REPORT

WORKSHOP ON DIABETES CONTROL
IN THE SOUTH PACIFIC

Suva, Fiji
25-27 January 1982

Manila, Philippines
June 1982
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NOT FOR RESALE

Printed and distributed
by the
Regional Office for the Western Pacific of the
World Health Organization
Manila, Philippines
June 1982
NOTE

The views expressed in this report are those of the participants of the Workshop and do not necessarily reflect the policies of the Organization.

This report has been prepared by the Regional Office for the Western Pacific of the World Health Organization for governments of Member States in the Region and for those who participated in the Workshop on Diabetes Control, which was held in Suva, Fiji, from 25 to 27 January 1982.
## CONTENTS

1. INTRODUCTION ................................................................. 1

2. OBJECTIVES ........................................................................... 1

3. EPIDEMIOLOGY OF DIABETES MELLITUS AMONG THE PACIFIC POPULATIONS ................................................................. 2

   3.1 Summary of papers presented ............................................ 2
   3.2 Summary of epidemiological data ...................................... 4

4. STRATEGIES FOR DEVELOPING COMMUNITY CONTROL PROGRAMMES ON DIABETES ................................................................. 10

   4.1 Commitment for action ...................................................... 10
   4.2 Organization of programme development .......................... 10
   4.3 Recognition of need for improved information ................. 11
   4.4 Recognition of need for education .................................. 11

5. COMMUNITY-BASED DEMONSTRATION PROGRAMMES ................................................................. 11

   5.1 Objectives .......................................................................... 12
   5.2 Services development ...................................................... 12
   5.3 Evaluation .......................................................................... 18

6. RESOURCES FOR DEMONSTRATION PROGRAMMES ................................................................. 19

   6.1 Local resources ............................................................... 20
   6.2 Supporting resources ....................................................... 20
   6.3 Coordination of resources for diabetes control in South Pacific ................................................................. 22

7. RECOMMENDATIONS ................................................................. 22

ANNEX 1 - LIST OF PARTICIPANTS ................................................................. 25

ANNEX 2 - ANNOTATED AGENDA ................................................................. 29

ANNEX 3 - PRIMARY PREVENTION OF DIABETES ................................................................. 33/34

ANNEX 4 - KNOWN ONGOING STUDIES ON DIABETES MELLITUS AND COMPLICATIONS ................................................................. 35/36

ANNEX 5 - SCHEME FOR EVALUATION OF DIABETES CONTROL ACTIVITIES ................................................................. 37
1. INTRODUCTION

Chronic non-communicable diseases, especially diabetes mellitus, have rapidly been increasing among many Pacific populations and constitute a serious public health problem in the Pacific area. In many countries diabetes mellitus is now probably the most important single disorder causing mortality and morbidity and could, to a large extent be prevented. The WHO Regional Office for the Western Pacific has given high priority to the prevention and control of diabetes mellitus:

- It is included in the regional medium-term programme for other non-communicable diseases;

- A joint WHO/South Pacific Commission (SPC) meeting on metabolic diseases with particular reference to diabetes was organized in Nauru, in July/August 1978;


- The Western Pacific Advisory Committee for the Medical Research (WPACMR) has identified research on diabetes mellitus as a priority area. In April 1982, at the seventh session of WPACMR there was a technical presentation on the topic "Diabetes mellitus";

- Budget provisions have been allocated for several Pacific countries to enable them to develop diabetes programmes in collaboration with WHO.

In Pacific countries, diabetes mellitus might serve as a model for the planning and development of community-based control and health promotion programmes. With the expected increase in chronic diseases, the experience gained in planning, organization and evaluation will be important in developing the chronic non-communicable disease programme. An integrated approach of this nature might also be a way to develop adequate primary health care services for Pacific countries.

2. OBJECTIVES

The objectives of the Workshop were:

(1) to review available knowledge and to identify areas for future studies relevant to the development of an action programme;

(2) to formulate strategies and a plan of action for diabetes control in the South Pacific;

(3) to identify the countries interested in developing coordinated diabetes control activities and to develop a training programme for health workers as well as to identify resources for programme implementation.
3. EPIDEMIOLOGY OF DIABETES MELLITUS AMONG THE PACIFIC POPULATIONS

3.1 Summary of papers presented

Dr Paul Zimmet presented the most recent data on the nature and magnitude of the diabetes problem in the Pacific area. The summary of this review is presented in Chapter 3 of this report.

The Regional Adviser in Cardiovascular and Metabolic Diseases, WHO Regional Office for the Western Pacific, summarized the need for epidemiological and health services research in diabetes in the South Pacific. While the prevalence of diabetes is now being studied among most Pacific populations, future research should provide health planners with sufficient data on the trends of diabetes (incidence, risk factors and complications resulting from diabetes). Information for health services planning is also needed about health behaviour and knowledge, treatment compliance and costs. Finally, the evaluation of community-based demonstration programmes for diabetes control in some Pacific countries should be given an especially high priority, also from a research development point of view.

Dr J. William Flynt presented the background of community-based diabetes control programmes. Using established approaches and strategies, community control can result in reduction of incidence, prevalence, complications, and other features of a community's burden in terms of morbidity and mortality. Community control does some of the same strategies as are used for diabetes control in individual patients. For example, patient education, outreach for follow-up and in some instances patient management could also be a part of community control. However, community control includes other strategies or activities such as programme planning, implementation and evaluation, public and professional education, and promotion of coordination and communication among various existing resources.

Community diabetes control programmes are based on those strategies and activities which seem most likely to result in a reduced community burden of morbidity and mortality. This entails planning based on information regarding the causes of excess morbidity or mortality and the design of interventions to correct these causes. Limited resources will always warrant efforts to involve other organizations, agencies, and resources, which can also develop strategies to influence the causes of morbidity or mortality. This necessitates coordination and cooperation among group in such areas as education, nutrition, epidemiology, health care delivery, and planning and evaluation. Demonstration setting seems most promising for exploring and developing interest and support in community-based diabetes control.
Dr V. Grabaukas, WHO, Geneva, presented a paper on the integration of diabetes control with other non-communicable diseases, indicating that there are at least two major justifications in public health terms for a comprehensive approach in designing and implementing chronic diseases prevention and control programmes in the community. First, several major non-communicable diseases, including diabetes, share the same causes resulting from unhealthy life styles. Second, it is impossible to have a separate health service for each major non-communicable disease entity, especially at the primary health care level. The possibility of a community intervention approach for individuals at high risk has been considered of the utmost importance for both primary and secondary prevention of diabetes, hypertension, gout and their complications, manifested as large vessel diseases (coronary heart disease, stroke, peripheral artery disease) and small vessel diseases (retinopathy, kidney failure). The concept of primordial prevention has been intensively explored and primary prevention covering entire communities is considered the most progressive approach in formulating national health strategies related to non-communicable diseases. Of these diabetes is of major public health importance in most of the Pacific countries.

Dr Parshu Ram of Fiji introduced some special problems in developing diabetes control in the South Pacific countries. Taking Fiji as an example, the increase in hospital admissions due to diabetes has increased between 1952 and 1980 from 170 to 1073, i.e. by 531%. Diabetic sepsis accounts for more than 50% of all sepsis patients requiring hospitalization and gangrene, is the most common cause of limb amputations. 40% of all cataract operations are performed on diabetics.

It is evident that more than 50% of diabetics in the community remain undetected, in some areas even more than 75%. There are serious problems with respect to elaborating an adequate methodology for diagnosis and case-finding, especially in rural and isolated island areas.

In addition, there are problems concerning under-reporting and under-treatment. The present health care delivery system does not provide reasonable standards for diagnosis, health education and treatment.

Poor patient compliance is obvious, which, in addition to the problems relating to delivery of health care, also results from poor patient appreciation of diabetes and its major complications as well as the general belief and attitude towards disease.

Health in general has a low priority in the Pacific. The problem is compounded by a lack of diabetes education at all levels - community, decision makers, patients and health personnel. The organizational structure for taking the necessary action is not adequate, either.

Dr T. Olakowski presented the mortality rates for diabetes in Fiji for the years 1971, 1975 and 1980.
The respective rates for Fijians were 5, 9 and 15 per 100,000 and for Indians 11, 24 and 43 per 100,000. Practically all these deaths were recorded among persons in the age group 40 and above. In the age group 40-59 mortality rates due to diabetes covering the years 1971, 1975 and 1980 were 27 and 36 per 100,000 among Fijians and 41, 87 and 143 per 100,000 among Indians respectively.

It should be pointed out that these figures may be influenced by the fact that 69.5% of the persons had a death certificate showing cause of death in 1971; in 1980 the percentage was 75.1%.

3.2 Summary of epidemiological data

Economic development among developing countries has produced drastic social, economic, and environmental changes. In many instances, traditional dietary and exercise patterns have been discarded and replaced by western patterns. This has been paralleled by a dramatic rise in the prevalence of chronic degenerative diseases such as diabetes, hypertension, and heart disease.

Until 15 years ago, there was little evidence to suggest that diabetes mellitus was a health problem in the Pacific region. Yet in the last decade a number of surveys have shown that at the present time diabetes is emerging as the major chronic disease in a number of Pacific populations. This trend has been seen in other developing countries around the globe.

In the central Pacific Republic of Nauru, the diabetes prevalence rate of 30.3% among people aged 20 years and over matches that of the American Pima Indians—a population who hold the world record for the type of diabetes seen in Nauru which is the non-insulin-dependent form.

3.2.1 Insulin-dependent diabetes (IDDM)

Insulin-dependent diabetes appears to be rare in most developing countries and no definite reports exist of its occurrence in the Pacific Islands. Whether this is due to genetic or environmental influence is not entirely clear. However, it has been suggested, in order to explain the absence of insulin-dependent diabetes in the Pacific and other developing countries that children with it die undiagnosed. Under these circumstances, such cases would not appear in any hospital or mortality statistics as diabetics. Although this is possible, there are well-trained local and expatriate doctors in many Pacific countries and it seems unlikely that this could occur except in isolated areas with poor medical care.

3.2.2 Non-insulin dependent diabetes (NIDDM)

The three major geo-ethnic groups in the Pacific region are Melanesians, Polynesians and Micronesians, and there is also a large Indian population in Fiji. An actual comparison of diabetes prevalence rates between these populations is difficult. The problem facing the diabetes epidemiologist in the Pacific is the same as anywhere else in the world. Different methodologies and glucose loads and different diagnostic criteria for diabetes create some problems in comparison.
3.2.3 Extent and variability of diabetes in the Pacific

Table 1 illustrates the results of the major studies performed in the Pacific region up to 1973 (see Table 1 annexed).

These studies indicated that:

(a) the prevalence of diabetes was lower among Melanesians than among Caucasians;

(b) traditional-living Polynesians (Pukapuka) had a lower prevalence rate than urbanized Polynesians (Rarotonga and New Zealand);

(c) Fiji Indians living in the same geographic environment as Fiji Melanesians had higher diabetes prevalence rates ten times higher than the latter;

(d) urbanized Polynesians, Micronesians, and Australian aborigines had diabetes prevalence rates 2 to 4 times higher than those of Caucasians.

It was earlier concluded that Melanesians might have a genetic protection against diabetes (as has been suggested for Eskimos). In contrast, it was suggested that diabetes was rare among traditional-living Polynesians and Micronesians, but that because of a genetic susceptibility to the disease, the modernization of their lifestyle had resulted in high prevalence rates.

However, just as there is heterogeneity in diabetes, there is clearly heterogeneity in the Pacific ethnic groups. A high diabetes prevalence has recently been reported among urbanized Melanesians in Papua New Guinea and Fiji.

The prevalence rates based on the most recent studies are shown in Table 2. In view of the recent move by the World Health Organization (1980) to standardize diagnostic criteria for diabetes, the prevalence rates reported use the new WHO criteria for diabetes, i.e. fasting plasma glucose $> 140 \text{ mg/100 ml}$ and/or 2 h plasma glucose $> 200 \text{ mg/100 ml}$ (after a 75g oral glucose load).

The highest diabetes prevalence rates were seen in Nauruans (30.3%) and rural and urban Fiji Indians (13.3% and 14.8%, respectively).

Diabetes prevalence rates were low among rural Western Samoans, Wallisians, (Polynesians), Fijians and New Caledonians, (Melanesians), but much higher among urban Western Samoans and Fijians. Similar findings were noted in Kiribati (Micronesians).

In Suva, diabetes prevalence among urban Indians was twice as high as among Melanesians. This difference is significant but much less so than the tenfold difference noted in an earlier study reported by Cassidy (1967).
In summary, the more recent Pacific studies show:

(a) low diabetes prevalence rates in certain Melanesian populations and high rates in others;

(b) low prevalence rates among the traditional-living Wallis Islanders (Polynesians) and high rates among their migrant counterparts in urban New Caledonia;

(c) low diabetes prevalence rates in rural populations compared with their urban counterparts, except Fiji Indians;

(d) high diabetes prevalence rates among Indians compared with Melanesians living in the same urban environments; and

(e) an exceptionally high diabetes prevalence (30.3%) among the Micronesian population of Nauru.

Prior and his co-workers have also reported relatively high diabetes prevalence rates in several Polynesian groups - New Zealand (16.4%), Tokelanians in Tokelau (7.0%), and migrant Tokelanians in New Zealand (7.4%).

3.2.4 Tropical malnutrition diabetes

In the tropics, another type of diabetes occurs and it may be seen in two forms - J type diabetes and pancreatic diabetes. J-type has been reported only in one Pacific country, Papua New Guinea. The etiology of these two forms of diabetes is not known, but their geographic distribution provides the epidemiologist with some fuel for speculation. The disease appears to be a degenerative disorder of the pancreas and the question of toxic damage arises. There appears to be an epidemiological association between cassava consumption and the geographic occurrence of the disease. Cassava contains cyanide-yielding substances, and it has been suggested that a combination of protein malnutrition along with cyanide ingestion is the cause of pancreatic diabetes.

3.2.6 Epidemiology of complications of diabetes

Apart from defining the prevalence and incidence of diabetes, epidemiological studies that would form the basis for an understanding of the natural history of diabetes and its complications are very few among Pacific populations.

The most powerful risk factors for diabetic retinopathy are duration of diabetes and poor control of the disease. The duration of diabetes in some of the Pacific populations studies may not have been long enough to produce retinopathy. Devastating retinopathy has been noted in the most recent studies on Nauruan diabetics, and also on diabetics in Kiribati and Rarotonga.
There is considerable evidence to suggest that the macrovascular complications of diabetes also occur among Pacific populations. Certainly, some of the major risk factors for ischaemic heart disease, e.g. obesity, diabetes, smoking, hypertension, and psychosocial stress are present and increasing in these people, and an increasing number of cases of myocardial infarction and stroke is occurring among Pacific islanders.

These complications of diabetes will place an increasing load on already overstretched medical resources. Not only this, but the high prevalence rates of diabetes in many of the Pacific countries --- and the morbidity and mortality from the complications - could have a major impact on the economy of these societies through the deleterious effects on the work-force.

3.2.7 Genetic susceptibility and environment

Even today, there are traditional-living Polynesian populations in whom non-insulin-dependent diabetes is unknown or rare. Yet urbanized subjects of the same ethnic group show exceptionally high diabetes prevalence rates. Thus, the genetic susceptibility to non-insulin-dependent diabetes in these populations appears to be unmasked by environmental factors. These environmental factors appear to be different from those which unmask the susceptibility to insulin-dependent diabetes.

The problem facing the epidemiologist is to determine which are the factors or combination of factors which contribute.

3.2.8 Need for further studies among Pacific populations

The need for further epidemiological studies should be examined with a view to preventing diabetes and its complications. To have more knowledge about incidence and natural history of diabetes will always be important for primary prevention.

In this context more information is also needed as to whether insulin-dependent diabetes mellitus exists among Pacific populations. Most Pacific studies have concentrated on the adult population. There is a need to establish whether insulin-dependent diabetes does occur in this region and, indeed, in other developing countries. There is some evidence that it is seen among the Fiji Indian population, and it seems unlikely that, except in isolated areas, children are dying of undiagnosed diabetes. Therefore, the absence of cases would suggest the need for studies of genetic resistance or absence of environmental determinants.

It is necessary to make economic valuations of diabetes (including direct costs of the disease and indirect costs due to mortality and morbidity).
<table>
<thead>
<tr>
<th>Study</th>
<th>Country and ethnic group</th>
<th>Age Yrs</th>
<th>Glucose Load (g)</th>
<th>Diagnostic criteria (Plasma glucose mg/100 ml)</th>
<th>Overall prevalence %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Low Prevalence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sloan (1963)</td>
<td>Hawaii - Caucasian</td>
<td>15+</td>
<td>50*</td>
<td>150 at 2-2 1/2 hours</td>
<td>0.7</td>
</tr>
<tr>
<td>Price (1966)</td>
<td>Papua New Guinea - Melanesian</td>
<td>15+</td>
<td>50</td>
<td>150 at 2 hours+</td>
<td>0.5</td>
</tr>
<tr>
<td>Cassidy (1967)</td>
<td>Fiji - Melanesian</td>
<td>21+</td>
<td>50</td>
<td>140 at 2 hours+</td>
<td>0.6</td>
</tr>
<tr>
<td>Prior (1966)</td>
<td>New Zealand - Caucasian</td>
<td>20+</td>
<td>50-100</td>
<td>150 at 2 hours</td>
<td>2.8</td>
</tr>
<tr>
<td>Prior (1966)</td>
<td>Pukapuka - Polynesian</td>
<td>20+</td>
<td>50-100</td>
<td>150 at 2 hours</td>
<td>2.4</td>
</tr>
<tr>
<td>Welborn (1968)</td>
<td>Australia - Caucasian</td>
<td>21+</td>
<td>50</td>
<td>150 at 2 hours</td>
<td>2.3</td>
</tr>
<tr>
<td><strong>High Prevalence</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sloan (1963)</td>
<td>Hawaii - Polynesian</td>
<td>15+</td>
<td>50*</td>
<td>150 at 2 1/2 hours</td>
<td>4.9</td>
</tr>
<tr>
<td>Prior (1966)</td>
<td>Rarotonga - Polynesian</td>
<td>20+</td>
<td>50-100</td>
<td>150 at 2 hours+</td>
<td>5.5</td>
</tr>
<tr>
<td>Prior (1966)</td>
<td>New Zealand - Polynesian</td>
<td>20+</td>
<td>50-100</td>
<td>150 at 2 hours+</td>
<td>8.1</td>
</tr>
<tr>
<td>Cassidy (1967)</td>
<td>Fiji - Indian</td>
<td>20+</td>
<td>50</td>
<td>150 at 2 hours+</td>
<td>5.7</td>
</tr>
<tr>
<td>Prior (1973)</td>
<td>Tonga - Polynesian</td>
<td>20+</td>
<td>75</td>
<td>145 at 2 hours</td>
<td>10.8</td>
</tr>
<tr>
<td>Reed (1973)</td>
<td>TTPI - Micronesian</td>
<td>20+</td>
<td>50</td>
<td>205 at 1 hour</td>
<td>10.0</td>
</tr>
<tr>
<td>Wise (1970)</td>
<td>Australia - Aborigines</td>
<td>20+</td>
<td>50</td>
<td>150 at 2 hours</td>
<td>19.0</td>
</tr>
</tbody>
</table>

Where whole blood glucose was measured, the value has been corrected to plasma glucose equivalent

* Meal contains at least 50g carbohydrates

+ In glycosurics
Table 2 - Age-standardized diabetes prevalence rates - Pacific Region (1975-1981)

<table>
<thead>
<tr>
<th>Geo-ethnic group</th>
<th>Number studied (over 20 years)</th>
<th>Diabetes prevalence %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Micronesians</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nauru</td>
<td>456</td>
<td>30.3</td>
</tr>
<tr>
<td>Kiribati* (rural)</td>
<td>1083</td>
<td>2.7</td>
</tr>
<tr>
<td>Kiribati* (urban)</td>
<td>1917</td>
<td>7.5</td>
</tr>
<tr>
<td><strong>Polynesians</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tuvalu</td>
<td>397</td>
<td>3.9</td>
</tr>
<tr>
<td>Western Samoa (rural)</td>
<td>745</td>
<td>2.7</td>
</tr>
<tr>
<td>Western Samoa (urban)</td>
<td>744</td>
<td>7.0</td>
</tr>
<tr>
<td>Cook Islands*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rarotonga</td>
<td>1177</td>
<td>6.0</td>
</tr>
<tr>
<td>Manihiki</td>
<td>133</td>
<td>6.6</td>
</tr>
<tr>
<td>Wallis Islands*</td>
<td>579</td>
<td>2.7</td>
</tr>
<tr>
<td>Niue**</td>
<td>1192</td>
<td>7.3</td>
</tr>
<tr>
<td><strong>Melanesians</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loyalty</td>
<td>535</td>
<td>2.0</td>
</tr>
<tr>
<td>New Caledonia</td>
<td>172</td>
<td>1.5</td>
</tr>
<tr>
<td>Fiji (r)</td>
<td>477</td>
<td>1.8</td>
</tr>
<tr>
<td>Fiji (u)</td>
<td>861</td>
<td>6.9</td>
</tr>
<tr>
<td>Papua New Guinea ++ (rural)</td>
<td>106</td>
<td>0.8</td>
</tr>
<tr>
<td>Papua New Guinea ++ (urban)</td>
<td>184</td>
<td>15.4</td>
</tr>
<tr>
<td><strong>Indians</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fiji (rural)</td>
<td>452</td>
<td>13.3</td>
</tr>
<tr>
<td>Fiji (urban)</td>
<td>848</td>
<td>14.8</td>
</tr>
</tbody>
</table>

Age standardized to Western Samoa Census (1976)
* Recent survey - data not yet age standardized
+ WHO criteria (1980)
++ Martin et al (1980)
4. STRATEGIES FOR DEVELOPING COMMUNITY CONTROL PROGRAMMES ON DIABETES

The discussions suggested some general approaches which would be needed to address the diabetic problems outlined for the Pacific countries.

4.1 Commitment for action

The need for commitment at all levels of the community to bring about changes in the priorities, policies, and the action required to bring about diabetes control measures was repeatedly emphasized.

Widespread publicity and effective dissemination of information, already available, concerning the magnitude and costs of diabetes are required. It is particularly important that policy makers and national leaders understand not only the implications of these figures but also that remedies are now available.

The Workshop emphasized that primary prevention of diabetes is preferred. This means any action which, if followed, would prevent disease occurrence; in diabetes this means proper food habits and increased exercise, which leads to weight loss and prevention of obesity. Participants recognized that considerable changes in perceived cultural values as well as extensive changes in food habits will be necessary. Thus a major political commitment may be necessary to bring about agricultural, food import and other policy changes.

4.2 Organization of programme development

The Workshop felt that the lack of a focus of responsibility for diabetes in each country was another major problem. Designation of such a focus was considered to be another important approach that was needed. Permanency of such a focus and its integration with other non-communicable diseases demanded that it be located in a key position in the Ministry of Health.

This focal point could be an individual, whole or part-time. In the latter case, time dedicated for diabetes control and prevention work would be essential.

A small coordination committee would be established, made up of persons from the health and other ministries, medical and other health professions and from the diabetes community. This committee and the designated focus would exercise responsibility for making recommendations regarding: (i) training programmes, (ii) assessment of existing resources, (iii) establishment of information systems.

Other responsibilities could include (iv) services development, (v) changes in education policies and practices, and (vii) promotion of a dialogue between diabetes clinicians, health administrators and other sectors of the community.
It was also noted that these organizational changes could perhaps be implemented with the help of an experienced external and neutral person. Such a technical consultant would have skills and experience in organizing and implementing public health prevention and control programmes.

4.3 Recognition of need for improved information

Considerable data may exist from surveys and other records which, if consolidated, could be effectively used to motivate action on the part of policy-makers and national leaders. Such information about diabetes would also be of value in the formulation of policies and action plans by the Ministry of Health as the focus of responsibility.

The Workshop was informed that a primary care manual and document on standardization of methods and materials for primary diabetes care were in the process of preparation. Completion and distribution of these at an early date would be important for information and education purposes.

Instances were noted wherein adequate information existed concerning costs, impact on the work-force, etc. These instances present attractive opportunities for outside agencies to fund special studies and projects within these countries.

4.4 Recognition of need for education

The Workshop judged effective education at all levels to be an integral part of the solution to the problems which they identified.

Participants believed that the establishment of a focus of responsibility for diabetes could result in a continuous search for opportunities where improved education could alter currently prevailing public, patient and professional attitudes about diabetes and obesity. These new and expanded educational ideas must be interwoven into the very fabric of society in order to bring about desired changes in attitude of this magnitude.

Without such societal changes, there cannot be realistic hopes for success in implementing either primary or secondary prevention and control programmes on diabetes and other noncommunicable diseases, because traditional knowledge about such modern health problems is vague and insufficient.

5. COMMUNITY-BASED DEMONSTRATION PROGRAMMES

A specific recommendation of the Workshop included the development of community-based demonstration programmes in a few countries, with especially careful planning and evaluation in one or two countries.
5.1 **Objectives**

The objectives of such programme would be as follows:

(a) to determine the feasibility of establishing national diabetes prevention and control programmes within the context of primary health care;

(b) to develop experience and knowledge in planning, organizing, implementing and evaluating a community-based diabetes programme;

(c) to determine the feasibility of integrating diabetes prevention and control with other non-communicable disease control programmes;

(d) to determine the effectiveness of diabetes prevention and control methods used in the community upon morbidity, mortality, and costs of the disease.

These objectives reflect the intent by the workshop participants that at least one or two comprehensive demonstration programmes be established. Not only would such demonstrations provide a foundation for subsequent extension to national programmes, but they would be used to provide information and also provide experience and information deemed useful to various Pacific countries as they progress in establishing their own organizational focus of responsibility.

Each demonstration programme would prepare its own implementation plan, which includes appropriate intermediate objectives. For this reason, the Workshop did not develop recommendations for a specific programme, but only recommended starting objectives. Objectives should be stated in specific terms. Some of these objectives would include specific reductions in diabetes morbidity and mortality within a set time frame. For example, a prevention programme intended to prevent gangrene infection and loss of lower extremities might have as an objective: *to reduce by 20% the number of diabetes related amputations by 1990.*

5.2 **Services development**

5.2.1 **Integration of diabetes control with other non-communicable diseases Rationale.**

Major factors in non-insulin dependent diabetes such as obesity, lack of physical activity and, certain nutritional patterns are risk determinants of other non-communicable diseases such as hypertension, stroke, ischaemic heart disease, gout and perhaps certain cancers. When combined with other faulty habits like smoking, alcohol and drug abuse, the risk may be aggravated. It may be possible to take preventive and control measures in a comprehensive and coordinated programme in the context of primary health care.
Such an integrated approach is even more justified in the light of the limited resources available in most Pacific countries. The programme contents may vary in different Pacific countries as a result of differing existing health care systems, health manpower and health service facilities.

General concept of integration

Such an integrated approach is based on, first, the fact that diabetes and some other non-communicable diseases are a major public health problem in the Pacific community; second, that a primary health care programme exists or is planned for the community.

The Workshop clearly indicated that the magnitude of the problem requires prompt and urgent action to prevent and control diabetes especially but also other non-communicable diseases. Owing to the socioeconomic and ethnic-cultural and other differences among the Pacific countries, considerable flexibility will be needed.

It is also useful at this juncture to refer to some points which might be helpful in planning, designing, implementing and monitoring community programmes for diabetes and other non-communicable diseases prevention and control in the context of primary health care:

(i) The purpose of primary health care is to address the major health problems of the community; it is the first level of contact for individuals, the family and the community with the national health system. In bringing primary diabetes care as close as possible to where people live and work, it constitutes the first element of a continuing health care process.

(ii) The content of primary health care will vary from country to another. The minimum recommended elements include: education concerning diabetes problems and the methods of identifying, preventing and controlling diabetes; appropriate treatment of major non-communicable diseases; and provision of essential drugs.

(iii) Primary health care is an integral part of socioeconomic development; hence its activities must be coordinated at national and community levels with other social and economic sectors.

(iv) The health activities of primary health care should be undertaken in a comprehensive manner, consequently, single purpose programmes must be integrated into primary health care activities as quickly and smoothly as possible or developed as part of these activities.

(v) Community participation is an essential aspect of the primary health care approach. An advisory group for the diabetes and non-communicable diseases programme could assist in such participation in countries.

(vi) Planning for primary health care needs to be carried out not only at the local level, but also at intermediate and central levels, and should include the provision of support by successive levels at referral facilities. The community diabetes demonstration programmes would allow for such planning and integration with primary health care.
(vii) Primary health care must make full use of available human resources.

(viii) Intermediate and central referral facilities should review their functions and staffing. They should provide not only the traditional support for clinical problems but also continuing training, consultation, guidance and supervision of community health workers as well as community education in health matters.

To integrate all the elements of specific control programmes into primary health care in a comprehensive manner would not be possible or even desirable. In some situations a realistic approach might be to start in one or two specific areas and to allow sufficient flexibility in planning to permit progressive extension and development, based on experience. Hence, in developing health promotion technology at community level, diabetes might serve as a model for such development.

Moreover, in some Pacific countries or areas, the present circumstances offer an opportunity to test the feasibility and effectiveness of health promotion programmes aimed at truly primary or "primordial" prevention of a group of major non-communicable diseases.

5.2.2 Information systems useful in community-based diabetes control and prevention programmes

A suitable information system is an essential component of a diabetes control programme.

It is needed for:

(a) planning;
(b) monitoring the process;
(c) monitoring the outcome;
(d) overall evaluation and assessment of the success of a programme.

There are many indices which are useful in planning and operating diabetes (and other non-communicable disease) control programmes. The extent to which data can be collected and usefully analysed will depend on the capability to collect appropriate information. At the primary health care level, only the simplest indicators may be enough.

The information needs can be classified according to the level at which the information is obtained (source), and according to the purposes for which it will be used. The following list is not intended to be comprehensive, but rather illustrative, of the type of data which should be considered as either essential or desirable in such programmes. The Workshop recognized that, in the planning phases of any community programme, the precise specifications regarding which data to collect, for what purposes, and how this will be accomplished must be precisely defined. Implementation of community diabetes control demonstration programmes will provide a setting and opportunity to explore such data needs.
A. Statistics which would provide a descriptive basis of life situations and used to judge the overall burden of noncommunicable diseases (NCD). These would include age, sex and ethnic composition of the population, information concerning economy, food distribution, socioeconomic indicators (education, occupation).

B. Indicators of the scope and impact of disease at national or community level. These would include mortality rates by age and cause and if possible by underlying, contributing cause and proportionate cause.

Morbidity estimates such as disease specific prevalence and incidence rates (by age, sex, ethnic groups, etc) provide an estimate of the extent of the existing problem in a community, from which basic estimates of the extent of services required (health services planning) can be formulated.

C. Risk factor indicators, which would include information on major risk factors such as: blood glucose, body weight, blood pressure, smoking, physical exercise, etc. Indicators assessing health behaviour would also be very useful.

D. Diabetes registration. Some form of diabetes register should be maintained at each local centre, e.g. primary health care centre. This has many purposes, which range from determining the number of existing cases known or receiving treatment, the number of new cases occurring in defined time intervals, determining the number of deaths, the number of complications, measure of workload, loss to treatment as well as providing a mechanism to ensure adequate follow up.

During the early phase of pilot programmes an appropriate and standard form of such register should be developed and tested so that it would be suitable for conditions in Pacific countries.

5.2.3 Educational intervention

Education is the delivery of information to upgrade both the knowledge and behaviour of the target population. It involves the preparation of materials (posters, leaflets, manuals, audiovisual cards) and equally important, the development of techniques. In general, participatory learning is vastly more effective than didactic methods where patients are forced into a passive role.

Nutrition is the major component in educational intervention employed in the primary prevention and treatment of diabetes mellitus. Promotion of increased physical exercise is an allied cover subject. Education should be used as a tool for:

(a) the individual to change health behaviour;

(b) assessing, developing and thereby improving the educational process itself.
Education should be directed at four target groups:

(1) political; (2) public; (3) professional; and (4) patients and their families.

(1) Education at the political level. Promotion of the programme aims should be carried out at the level of health ministers, other relevant portfolios such as agriculture, foreign affairs. Meetings such as the South Pacific Forum, South Pacific conference, should be used as well to make the countries' leaders aware of the prevalence and morbidity of diabetes.

(2) Education of the public. General health education should be based upon the perceived needs of the community in question, e.g. obesity, poor dietary habits, hypertension, sedentary habits, etc. It should support the other interventions and promote behaviour changes in the community with the aims of:

(a) increasing the community's knowledge about the importance of diet and physical recreation in the treatment and prevention of diabetes mellitus;
(b) increasing the community's motivation by publicising the magnitude of the morbidity and mortality of diabetes mellitus;
(c) providing the community with practical methods of changing their exercise and dietary patterns;
(d) publicising the programme's operations, schools, community groups, health services, institutions and food outlets and distribution chains.

(3) Education of professionals and (4) Education of patients and their families

Components of these two programmes (3) and (4) should be:

(a) clearly defined goals and measurable objectives and needs of client (professional, patient, families);
(b) a curriculum derived from the assessment of those needs and educators trained in both curriculum and effective teaching techniques;
(c) involvement of health professionals at all levels of the health care system, and involvement of the other family members in patient education programmes;
(d) ongoing evaluation of the education process in terms of changes in knowledge, behaviour and relevant biochemical and anthropomorphic data;
(e) the use of pilot studies to develop educational intervention systems worthy of formal testing.
5.2.4 Governmental support

Prior to starting a programme, the Ministry of Health must decide to support development of the programme. This support might be indicated by letters of agreement with organizations providing funds for the demonstration projects. Further evidence of support would also include provision of some funds from the Ministry, assignment of persons full or part-time to the programme, a willingness to involve skilled services health persons in an advisory capacity, and administrative support at the highest organizational level.

The next step is the appointment of a programme coordinator and establishing an advisory committee for the programme. This individual and the advisory committee may be, or become, the focus of responsibility. Early tasks of these persons will now include development of a plan and strategies for the demonstration control programmes. The following activities will be required:

- Conduct an initial assessment of the diabetes problem in the country. This will include obtaining and analysing available data on morbidity and mortality from surveys, hospital records, and death certificates. Discussions with clinicians and other experts can be a source of suggestions as to where diabetes problems might be.

- Identify available resources within the country that could be used to assist in providing patient education, training of health professionals, analysing and interpreting data, designing evaluation and disseminating information.

- Compile list of available resources from WHO, SPC and from other countries that might be useful sources of technical cooperation during various stages of community-based diabetes control programmes.

- Develop dialogue with and among these various resources and the Ministry of Health staff and the national experts.

- Promote workshops, seminars, site visits, and interviews which will help educate clinical specialists, public health professionals, persons with diabetes, and other health care workers about the extent of the diabetes problem and need for a community-based approach to prevention and control.

These activities will assist in establishing widespread support for developing and implementing a community programme.
In the course of this work, a variety of problems and potential approaches for addressing them will come to light. These will become the basis of discussion for planning the community programmes. In such planning three major points should be kept in mind:

1. Resources will not be adequate for all that needs to be done.
2. Data will rarely be as complete as desired.
3. Every effort should be made to work within existing health care systems and community networks.

Special attention to planning will identify the priority problems which the community's programme can address.

Persons and institutions from other countries with skills in planning and evaluating epidemiology, education, and clinical care can be of particular assistance in developing the plan and setting objectives. The resources previously identified in the planning papers can be used to obtain help with these skills as need occurs.

5.3 Evaluation

The Workshop agreed that evaluation must become an integral part of any community demonstration programme and should be incorporated into the programme as a part of the planning process. Evaluation will provide information with which to assess feasibility effects and costs of the programme and its various component activities.

Evaluation information will be used in different ways by persons at different levels of interest:

- In general, there is a need for information to decide whether the tasks required are accomplished in various parts of programme activities.

- The programme director, advisory board members and others should know how well tasks for each programme activity are being done. They should also be able to assess the impact that these activities are having upon the problems the programme has addressed.

- Policy makers, funding services, and other leaders will expect information with which to judge feasibility and make decisions about the usefulness and costs of the programme.

The Workshop noted that programme evaluation therefore requires three types of data:

1. programme performance or process measures;
2. programme impact or outcome measures;
3. costs.
Annex 5 tabulates a variety of process and outcome measures to consider in the design and implementation of programme activities directed at reducing diabetes morbidity and mortality. The programme activities directed at primary prevention of diabetes as shown in Annex 3 would require a different series of process and outcome measures. In either case, a detailed description is more appropriately planned according to the design of individual demonstration programmes.

Cost data are also dependent to a considerable extent upon the type and scope of the programme activities planned by the individual programmes. Examples to include are costs associated with developing and implementing programme activities. These might then be used with the number of diabetes persons served for an appropriate cost of educating a person with diabetes. Cost-savings might be reflected in terms of lower costs resulting from hospital days saved, fewer physician visits, or amputations prevented. Such cost-saving information is highly regarded by policy makers, but experience has shown it is among the most difficult to obtain.

6. RESOURCES FOR DEMONSTRATION PROGRAMMES

It was estimated that a considerable amount of resources is currently used for diabetes care (secondary prevention) in the Pacific countries. The only assessment of costs and health services related to diabetes in the Pacific is available from Guam,1 where costs attributable to diabetes were projected to be at least US$3 million per year. Direct hospital costs alone exceeded US$600 000 in 1976, including 5 352 disability days from 435 hospital admissions, with an average of 12.3 days/admission.

Thus in general, identification of such resources that are available already in the countries is needed. Resources for demonstration programmes are needed for: (i) planning, monitoring and evaluation; (ii) implementation of the programme activities

In addition to the resources for health care delivery in the countries (local resources), community-based demonstration programmes require expertise that is not available in the Pacific countries as much as needed. Outside resources are needed for planning, monitoring and evaluation as well as for practical implementation.

6.1 Local resources

(a) Health workers

Doctors, medical assistants, public health nurses (district nurses),
staff nurses, dietitians are available.

The number and qualifications vary somewhat between Pacific countries.
Systematic use of the existing manpower would require much in-service
training at all levels and reorganization of duties related to diabetes
care.

Special emphasis on primary prevention measures as indicated above
would require reorientation aiming at intersectoral coordination of various
community resources.

(b) Programme administration

This requires source resources at the highest level of health
administration.

Here also the emphasis on primary prevention and coordination is of
the greatest importance. The nutrition, education, and information sectors
in particular may have resources that are useful and immediately available.

(c) Training

The Fiji School of Medicine, the Nursing Schools in Fiji and Samoa and
the Health Training Centre in Tonga provide infrastructure that can be used
but review of their curricula with appropriate recommendations would be
preferable.

(d) Other community (voluntary) organizations

Churches, women's associations, sports clubs, lay organizations.

(e) Materials and equipments

Health education materials, drugs, patient records and registers,
equipment and tools for measuring blood and urine sugar, blood pressure
measurement services.

Some of these resources are available but are not sufficient in
Pacific countries and the quality may vary. At primary care level
especially the shortage is serious.

6.2 Supporting resources

(a) Technical support

In the Pacific countries resources are limited for the epidemiological
surveillance, planning and postgraduate (in-service) training that are
needed for development of national programmes for noncommunicable
diseases. Outside of the Pacific countries, such resources are currently
available at the WHO Regional Office for the Western Pacific (including the intercountry epidemiology team in WHO Suva Office) and in the South Pacific Commission (SPC). It was noted with satisfaction that the Department of Epidemiology and Metabolic Medicine of Royal Southern Memorial Hospital, Melbourne, Australia, was recently designated as a WHO Collaborating Centre for Diabetes Mellitus. Through this centre, in cooperation with other expert resources in the Pacific area, technical planning and scientific evaluation of prevention and control programmes for diabetes would be possible.

(b) **Financial support**

Countries are already using considerable amounts of drugs, etc. but for comprehensive programmes, it will be essential to obtain financial support, which will be used for:

- training and manuals;
- appropriate laboratory technology at primary health care level;
- drugs;
- health education materials and local costs for health education;
- programme administration;
- local costs for monitoring and evaluation.

In addition to WHO and SPC provisions, such funding should be sought from foreign aid agencies in Australia, New Zealand or U.S.A. for the countries that are able and willing to initiate demonstration programmes.

(c) **Training support**

Support for training is to a great extent related to financing the overall programmes. On the other hand, there is a need for special training for persons responsible for programme implementation at national level; mainly training in principles of epidemiology, programme administration and evaluation is needed. Such resources could be made available through WHO (fellowships, training courses, meetings) and several collaborating institutions in Australia, New Zealand and U.S.A. Several postgraduate training courses should be made available, especially for persons who would plan and supervise patient education activities at country level.

(d) **Resources for research and evaluation**

These are available in the abovementioned resource countries and also to some extent in WHO and SPC. The WHO Collaborating Centre for Diabetes Mellitus in Melbourne has an important role in executing and coordinating appropriate research and evaluation of intervention programmes.
6.3 Coordination of resources for diabetes control in South Pacific.

The resources, as described above, should be used in a coordinated way. At country level, the responsible focal point in the Ministry of Health should take care of coordination of the local and outside resources as indicated in the detailed programme plan.

At regional level, WHO should take care of the promotion of funds for pilot programmes from extrabudgetary sources, in addition to the limited provisions available within the WHO regular budget. A group of experts, including the WHO Collaborating Centre for Diabetes Mellitus, should look into the possibility of establishing a collaborative study group to design a proposal for discussion with local governments and funding executing agencies.

7. RECOMMENDATIONS

The Workshop emphasized the importance of the fact that WHO had made diabetes a regional priority in the Western Pacific Region, especially in the South Pacific area.

It was noted with satisfaction that the Western Pacific Advisory Committee for Medical Research (WPACMR) had included diabetes mellitus among the research areas of highest priority, and that a technical presentation on diabetes would be given at the next meeting of WPACMR in April 1982.

In 1978 a WHO/SPC meeting on metabolic diseases made eleven recommendations. Some of these have now been partly implemented.

Further information accumulated since 1978 only re-emphasizes the need for community-based prevention and control programmes. In the light of this, representatives were convened for this Workshop, which made the following recommendations:

7.1 It is recommended that WHO should take action in order:

(1) to create an awareness of the impact of economic, nutritional, social and medical problems of diabetes mellitus and other emerging noncommunicable diseases at highest government levels. This might lead to discussions relating to diabetes at the South Pacific Forum and the South Pacific Conference;

(2) to promote the establishment of an expert multidisciplinary task force. Such a group would investigate and report on the social, economic and medical impact of diabetes and other noncommunicable diseases on Pacific island communities;

(3) to play a major coordinating role between countries and nongovernmental organizations and other contributing agencies in planning, monitoring and implementing such programmes. This will require further meetings on a regular basis;
(4) to make use of ongoing educational programmes such as the WHO national workshops on epidemiology as a resource to improve knowledge and training skills related to diabetes and other noncommunicable diseases;

(5) to urge aid agencies of resource countries to promote and consider sympathetically requests for funds to implement such projects in Pacific countries.

7.2 It is recommended that the Pacific countries should take action in order:

(1) to establish a focus of responsibility in the Ministry of Health for diabetes mellitus and non-communicable diseases. This would include a commitment to serve as a point of contact for communication and coordination for diabetes mellitus and noncommunicable diseases within the community;

(2) to consider primary prevention as the best long-term strategy for diabetes control in the community. This should be accompanied by evaluation, which would require that special demonstration projects be set up initially in few identified target areas or countries;

(3) to develop, in collaboration with WHO, other technical organizations and experts, comprehensive community demonstration projects for the prevention and control of diabetes. Such projects should include the following elements:

(a) provision of information on diabetes, its hazards, and its prevention and control to the public;

(b) training and upgrading of all health professionals;

(c) strengthening and reorganization of services as a part of primary health care;

(d) development of information systems to monitor morbidity and mortality from diabetes;

(e) evaluation of the project.

7.3 The participants considered that, in addition to primary and secondary prevention programmes, the following were also priority areas, for which support from WHO and other support and resource organizations and the respective countries should be sought:

- primary prevention trial;

- studies of diabetes-related costs;

- studies of incidence rates of diabetes and its complications, including hospital record reviews;

- studies of techniques of health and professional education in diabetes control-related aspects.
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ANNEX 2

ANNOTATED AGENDA

First day - 25 January

0930 Registration

1000 Opening ceremony

- Opening address of the Regional Director
- Remarks by the Consultant
- Self-introduction of the participants

Election of Chairman, Vice-Chairman, Rapporteur

Adoption of Agenda

1045 Coffee/tea break

1100 Session - Discussion of topics

1. Review of epidemiological studies on diabetes mellitus in the South Pacific Dr P. Zimmet

2. Need for future studies on the epidemiology and control of diabetes in the South Pacific Dr J. Tuomilehto

1230 Lunch break

1330 Session - continuation of topics

3. Review of the different approaches used for diabetes control in the community in other countries Dr W. Flynt, Jr.

4. Integration of diabetes control with other noncommunicable disease control activities Dr V. Grabauskas

1500 Coffee/tea break

1530 Session - Discussion

5. Special problems in developing diabetes control in the South Pacific countries Dr P. Ram

6. General discussion on:
   - primary health care for diabetes
   - surveillance of diabetes and its complications in the community

Comments by other participants
Annex 2

Second day - 26 January

0800 Session - Discussion

(7) Countries' interest and resource areas for diabetes care:

(a) case-finding: screening programmes clinics

(b) treatment: out-patient care hospital treatment

(c) health education

1000 Coffee/tea break

1030 Session - continuation of discussion

(8) Discussion on priority areas for developing diabetes care in the South Pacific countries

(9) Introducing special supportive services

(a) patient education programme
(b) health personnel needs

1230 Lunch break

1330 Session - continuation of discussion

(10) Training programme for primary health care personnel

(a) medical
(b) auxiliary
(c) nutrition

1500 Coffee/tea break

1530 Session - continuation of discussion

(11) Organizing intersectoral cooperation for diabetes care

Third day - 27 January

0800 Session - discussion

(12) Evaluation of diabetes control programmes

(a) feasibility
(b) effects

1000 Coffee/tea break
1030 Session - continuation of discussion

(13) Resources required (existing possibilities to fund diabetes control in the South Pacific countries)

(a) local resources
(b) other sources

1230 Lunch break

1330 Session - continuation of discussion

Final discussion - Conclusions

Recommendations for plan of action for diabetes control in the South Pacific area

1500 Coffee/tea break

1530 Closing session
AIMS
To reduce obesity.
To increase consumption of PACIFIC FOODS
To increase physical exercise.

By means of

PUBLIC EDUCATION
* Opinion leaders (elders, chiefs, politicians, ministers, etc.)
* Media - radio, newspapers, cinemas
* Posters
* Health professionals
* Community, sporting and womens clubs
* Patients

Using

STRUCTURAL CHANGES
- National food and nutritional policy
- Import and export policy and tariffs
- Agricultural policy
- Transport and marketing policy
- Increased sporting facilities
- Changes in school and institutional meals
<table>
<thead>
<tr>
<th>Country</th>
<th>Studies</th>
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<tbody>
<tr>
<td>Fiji</td>
<td>Diet study</td>
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<td>ICT - DM</td>
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<tr>
<td></td>
<td>Complications (chronic diseases, microangiopathy) and mortality</td>
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<td></td>
<td>Incidence of diabetes mellitus and complications</td>
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<tr>
<td>Nauru</td>
<td>Prevalence (chronic diseases, retinopathy, nephropathy)</td>
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<tr>
<td></td>
<td>Incidence data</td>
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<td>Mortality</td>
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<td>IGT - DM</td>
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<td></td>
<td>Diet study</td>
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<tr>
<td>Cook Islands</td>
<td>1980 Prevalence of diabetes mellitus</td>
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<tr>
<td></td>
<td>Prevalence of retinopathy</td>
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<tr>
<td>Tonga</td>
<td>Registration of new cases</td>
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<tr>
<td>Western Samoa</td>
<td>Incidence of diabetes mellitus (1983)</td>
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<tr>
<td>Wallis &amp; Futuna</td>
<td>Prevalence of diabetes mellitus</td>
</tr>
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<td>Chronic diseases and non-factors</td>
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<tr>
<td>New Caledonia</td>
<td>Prevalence of diabetes mellitus</td>
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<td>Chronic diseases and non-factors</td>
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<td>Niue</td>
<td>Prevalence of diabetes mellitus</td>
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<td>Chronic diseases and non-factors</td>
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<td>Vanuatu</td>
<td>Prevalence of diabetes mellitus</td>
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<td>Kiribati</td>
<td>Prevalence of diabetes mellitus and complications</td>
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<td>Dietary study</td>
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<td>Socio-economic impact of diabetes mellitus on the community</td>
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<td>Tokelau</td>
<td>Prevalence of diabetes mellitus and complications</td>
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<td>and other noncommunicable diseases</td>
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<td>Mortality</td>
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<td></td>
<td>Dietary studies</td>
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<td>Migration effects</td>
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**KNOWN ONGOING STUDIES**

**ON DIABETES MELLITUS AND COMPLICATIONS**
## ANNEX 5

### SCHEME FOR EVALUATION OF DIABETES CONTROL ACTIVITIES

#### SECONDARY PREVENTION

<table>
<thead>
<tr>
<th>Problem</th>
<th>Process</th>
<th>Outcare</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. <strong>Inadequate diabetes treatment of individual cases</strong></td>
<td>e.g. Diabetes register</td>
<td></td>
<td></td>
</tr>
<tr>
<td>a) Weight reduction</td>
<td>a) Measure weight loss</td>
<td>a) Case fatality ratio</td>
<td>a) Reduced costs</td>
</tr>
<tr>
<td>b) Systematic assessment of risk factors for complications</td>
<td>b) Frequency of evaluation of BP, eye examinations, etc.</td>
<td>b) Incidence of complications</td>
<td></td>
</tr>
<tr>
<td>c) Appropriate use of therapeutic agents</td>
<td>c) Professional education</td>
<td>c) Hospitalization frequency</td>
<td></td>
</tr>
<tr>
<td>d) General patient education</td>
<td>d) Days of incapacity</td>
<td></td>
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<tr>
<td>e) Measurement of blood sugar control</td>
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</tbody>
</table>

2. **Diabetic retinopathy recognition and treatment**

<table>
<thead>
<tr>
<th>Process</th>
<th>Outcare</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Surveillance for neuropathy</td>
<td>a) Proportion of eye</td>
<td>a) Treatment</td>
</tr>
<tr>
<td>b) Photo evaluation therapy preferred</td>
<td>b) Incidence of blindness</td>
<td>b) Productive days saved</td>
</tr>
</tbody>
</table>

3. **Lack of food care resulting sepsis and amputation**

<table>
<thead>
<tr>
<th>Process</th>
<th>Outcare</th>
<th>Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Patient education</td>
<td>a) Hospital rates in sepsis or gangrene</td>
<td>a) Hospital treatment costs</td>
</tr>
<tr>
<td>b) Professional education</td>
<td>b) Amputation rates</td>
<td>b) Productive days saved</td>
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</table>
### Annex 5

#### SECONDARY PREVENTION

<table>
<thead>
<tr>
<th>Problem</th>
<th>Process</th>
<th>Outcare (End-point)</th>
<th>Costs</th>
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</thead>
<tbody>
<tr>
<td>4. Hypertensive complications</td>
<td>a) Systematic blood pressure evaluation</td>
<td>a) Reduced intake of retinopathy</td>
<td>a) Lives saved</td>
</tr>
<tr>
<td></td>
<td>b) Patients receiving adequate treatment</td>
<td>b) Reduced incidence of CHD and CVA</td>
<td>b) Treatment and screening costs</td>
</tr>
<tr>
<td>5. Diabetic frequency and associated perinatal mortality and morbidity</td>
<td>a) Number of pregnancies screened for diabetes</td>
<td>a) Reduced perinatal mortality</td>
<td>a) Lives saved</td>
</tr>
<tr>
<td></td>
<td>b) Number of pregnant women with controlled diabetes</td>
<td>b) Reduced proportion of infants 450 gms</td>
<td>b) Reduced costs of perinatal care</td>
</tr>
</tbody>
</table>