase the knowledge and awareness of the disease and the risk factors in the target group (Bjärås *et al.*, 2001; unpublished data).

Improving access to healthy food and a non-smoking environment

By initiating healthy food projects we have tried to reach the public at food stores, restaurants and workplaces. The environment for guests and staff, kitchen conditions and the nutritional value of the food were checked in a selection of restaurants. A contest was held and the healthiest restaurant was acknowledged. Community catering has introduced a healthy lunch with a 'green keyhole' symbol for the population. The initiative to get the food stores and restaurants involved in the program has been less successful. It has been difficult to motivate them to participate and to find suitable forms of collaboration. One reason given for this was that the customer 'prefers fattier food'. Another reason was the lack of time and possibility to engage in activities.

A non-smoking restaurant campaign ('golden fork') has been launched to stimulate restaurants to offer non-smoking environments. Restaurants that offer a smoke-free environment have been listed in pamphlets distributed to the public. Other restaurants where smoking is permitted have been encouraged to become smoke-free and to have non-smoking areas.

Ease of access to physical activities

The walking concept with or without leaders has been ongoing since 1997 (Bjärås *et al.*, 1999; Bjärås *et al.*, 2001). New tracks for cycling and maintenance of those already in existence were part of a project entitled 'take the bike to work'. A map showing all the tracks for cycling and walking is available free of charge.

A calendar of activity has been developed and it includes all physical initiatives offered by sports organizations in the specific municipality. An activity suitcase has been designed to be used individually or in groups, and contains pedometers, a heart rate monitor and information on the health gains of physical activity. The suitcase was prepared as a tool for stimulating all forms of physical activity, especially walking. Walking sticks are also available to borrow. Several

municipal departments have ordered the activity suitcase for their personnel.

Ease of access to professional advice

Prescription initiatives have been introduced to decrease physical inactivity, obesity and tobacco use. The staff at some of the health care centres have started to use the prescription in their daily work with patients. Some of the health care centres have introduced a national database program, 'Dr Smoke Free', to be used as a tool for individuals to quit smoking.

Continue strategy development, S6

Appropriate strategies are reconsidered when developing each new activity and choosing intervention channels. Experiences from early program activities, diaries and surveys are reported and used in forming further initiatives. To develop program strategies there is also a need to know more about how much attention local authorities pay to health promotion. The political and financial situation and the existing administrative and organizational structures are of great importance for the development of the program. SDPP has undertaken a study of health promotion activities within the local governmental committees in the intervention municipalities. A lot of activities to improve public health are going on, even if it is not always addressed specifically as health promotion (Andersson *et al*., in press).

Periodic review of objectives, T6

The main objectives as well as the intermediate objectives have been subject to many critical and creative discussions in the program groups, and some adjustments have been made.

The achievement of goals is to be measured by the follow-up study after 10 years of intervention. It is not certain that we will be able to reduce the prevalence of type 2 diabetes by 25%, however, the program may achieve its intermediate objectives.

The active involvement from municipal politicians and authorities increases over time, and more and more activities of importance are implemented. The intervention activities have focused on lifestyle changes, but to date we have not had a chance to measure whether the program has altered the lifestyle of the population.

Periodic survey in the study population, E6

Due to a financial shortfall, a periodic review from an aetiological study after 5 years was not possible. A follow-up study of the study population will be carried out after 10 years of intervention and will form the basis of a summative evaluation.

DISCUSSION

The program preparation was satisfying and included community analyses that yielded useful information on the communities and their administrative and organizational structures. The program was initiated as planned and the organization of the program seemed to be relevant for the purpose of the program's development. During the program period the interest and responsibility of the municipal authorities has grown. This review was made by applying the model used in the planning of SDPP; it pushes forward ideas and will provide a good basis for a future evaluation of the program.

Application of the model

The stage model underlying SDPP plans has also been found to be useful when presenting program development (Sandersson *et al*., 1996; Bjårås *et al*., 1997). The model has been a useful tool in following the process and describing the different phases of the program to see if all category requirements have been met and all phases passed (Figure 1). A long time passed between the first informal contacts (O1) and the establishment of the program in local settings (O6), but even at this latter stage the program is only at the beginning of its implementation.

The model links practice and theory together. However, the various phases of the program are not strictly separated in time and the model is sometimes too rigid to elucidate the whole spectrum of underlying circumstances and all evidence of program development. For the future evaluation of this program it will be necessary to use some additional models. It is important to understand the processes and mechanisms of change within the program as well as the outcomes that are desired and achieved (Wimbush and Watson, 2000). Process evaluation studies will review all program inputs and could therefore be a useful step in furthering knowledge in the health promotion field. However, to describe the many parallel ongoing activities and to assess the value of the program's process and outcomes, there is a need for the use of a more detailed model (Nutbeam, 1998; Green and Kreuter, 1999; Kahan and Goodstadt, 2001).

Future evaluation of SDPP and reflections on the half-time review

SDPP will be evaluated by both a summative and a process evaluation. Expected short-term as well as intermediate- and long-term outcomes of SDPP (Figure 2) will be the object of these evaluations. The ultimate health outcome, a reduction in type 2 diabetes, which is also the main objective of the program, will be measured and compared between the intervention and control municipalities by the aetiological follow-up study. The long-term outcomes of lifestyle changes are also to be measured in the follow-up study. Information about changes in weight, physical activity pattern, eating habits and tobacco consumption will be compared with the control communities (Persson *et al*., 1997; Tillgren *et al*., 1997). However, obtaining evidence on the impact of the program will have its difficulties. A greater focus on risk groups in the intervention could perhaps yield more information on the long-term outcomes of changes in lifestyle and health.

In a summative evaluation of a community-based program such as SDPP, the biases connected to the program design must be taken into consideration (Farquhar, 1978; Farquhar *et al*., 1985; Puska *et al*., 1985; Mittelmark *et al*., 1993). This will create some difficulties as the communities are the units of health promotion assignments, but the individuals remain the units of observation (Nutbeam, 1998). Dilution biases may also occur when intervention and control municipalities are located in the same metropolitan area (Nutbeam *et al.*, 1993). Another problem might be that the interventions have been insufficiently intense to have an impact over and above prevailing secular trends (Mittelmark *et al*., 1993; Susser, 1995). This strengthens the arguments for choosing intermediate outcome measures rather than morbidity or mortality for measuring program impact (Macdonald, 1996; Lindholm and Rosén, 2000). From this point of view, it is even more important to perform a process evaluation (Nutbeam *et al*., 1993).

The short-, intermediate- and long-term outcomes of community adoption will be measured in different studies with different methodologies, and will be the elements of the process evaluation. This review indicates the importance of the local context to highlight actions needed to improve the health of the populations in the intervention municipalities. To reach pre-determined goals, work must be built on public policy for health promotion, and must engage politicians and decision makers. The health promotion concept is not, traditionally, on the agenda of local government. However, a great deal of the work carried out in the municipalities is associated with health promotion. By issuing clear guidelines on the most effective way of creating supportive environments for health, politicians can be advised to take the right decisions for health promotion. Actions to create healthy and supportive environments have been taken in the intervention municipalities of SDPP by improving access to physical activity, healthy food and by restricting tobacco use.

For program activities to be maintained, they must be incorporated into the municipalities' own structure. Policy makers should be involved even more than today. Allowing communities and organizations to take over program ownership and to integrate the activities into the ordinary agenda must be of great importance in the future for all involved in SDPP. Having representatives of the municipalities' governmental boards in the program steering group has encouraged involvement and has eased the local adoption of the program and its components. The project leaders and members of the local program organization have been of great importance in initiating, inspiring and maintaining activities.

In the municipalities involved in SDPP, the program and its ongoing activities seem to have strengthened the engagement on the political and administrative levels for health promotion issues. Local governments appreciate the importance of the intermediate targets of SDPP for other health issues. Thus, community adoption of the program seems attainable.

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REFERENCES

Andersson, C. M., Bjärås, G., Tillgren, P. and Östenson, C.-G. (2002) Health promotion activities in annual reports of local governments. 'Health for all' as a tool for content analysis. *European Journal of Public Health* (in press).

Amos, A. F., McCarty, D. J. and Zimmet, P. (1998) The rising global burden of diabetes and its complications: estimates and projections to the year 2010. *Diabetic Medicine*, **14**, S7–S85.

Bandura, A. (1977) *Social Learning Theory*. Prentice-Hall, Englewood Cliffs, NJ.

Bjärås, G., Ahlbom, A., Alvarsson, M., Burström, B., Diderichsen, F., Efendic, S. *et al*. (1997) Strategies and methods for implementing a community-based diabetes primary prevention program in Sweden. *Health Promotion International*, **12**, 151–160.

Bjärås, G., Klinge Härberg, L. and Östenson, C.-G. (1999) Walking campaigns—a useful way to get people involved in physical activity? *Scandinavian Journal of Public Health*, **27**, 237–238.

Bjärås, G., Klinge Härberg, L., Sydhoff, J. and Östenson, C.-G. (2001) Walking campaign: a model for developing participation in physical activity? Experiences from three campaign periods of the Stockholm Diabetes prevention program SDPP. *Patient Education and Counselling*, **42**, 9–14.

Blair, S. N. and Brodney, S. (1999) Effects of physical inactivity and obesity on morbidity and mortality: current evidence and research issues. *Medicine and Science in Sports and Exercise*, **31**, 646–662.

Borland, R. (1992) Evaluation of a comprehensive health promotion programs. *Health Promotion Journal of Australia*, **2**, 16–21.

Bracht, N. and Kingsbury, L. (1990) Applying community organisation principles to health promotion: a five stage model. In Bracht, N. (ed.) *Health Promotion at the Community Level*. Sage, Newbury Park, CA, pp. 66–88.

Carlsson, S., Persson, P.-G., Alvarsson, M., Efendic, S., Norman, A., Svanstrom, L., Östenson, C.-G. and Grill, V. (1998) Weight history, glucose intolerance, and insulin levels in middle-aged Swedish men. *American Journal of Epidemiology*, **148**, 539–545.

Carlsson, S., Persson, P.-G., Alvarsson, M., Efendic, S., Norman, A., Svanstrom, L. *et al*. (1999) Low birth weight, family history of diabetes, and glucose intolerance in Swedish middle-aged men. *Diabetes Care*, **22**, 1043–1047.

Carlsson, S., Hammar, N., Efendic, S., Persson, P.-G., Östenson, C.-G. and Grill, V. (2000) Alcohol consumption, type 2 diabetes mellitus and impaired glucose tolerance in middle-aged Swedish men. *Diabetes Medicine*, **17**, 776–781.

Farquhar, J. (1978) The community-based model of life style intervention trials. *American Journal of Epidemiology*, **108**, 103–111.

Farquhar, J. W., Fortmann, S. P., Maccoby, N., Haskell, W. L., Williams, P. T., Flora, J. A. *et al*. (1985) The Stanford five-city project: design and methods. *American Journal of Epidemiology*, **122**, 323–334.

Farquhar, J. W., Fortmann, S. P., Flora, J. A., Taylor, C. B., Haskell, W. L., Williams, P. T. *et al*. (1990) Effects of communitywide education on cardiovascular disease risk factors. The Stanford Five-City Project. *Journal of the American Medical Association*, **264**, 359–365.

Green, L. W. and Kreuter, M. W. (1991) *Health Promotion Planning: an Educational and Environmental Approach*, 2nd edition. Mayfield, Mountain View, CA.

Green, L. W. and Kreuter, M. W. (1999) *An Educational and Ecological Approach to Health Promotion Planning*. Mayfield, Mountain View, CA.

Grill, V., Persson, G., Carlsson, S., Norman, A., Alvarsson, M., Ostensson, C. G. *et al*. (1999) Family history of diabetes in middle-aged Swedish men is a gender unrelated factor which associates with insulinopenia in newly diagnosed diabetic subjects. *Diabetologia*, **42**, 15–23.

Haglund, B. J. A., Pettersson, B., Finer, D. and Tillgren, P. (eds) (1996) *Creating Supportive Environments for Health: Stories from the Third International Conference on Health Promotion, Sundsvall, Sweden*. World Health Organization, Geneva, Switzerland.

Hamman, R. F. (1992) Genetic and environmental determinants of non-insulin-dependent diabetes mellitus (NIDDM). *Diabetes and Metabolism Review*, **8**, 287–338.

Henriksson, F., Agardh, C.-D., Berne, C., Bolinder, J., Lönnqvist, F., Stenström, P. *et al*. (2000) Direct medical costs for patients with type 2 diabetes in Sweden. *Journal of Internal Medicine*, **248**, 387–396.

Johnston, M. (1988) Development of a community health programme. In Haglund, B. J. A. and Tillgren, P. (eds) *Community Intervention Strategies*. Karolinska Institute, Department of Social Medicine, Kronan Health Centre Sundbyberg, Sweden.

Kahan, B. and Goodstadt, M. (2001) The Interactive domain model of best practices in health promotion: developing and implementing a best practices approach to health promotion. *Health Promotion Practice*, **1**, 43–67.

King, H., Aubert, R. E. and Herman, W. H. (1998) Global burden of diabetes 1995–2025: prevalence, numerical estimates and projections. *Diabetes Care*, **21**, 1414–1431.

Lindholm, L. and Rosén, M. (2000) What is the 'golden standard' for assessing population-based interventions? Problems of dilution bias. *Journal of Epidemiology and Community Health*, **54**, 617–622.

Macdonald, G. (1996) Where next for evaluation? *Health Promotion International*, **11**, 171–173.

Manson, J. E., Nathan, D. M., Krolewsky, A. S. *et al*. (1992) A prospective study of exercise and incidence of diabetes among US male physicians. *Journal of the American Medical Association*, **268**, 63–67.

Mittlemark, M. B., Hunt, M. K., Heath, G. W. and Schmidt, T. L. (1993) Realistic outcomes: lessons from community based research and demonstration programs for the prevention of cardiovascular diseases. *Journal of Public Health Policy*, **14**, 455–462.

Nix, H. L. (1987) The community and its involvement in the study planning action process. Publication No. (CDC) 78-8355. U.S. Department of Health, Education and Welfare, Atlanta, GA.

Nutbeam, D. (1998) Evaluating health promotion—progress, problems and solutions. *Health Promotion International*, **13**, 27–44.

Nutbeam, D. and Harris, E. (1999) Theory in a nutshell: a guide practitioner's guide to health promotion theory. McGraw Hill, Sydney, Australia.

Nutbeam, D., Smith, C., Murphy, S. and Catford, J. (1993) Maintaining evaluation designs in long-term community based health promotion programmes. *Journal of Epidemiology and Community Health*, **47**, 127–133.

Persson, G., Tillgren, P., Östenson, C.-G., Ahlbom, A., Bjärås, G., Efendic, S. *et al*. (1997) Plan för utvärdering av programmets effekter avseende förekomsten av diabetes och nedsatt glukostolerans samt riskfaktorer. Stockholms

läns diabetespreventiva program (SDPP) Diabetespreventiva enheten, Karolinska sjukhuset. Report No. 13.

Persson, P. G., Carlsson, S., Svanström, L., Östenson, C.-G. and Efendic, S. (2000) Cigarette smoking, oral moist snuff use and glucose intolerance. *Journal of Internal Medicine*, **248**, 103–110.

Physical Activity and Health (1996) *A Report of the Surgeon General*. Superintendent of documents, Pittsburg.

Puska, P., Nissinen, A., Tuomilehto, J., Salonen, J. T., Koskela, K., McAlister, A. *et al*. (1985) The community based strategy to prevent coronary heart disease. Conclusions from the ten years of the North Karelia project. *Annual Review of Public Health*, **6**, 147–193.

Rogers, E. M. (1983) *Diffusion of Innovations*, 3rd edition. Free Press, New York.

Sanderson, C. and Svanström, L. (1988) Contributions of social medicine and systems analysis to formulating objectives for a community-based cancer prevention programme. *Scandinavian Journal of Social Medicine*, **16**, 35–40.

Sanderson, C., Haglund, B. J. A., Tillgren, P., Svanström, L., Östenson, C.-G., Holm, L. *et al*. (1996) Effect and stage models for community intervention programmes; and the development of the Model for Management of Intervention Programme Preparation (MMIPP). *Health Promotion International*, **2**, 143–156.

Susser, M. (1995) The tribulations of trials: interventions in communities. *American Journal of Public Health*, **85**, 156–158.

Tillgren, P., Bjärås, G. and Östenson, C.-G. (1997) Processutvärdering Bakgrund, modell och riktlinjer för genomförande. (Background, model and outlines for the realisation.) Stockholms läns diabetespreventiva program (SDPP) Diabetespreventiva enheten, Karolinska sjukhuset, Report No. 10, Stockholm.

Tuomilehto, J., Knowler, W. C. and Zimmet, P. (1992) Primary prevention of non-insulin-dependent diabetes mellitus. *Diabetes and Metabolism Reviews*, **8**, 339–353.

Vessby, B. (2000) Dietary fat and insulin actin in humans. *British Journal of Nutrition*, **83**, 91–96.

Vouri, I. (1998) Does physical activity enhance health? *Patient Education and Counseling*, **33**, 95–103.

Wimbush, E. and Watson, J. (2000) An evaluation framework for health promotion: theory, quality and effectiveness. *Evaluation*, **6**, 301–321.