

Evaluation of community-based oral health promotion and oral disease prevention – WHO recommendations for improved evidence in public health practice

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Systematic evaluation is an integral part of the organisation and delivery of community oral health care programmes, ensuring the effectiveness of these community-based interventions. As for general health promotion programmes the common problems from effectiveness reviews of oral health interventions relate to the quality and validity of programme evaluations. Problems identified mostly refer to the quality of outcome measures, short-term timescales to assess change, inadequate evaluation methodologies and inappropriate evaluation of programme implementation and processes. It remains a challenge to oral health professionals to integrate community oral health programmes into a wider health agenda. Public health research focusing on the development of evaluation methodologies has identified a variety of issues including the importance of using pluralistic evaluation approaches (quantitative and/or qualitative), limitations of the randomised controlled trial (RCT) design for evaluation of public health interventions, the need to match evaluation methods with the nature of intervention, development of outcome measures appropriate for the nature of intervention, importance of developing workforce capacity in evaluation techniques, and the need for development of partnerships between health practitioners and academics in conducting evaluations. In June 2003, the WHO Oral Health Programme at Headquarters organised a two-day workshop to take forward the development and documentation of the evaluation of oral health promotion and oral disease prevention programmes. The aims of the workshop were to: (1) identify common problems and challenges in evaluating community-based oral health interventions; (2) explore developments in the evaluation approaches in public health; (3) share experiences in evaluating oral health intervention programmes implemented at national or community levels in developing and developed countries and (4) develop guidelines for quality evaluation of national and community oral health programmes. Twenty-two invitees from 15 countries attended in addition to WHO staff. The first day was devoted to presentations of oral health promotion and oral disease prevention programmes from around the world. During the second day, WHO staff at Headquarters in Geneva discussed aspects of evaluation of public health programmes. Two working groups were formed to discuss agreed topics, and the reports from their deliberations, together with the general discussion, resulted in the presentation of emerging key issues and recommendations. In summary, it was agreed that evaluation of oral health promotion and disease prevention programmes should integrate, whenever possible, with general health programmes. While the design and advantages of RCTs in clinical evaluations are well documented, the relevance of this design in evaluation of community oral disease preventive programmes and oral health promotion programmes are much less clearly defined. Subsequently, the conduct of such programmes may be inappropriately evaluated in systematic reviews. There is a need for more research into appropriate immediate, interim and ultimate outcome measures, as well as process evaluation, an assessment that is poorly understood and practised less often than outcome evaluation. Guidance on potential design, conduct, and especially the evaluation, of community oral disease prevention programmes and oral health promotion programmes should be developed and updated regularly. WHO Collaborating Centres could have a role in promoting good practice, training and collaboration between teams throughout the world. Centres undertaking systematic reviews should consider the guidelines given in the proposed WHO document when defining their evaluation criteria.

Introduction

The profile of oral disease has changed markedly in the last 50 years. The impact of fluoride, the change from traditional diets to high sugar diets in emerging economy nations, and the ubiquity of alcohol and tobacco have resulted in a varied picture of global oral health (Petersen, 2003; WHO, 2003a). The majority of oral diseases is related to life-styles and reducing these mostly chronic diseases relies much on changing behaviour. Changes for the better in behaviour can and do occur, but require commitment and expertise within health promotion. Health promotion is a relatively young science but is now firmly accepted in public health. It is necessary, though, to evaluate the effectiveness of health promotion

programmes and the science of such evaluations is, as yet, poorly developed and documented.

Oral health is an important component of general health. It has also become clear that causative or risk factors in oral disease are often the same as those implicated in the major general diseases (WHO, 2003b). Thus, oral health promotion and oral disease prevention should embrace what is termed 'the common risk factor approach'; leading to the integration of oral health promotion into broader health promotion. As a result, any advances in the evaluation of oral health promotion programmes are likely to benefit the development of health promotion in general. It is hoped that this document will be useful to an audience wider than those concerned with oral disease.

At present, the systematic review is perceived as the

most robust and reliable indication of effectiveness. Yet, relying on this type of evidence to inform decisions about public health interventions has limitations. Definitions of what constitutes good quality evidence were developed from biomedical paradigms, and experimental evaluation of clinical efficacy is common with much emphasis on statistically measurable outcomes. In contrast, public health interventions are usually complex and relational, and often impossible to capture in quantitative outcomes alone (Protheroe *et al.*, 2003). If public health interventions are to be amenable to systematic reviews – which is highly desirable – then criteria by which quality of evidence can be judged, have to be developed. Drawing up guidelines for conducting evaluations of health promotion and disease prevention programmes need to consider this responsibility.

In recognition of the importance of developing better quality evaluation of community based oral disease prevention programmes and health promotion, the WHO Oral Health Programme at Headquarters organised a two-day workshop in June 2003. The Workshop was held in Geneva and participants were invited from countries throughout the world. Participants had undertaken important programmes in community oral disease prevention and oral health promotion; also, experts in oral public health and oral disease prevention were invited. The format of the workshop was chosen to allow descriptions and critiques of a wide variety of programmes in order to clarify the key issues. They were joined by WHO staff at Headquarters in Geneva who were working on these issues in general health promotion, and time was allocated for working groups to consider all the points raised. The working group reports and the general discussion provided the basis for the list of key points and recommendations.

Evaluation of community oral health interventions

Health promotion as defined by the Ottawa Charter particularly refers to the process of enabling people to increase control over the determinants of health (WHO, 1986). The implementation of this definition requires that health promotion initiatives should be empowering, participatory, holistic, equitable, sustainable, and multi-strategy (WHO, 1998). The development and implementation of evidence based practice is important for both clinical health care and health promotion interventions. The randomised control trial (RCT) is a methodology that has been used extensively to evaluate clinical interventions. Other approaches and methods are however required in health promotion evaluation (WHO, 1998; Petersen and Peng, 2004). Evaluation approaches need to be developed that are appropriate for oral health promotion programmes.

Evaluation of health promotion is important for a variety of reasons including:

- As a means of developing effective interventions;
- Sharing and disseminate examples of good practice;
- Making best use of limited resources;
- Providing feedback to staff and participants;
- Informing policy development and implementation.

Although widely recognised as being important, evaluation

is often a neglected area of practice. There are many reasons for the lack of progress with evaluation, including lack of knowledge, confidence and skills in practitioners; inadequate provision of resources; time and support for evaluation activity; and uncertainty of appropriate evaluation frameworks. As a result, the quality of evaluation has been reported as poor in many instances (Brown, 1994; Schou and Locker, 1994; Sprod *et al.*, 1996). A variety of topics need to be discussed when reviewing ways of developing evaluation approaches for oral health promotion programmes. Evaluation should be a core element in the planning process for any intervention. With oral health programmes, a wide diversity of intervention approaches can be identified. Increasingly rather than relying solely on educational interventions, a broader range of public health strategies are being developed. It is therefore essential that the evaluation developed is in accordance with the nature of the intervention (Watt *et al.*, 2001).

Evaluation methods and measures

Oral health services have been developed from a biomedical research paradigm. Clinical research has therefore been based upon experimental methodology and quantitative sciences. Randomised controlled trials (RCTs) are recognised as being the ‘gold standard’ method in the evaluation of clinical interventions. In recent years the need for a more pluralistic approach in the evaluation of public health and community interventions has been acknowledged (WHO, 1998; WHO, 2001). The strengths and weaknesses of different evaluation methods need to be considered (Puska, 2000). Both quantitative and qualitative approaches have an important role to play in the evaluation of community oral health programmes (Petersen, 1989). The choice of methods depends on the nature of the intervention, the purpose of the evaluation and the resources available. What evaluation methods are most appropriate for oral health promotion? On a practical level how can theoretical evaluation frameworks be implemented in community settings? A comprehensive evaluation of any community based intervention requires both process and outcome data. One of the major criticisms emerging from reviews of the oral health promotion literature was the inappropriate nature and poor quality of many evaluation outcome measures used (Sprod *et al.*, 1996). Process evaluation seeks data on how the intervention was implemented and may uncover information on unexpected activities and results. This type of information is valuable as feedback in reviewing the development and delivery of the intervention. Outcome measures are essential indicators assessing the effects of the intervention, either in the short, intermediate or longer term (Nutbeam, 1998). The outcome measures selected need to be relevant to the nature of the intervention and timescale of the evaluation. Standardised clinical measures may be useful outcome indicators but in health promotion these need to be complemented by a range of other measures. What types of outcome measures are most appropriate in the evaluation of oral health promotion interventions? What measures could be used in a community development intervention?

Roles, responsibilities and partnership working

Evaluation should be a core element in the planning of oral health interventions. It is important that this task is shared between the key players and participants. Far too often evaluation is solely left to those implementing the intervention. Instead it should be a shared responsibility with planners, researchers and practitioners actively cooperating together from clear roles in the evaluation process. In addition, consultation and involvement of the local community is also important. Shared ownership increases credibility and ensures the relevance of evaluation (WHO, 2001). How can local communities become involved in the evaluation of oral health programmes?

It is essential that developments in public health evaluation approaches are utilised, as appropriate in oral health evaluations. A great deal of expertise and experience already exists in other areas of public health research. What ways can this be disseminated to the oral health community? In addition, cooperation between international agencies is essential in terms of developing and disseminating resources and materials. What role do WHO, research institutions, national health authorities and non-governmental agencies have to play?

Capacity building

Many oral health practitioners feel daunted at the prospect of undertaking a detailed evaluation of community based programmes. Practitioner's knowledge, skills and confidence need to be developed to facilitate progress in this area. Evaluation training programmes and resources are required. These need to be developed at the appropriate level and be tailored to the nature of community oral health interventions. Sharing examples of good practice and dissemination are critically important. Practitioners who are isolated and not integrated into existing professional networks require the greatest level of support. What types of training and support resources are needed? How can the needs of developing countries be best met?

High quality evaluation of community health programmes requires both time and expertise, and therefore resources. The WHO recommends that at least 10% of resources should be allocated to the evaluation of interventions (WHO, 1998). Inadequate resources have often been allocated to the evaluation of community oral health programmes. The evaluations may be of limited value and do not capture the full impact and value of the interventions. Are sufficient resources available for the evaluation of community oral health programmes? How can resources be used to best effect? The evaluation of community oral health promotion and disease prevention programmes is an important activity which requires further development. A range of issues need to be considered to ensure that the evaluation approaches adopted fully capture the impact and effects of oral health interventions. The development and use of appropriate evaluation methodologies and valid measures are essential.

Scope, purpose and objectives of the meeting

Systematic evaluation is a core element of organisation and adjustment of community oral health care programmes and particularly important to demonstrate the value and effectiveness of community-based interventions. One of the common findings from effectiveness reviews of oral health interventions is the problem of ensuring good quality evaluation of programmes. Problems identified relate to specification of quality outcome measures, short-term timescales to assess change, inappropriate evaluation methodologies and inappropriate evaluation of programme implementation and processes. It remains a challenge to oral health professionals to integrate and link community oral health programmes with the broader health agenda. Public health research focusing on the development of evaluation methodologies has identified a variety of issues including the:

Importance of using pluralistic evaluation approaches (quantitative and/or qualitative);

- Limitations of the RCT design for evaluation of public health interventions;
- Need to match evaluation methods with the nature of intervention;
- Development of outcome measures appropriate for the nature of intervention;
- Importance of developing workforce capacity in evaluation techniques;
- Need for development of partnerships between health practitioners and academics in conducting evaluations.

In recognition of the importance of developing better quality evaluation of community based oral disease prevention programmes and health promotion, the WHO Oral Health Programme at Headquarters organised a two-day workshop in June 2003. The aims of the meeting were to share experiences from evaluation of community oral health programmes carried out in different regions of the world and to set up guidelines for appropriate evaluation approaches in the future.

Specific objectives of the meeting were to:

1. Identify common problems and challenges in evaluating community-based oral health interventions;
2. Explore developments in evaluation approaches in public health;
3. Share experiences in evaluating oral health intervention programmes implemented at national or community levels in developing and developed countries;
4. Develop guidelines for quality evaluation of national and community oral health programmes.

The programme of the workshop focused on:

1. Identification of problems and challenges related to outcome and process evaluation of community-based oral health promotion and oral disease prevention programmes;
2. WHO developments in evaluation methodologies and public health research;
3. Examples of oral health community projects implemented in developing and developed countries, interventions established in a range of settings and with a variety of intervention strategies for disease prevention and promotion of oral health;
4. Review of oral health programme evaluation: methods

and outcome measures, measures of processes and activities and exploring respective strengths and weaknesses;

5. Develop shared action plan for improving quality of community-based oral health programmes.

Outline on the structure of the Meeting

During the first day, examples of oral health promotion and disease prevention programmes from around the world were presented. Summaries of these presentations are given in the next section. A number of short presentations on broader issues of evaluation of community health programmes by four members of staff at WHO Headquarters in Geneva were included in first part of the second day. Two working groups then were formed, each considering a separate issue relevant to the theme of the meeting. These working groups reported their deliberations to the whole group; this was followed by a general discussion. Finally, Dr P.E. Petersen presented the conclusions and recommendations of the workshop.

Summary of Presentations and Discussions

Evaluation of fluorides used in community preventive programmes: the example of milk fluoridation schemes (UK, Bulgaria, Thailand, China)

Norman Whitehouse

Professor N. Whitehouse presented an example of one type of fluoride-based community preventive programme. This example was fluoridated milk programmes which now involves about 74,500 children in seven countries. He commented that evaluation was usually made with caries development as the outcome variable. Programmes in Bulgaria, China, Chile and the UK were described, focussing on the ethical and practical barriers to study design and evaluation. These included sample selection, control group choice, attrition rates, power of the study, examiner bias, evaluation of process and consideration of confounding factors. The importance of process evaluation was highlighted. He posed the questions: Can you organise a RCT within a community preventive programme? If not, what is the most robust method for community evaluation? This project has identified the need for alternative approaches in evaluation of community-based oral disease prevention as the RCT design does not match the socio-cultural conditions and the need for follow-up. Applicable non-randomized designs and confounder-control through advanced multivariate statistical analysis are called upon.

Evaluation of automatic fluoridation programme: the example of water fluoridation and salt fluoridation schemes in the Americas

Stephen Eklund

Professor S. Eklund described the evaluation of automatic fluoridation programmes in the Americas. He recalled that water fluoridation existed in at least seven countries and salt fluoridation in eight countries, in the Americas. The problems of evaluation were given, particularly the lack of longitudinal studies, although he said that the evidence was convincing. Since the meas-

ures are highly effective, outcome measures (caries and fluorosis) have always been the form of evaluation. Process evaluations, while critical, are not usually considered, particularly issues such as individual choice and safety. Qualitative research is needed to understand opposition to fluoridation and to understand the process by which individuals and communities make health-related decisions. Professor Eklund emphasised the difficulties of evaluating a public health measure such as water fluoridation when a high proportion (70–80%) of the population receive it; the halo effect (e.g. soft drinks made in a fluoridated area and consumed in a non-fluoridated area and vice versa) is bound to reduce the measured effectiveness. The issues of the impossibility of random allocation of subjects, of blinding the evaluators, and control of confounding factors, were well documented. Methods of expressing dental caries outcomes were discussed: it was commented that the increase in the percentage of people caries-free could be one of the ways to express outcome. He concluded that while the evidence is convincing that water fluoridation and salt fluoridation can be highly effective in reducing the burden of dental caries, little is known about the mechanisms associated with community-level acceptance or rejection of these preventive methods. In an era of alternative sources of fluorides, where individual choice is more apparently available, the processes through which individuals and communities make health-related decisions need to be better understood.

Evaluation of school oral health programmes in Tanzania
Ursuline Nyandindi

Dr U. Nyandindi described a school-based oral health education programme in Tanzania. A manual was produced and used to train teachers who delivered the oral health education. Different strategies for training teachers were experimented in different districts and evaluated by questionnaires. The findings would inform future programmes. Novel features in this study include: teachers inspecting each others' mouths to learn about dental hygiene and oral health; parents as well as pupils participating; integration of oral health programmes into general health promotion (e.g. vaccination, first aid, HIV/AIDS, de-worming), and the children themselves acting as messengers back to families. In Tanzania, several school based oral health projects are now established within the context of the National School Health Programme and these projects are developed in collaboration with the WHO Oral Health Programme at Headquarters. The evaluation of these projects is conducted from quasi-experimental study designs and includes collection of sociological data related to children, parents, schoolteachers, administrators, and oral health promotion facilitators.

Evaluation of mass oral health education programmes: examples from the Love-Teeth-Day programme in China
Ling Zhu

Dr L. Zhu described the Love-Teeth-Day (LTD) programme in China and its evaluation. This is an example of mass health education and its scope is impressive. It began in 1989 as a stand-alone dental health promotion project as it was perceived to be difficult to integrate oral

health into general health promotion. A key organisation has been the National Committee for Oral Health (NCOH) which has been largely responsible for its initiation and organisation. The stratification of responsibilities is important also: the support of the Minister of Health as well as nine government and non-government organisations is strong, as is the support at provincial, district and local levels. About 60% of the population and about 80% of schoolchildren are involved with LTD. In the presentation, Dr Ling Zhu listed the programmes main characteristics: (a) active participation of key VIPs, (b) oral health education and promotion commission, (c) well-functioning organisation which included key people (e.g. celebrities, industry), (d) introducing a different theme each year (e.g. brushing teeth, health through oral health, children, fluoride), (e) the possibility of extending the time period from one day to one month, and (f) the possibility of a 'long march through the provinces' with, perhaps 'gymnastic toothbrushing'. Evaluation has been by structured questionnaires completed by the public and conducted by provincial oral health committees. As given in the abstract, there have been impressive improvements in knowledge, attitudes and behaviour, which were measured in 1989, 1997 and 2000. The inability to attribute these improvements wholly to the LTD programme is recognised as, in this nationwide programme, there is no control group. The resources for this programme are raised from the whole society and no funding is received from government, although they support it strongly.

Oral health promotion programmes for preschool children in China and Hong Kong

Edward Lo

Professor E. Lo described experiences from the oral health promotion programmes for preschool children in China and Hong Kong. Caries experience in the primary dentition is a significant problem and preventive programmes are organised on three levels – primary, secondary and tertiary. In the early 1990s, the focus was on primary prevention with education for teachers, parents and children, and daily toothbrushing with fluoride-containing toothpaste after lunch in kindergarten. More recently, secondary prevention, using topical fluorides to arrest caries, and tertiary prevention, using Atraumatic Restorative Treatment (ART) to restore teeth, have been included. Both process and outcome evaluations have been considered. Process evaluation involved regular focus group discussions with staff and health officials and monitoring the usage of materials and oral health education aids. Outcome evaluation has been conducted by structured questionnaires to teachers and parents to assess changes in knowledge and behaviour, and annual dental examination of children to assess caries experience and status of restorations. The participating children were compared with a control group, and these analyses showed that the three levels of this preventive programme were effective. Professor Lo suggested the need for flexibility in the evaluation, as sometimes there are additional unexpected benefits that should be quantified – in this case it was an increase in the prevalence of arrested caries. However, there was a warning against subjecting

such an unexpected finding to statistical analysis; it was better to describe the occurrence and test the hypothesis in a subsequent study. The sustainability of the programme was reported to be positive, as teachers were able to continue the programme. In discussion, it was pointed out that the process evaluation could be formative and could be fed back to improve the programme – in this case, to investigate parents' willingness to pay for the programme.

Evaluation of community programmes on tobacco induced oral diseases

Kevin Hardwick

Dr K. Hardwick presented an evaluation of community programmes to prevent tobacco-induced oral diseases. Dr Hardwick pointed out the many ways in which smoking can adversely affect oral health – oral cancer and precancer are the most important, but social impacts (tooth discolouration, halitosis and reduction in taste and smell acuity) and other oral diseases (periodontal disease and failure of implants) should not be forgotten. Tobacco is responsible for about 5,600 of the 8,000 deaths from oral cancer per year in the USA. In 1982, the US National Cancer Institute began a major effort to reduce the national prevalence of tobacco use: there are three priorities. First, there are physician and dentist interventions to reduce patient smoking prevalence; second, self-help interventions aimed at helping individuals who wish to quit; and, third, mass media interventions to encourage cessation and prevent tobacco use initiation. The first approach – described under the name COMMIT (Community Intervention Trial for Smoking Cessation) – did not increase the quit rate for smokers. An interesting feature of the study protocol described was the four evaluation measures: outcome (change in smoking behaviour), impact (changes in factors thought to be important in facilitating community-wide smoking behaviours), process (documents the extent of intervention implementation) and economic. The second approach was described under the name TNT (Project Toward No Tobacco Use). This was reported to be 'highly cost-effective'. Recently, it has become clear that policy interventions aimed at changing the social context and general environment in which tobacco is purchased and consumed are more important than delivery of cessation and prevention services.

Evaluation of primary oral health programmes in relation to oral mucosal lesions

Neil Myburgh

Professor N. Myburgh presented an evaluation of primary oral health care programmes in relation to oral lesions, in South Africa. He began by listing oral conditions according to their social impact, prevalence, morbidity and mortality. Those with the highest impact were: oral HIV, oral cancer and oral trauma; while the impact of dental caries and dental fluorosis was low. The ability of health personnel to recognise oral lesions and to respond, treat and/or refer, was discussed. Nationally, regulations for water fluoridation have been approved, but not yet implemented, and a National Oral Health Policy has been presented but awaits approval. Popula-

tion-based initiatives include raising awareness of oral disease risk and appropriate means of oral self-care, integrating oral health policy elements into general health promotion programmes, and to develop collaborative approaches to initiatives for common risk factors (e.g. tobacco, sugar, alcohol, unsafe sex, chronic medication, violence, and vehicle accidents). Programmes include posters, training of health staff, HIV booklets, and research. Evaluation of the HIV/AIDS poster programme indicated positive changes in knowledge and attitudes. The lessons learnt so far are that: progress takes time, outcomes should be assessed not just process, better quality research and evaluation is needed, programmes must be locally contextualised, must extend across sectors of the population, be based on meaningful objectives, and health promotion policies and programmes should be linked.

Programmes for prevention of periodontal disease in adults in Japan

Tatsuo Watanabe

Professor T. Watanabe described the programmes for prevention of periodontal diseases in adults in Japan. He began by emphasising that living to 100 years is not so uncommon in Japan; however, 94% of centenarians are edentulous. Questionnaires showed that eating and talking were important pleasures for them. Research had also shown that people can chew with 20 teeth. From this knowledge, the national 80/20 campaign was launched; first by the Japanese Dental Association in 1990 and then approved by the Ministry of Health and Welfare in 1997. The goal of 80/20 is that 20% of people at the age of 80 years must have 20 or more teeth by 2010. Professor Watanabe said that there had been extensive discussions nationally as to how this could be achieved. It was agreed to target people over 60 years. As periodontal disease was the biggest cause of tooth loss (dental caries accounted for 38% of tooth loss and national surveys between 1957 and 1999 had shown a decline in dental caries experience), it was agreed that prevention of periodontal disease would be the top priority. Professor Watanabe recognised that one problem was the lack of an evidence base for the prevention of periodontal disease: for example, the evidence that toothbrushing prevents periodontal disease is equivocal. So far there have been few evaluations of national preventive programmes. Presumably, the main outcome in this case is 20 teeth at 80 years of age, and this will be recorded in on-going national surveys. It was commented that, in this programme, there seemed to be a welcome shift in emphasis from disease to health. It was a little unclear how well the programme is accepted by those who will implement it (e.g. Japanese dentists). It will be interesting to follow the process – what the dentists will do, and the nature of the collaboration between the dental profession and the oral health industry.

High-risk preventive approaches for control of dental caries in Germany

Annarose Borutta

Professor A. Borutta presented the evaluation of high-risk preventive approaches for the control of dental

caries in Germany. Since 1989, there has been a legal requirement for the organisation, implementation and evaluation of dental caries preventive programmes for schoolchildren in Germany. In 2000, this requirement was extended to include those at high risk of dental caries. Epidemiological evidence has indicated an improvement in the health of both primary and permanent dentitions on a population basis over the period from 1994 to 2000. On a Federal level, the German Academy of Oral Health Promotion has responsibility for these programmes, which involve basic prevention for all children and intensive prevention for children at high risk. In Thuringia, for example, about 16 to 24% of children aged 2 to 12 years were recorded to be at high caries risk. The basic prevention involves health education, toothbrushing with a fluoride toothpaste in kindergarten, and application of fluoride varnish twice a year. The intensive programme involves, in addition to the basic programme, more frequent topical fluoride applications and oral health projects involving healthy breakfasts and education for parents and teachers. So far there has been no systematic evaluation of the high-risk programmes, although such evaluations are planned and will adopt the Donabedian model involving structure evaluation (e.g. has the programme worked in all 'planned structures and facilities'?), process evaluation (e.g. how well/ to what extent have the planned interventions been implemented and why, as well as factors that facilitated or hindered the implementation?), and outcome evaluation (clinical and behavioural outcomes including satisfaction with the programme). Professor Borutta also described the evaluation of a preventive programme for pupils of schools for children with special needs, using the above system of structure, process and outcome evaluation. The programme was highly successful by all measures. However, there would seem to be no economic evaluation. There is a need for evaluation at local level. Resources must be allocated for evaluation. There should be more research on evaluation. Evaluation should be explained more to administrators and professional staff. There should be feedback from the evaluation, changes to the programme if necessary, and regular re-evaluation. This is an example of how important it is to establish a valid information system which matches the oral health promotion initiatives. Also, because all programmes are the same, it is not possible to attribute success proportionally to any part of the programme. However, these extensive schemes would seem to be exclusively dental, with no integration with general health promotion.

Empowerment strategies and process evaluation of oral health promotion for deprived communities in the United Kingdom

Cynthia Pine

Professor C. Pine presented an account of three community prevention programmes in Scotland and northern England. The so-called Tayside Brushing project involved supervised toothbrushing with a fluoride toothpaste in school between the ages of 5 and 10 years. It was a community-based RCT, with allocation to test and control (no brushing in school) groups being made on a school class basis. Both clinical benefit and process were

evaluated. The second project tackled persistent inequalities in child dental health in Asian and white children. The intervention in this project addressed diet and toothbrushing. The third project described oral health programmes organised by the community dental service. This programme was criticised for its diffuse aims and the delivery of multiple messages. In summary, it was concluded that: empowering local people by involving them in delivering the health promotion programmes has clear benefits; empowering local people to set the agenda, design and maintain the programmes is important; evaluation is made easier by appropriate project design and precise aims; and evaluating the outcome of programmes simply using process measures cannot inform on health benefit. Changes in empowerment were evaluated by regular meetings with the toothbrushing supervisors. The Tayside Study is an example of a community trial with key control elements such as examiner blindness and random allocation achieved. Analyses mainly used the child as the unit of analysis; there would seem a need for sound statistical advice to provide guidance for people conducting this type of study where intervention is by cluster. Appropriate statistical methods must be clearly set out since they are necessary at the planning stage for sample-size and power estimations. The issue of contamination of the control group (because it was in the same school as the study group) was discussed. However, the evaluation showed the programme to be effective; if there had been contamination, effectiveness would have been underestimated. Sustainability was evaluated after completion of the programme: the difference in caries experience of the study and control groups continued to widen after 30 months. In all three examples, interventions were aimed only at dental health and the common risk factor approach was not used.

Community Care Model for Oral Health in Thailand *Prathip Phantumvanit*

Professor P. Phantumvanit described community oral health care models in Thailand. The background for these programmes was: the high level of oral disease and dental plaque, the need for outreach rural programmes, the existing services (including equipment) were expensive, and there was a lack of oral health care manpower. Health Maintenance Units were established at village level, with villagers being trained in simple tasks such as examination by health personnel, education by schoolteachers, and dental scaling by village scalars. Health Restorative Centres were established at the province level where dental nurses provide simple treatment and dentists more complicated treatment. An important element was community participation. This involved training and discussions with teachers and health care volunteers, agreement on financing, and arranging group travel for treatment at the Health Restorative Centres. Evaluation was at several levels: dental health was assessed every five years using WHO survey methods (this included caries, oral hygiene and gingival health). Process evaluation examined the level of community participation and the time used in various tasks – this allowed examination of cost-effectiveness. It was pointed out that the process evaluation was very useful in planning schedules.

Professor Phantumvanit highlighted the constraints and difficulties in the evaluations. These included the reliability of data collection, dropouts from the evaluation, the considerable time needed for evaluation and data analysis, and the difficulty of interpreting the data for use in future planning. At present, the programme is restricted to Chiangmai. The extent to which the findings could be extrapolated from Chiangmai to the rest of Thailand was discussed, and it was concluded that the model, but not the village scalars, could be used elsewhere. It was also concluded that, in this situation, supervised toothbrushing was not as effective as had been expected. This project is another example of the value of empowerment of local people in local health promotion schemes.

Analysis of experiences from programme evaluation – strengths and weaknesses

Richard Watt

Dr R. Watt provided an analysis of experiences from programme evaluation. The importance of evaluation was pointed out and the need for development in evaluation. At present there was limited awareness, few resources for evaluation, lack of support and a sense of isolation by the evaluators, there was often poor evaluation design, inappropriate outcomes and unrealistic timescales. WHO had provided guidance on intervention design in 1998 which emphasised the following elements: they should be empowering, holistic, equitable, sustainable and multi-strategy. Interventions should be targeted at the main determinants of disease, not just the individual. Evaluation should be set in the context of the study. Dr Watt then discussed the analytical framework – what is the best quality design? He listed essential strengths in design as: strong clinical base, defined timescale for evaluation, appropriate design (including limitations of RCTs), multiple methods of evaluation, links with general health activity, different levels of activity (e.g. national and local), importance of setting goals and objectives, policy agenda (e.g. smoking, diet), and measuring change in inequalities. He listed potential weaknesses as: emphasis on clinical disease, reliance on self-reported outcomes (are they valid and reliable?), limited focus on policy measures and equity, uncertainty about sustainability of outcomes, limited evidence on cost-effectiveness, and limited community input.

Summary of discussion

The following topics were subject for discussion: planning interventions – understanding the theory base; roles and responsibilities of academics and practitioners; design of evaluation – the need for a pluralistic approach; outcomes and processes; resources; linkage; dissemination of good practice. The outcome of the discussion is summarised under five headings.

The need for evaluation of community-based oral disease preventive programmes and health promotion programmes

- There is a need for an evidence-based approach to oral health promotion.
- There is a difference between oral health promotion

and disease prevention, and evaluations will differ accordingly.

- There is only a need for a programme if a problem has been identified. Then the evaluation must provide an answer to what is the best way to deal with this problem.
- For ethical reasons, studies should not be done if it is reasonably certain that the intervention will be effective: public co-operation is a limited resource.
- There is a need to evaluate health outcomes which are important to decision-makers.
- There is a need to identify very clearly that at least 10% of the programme budget is allocated for evaluation. Too often, evaluation is perceived as unimportant.
- The purpose and objectives of evaluation needs to be explicit.

Planning the evaluations

- The difference between a RCT and a community trial is that the former examines effectiveness under highly controlled conditions and the latter examines application.
- Routine data should be used to the maximum.
- There is a need to collaborate between groups of evaluators, including internationally.
- There is a need to translate outcomes into terms which decision-makers can understand.
- There is a need to give attention to defining terms to assist those undertaking systematic reviews.
- Oral health programmes should be linked to the main health concerns of the community by using a common risk factor approach to target oral and general health problems.
- Criteria are needed for ending the programme – e.g. has the aim been achieved? is there no chance of it being achieved?
- Intensive evaluation should not be undertaken for routine projects – a correct balance is required.
- Selection of interventions will depend upon: the evidence base, what is culturally appropriate, and what is possible within the available resources.
- There have been plenty of examples of clinical outcomes and their measurement but less on QALYs (Quality Adjusted Life Years) which are used extensively in general health promotion analyses.
- Both clinical outcomes as well as impact on oral health related quality of life, need to be evaluated. The evaluation needs to be appropriate to the problems targeted.
- Methods for measurement in oral health studies needs to be developed further and documented. The WHO needs to take a lead by updating the 1997 edition of oral health survey basic methods.
- Managers are often interested in outcomes different from what might be expected and we should be aware of this possibility.
- The method of choosing a sample is very important. If a sample is too large there is the danger of losing control of the sample. The possibility of contamination between study and control groups is significant and must be addressed.
- When designing a study, the need for, and choice of,

control or comparison groups need to be considered carefully. There are difficult ethical questions regarding choice of a control group, and there are difficulties in using historical controls.

Personnel

- Particularly in the area of oral health promotion, it is important to link in public health personnel, clinicians, epidemiologists, social scientists, the general public, and politicians. The results of evaluations must be accessible and clear to all.
- Personnel must be trained in evaluation.
- There is a need to address the concerns of policy-makers as well as the people in the community. Because of this, they should be involved.
- There is a specific need for involvement of health sociologists, health psychologists and statisticians.

Equity

- In many countries and communities, equity is a very important issue – programmes must be equitable.
- There is considerable diversity in health and resources between countries which must be addressed. Relevant outcomes may be very different between countries and cultures.

WHO approaches to evaluation of community/national health programmes

Desmond O'Byrne

Dr D. O'Byrne outlined the WHO approaches to evaluation of national and community health programmes. He emphasised the value of the common risk factor approach. The example he presented was 'DDT' – Diet, Dirt and Tobacco. Successful evaluations require that the appropriate infrastructure is in place, and this implies that there is sufficient 'capacity'. Evaluation must be an integral part of community disease prevention and health promotion programmes. Dr O'Byrne described the disease pathway, moving from the 'non-modifiable factors' (such as age, gender and genes) to 'intermediate risk factors' (such as blood lipids, hypertension) together with 'behaviour risk factors' (such as tobacco use, diet and physical activity) and socio-economic, cultural and environmental influences to the disease endpoint (such as CVD and cancers). Each of these should be considered for evaluation.

Principles of public health programme evaluation: designs, outcome, interventions and processes, monitoring and implementation

Kathy Douglas

Dr K. Douglas listed the principles of public health programme evaluation with special emphasis on the value of public health surveillance data. It is important, though, that public health surveillance data actually leads to public health action. Public health surveillance provides an important "evidence-based" foundation for programme and policy development. The goal should be to link data collection to data use. However, surveillance can be infrequent, too slow and inconsistent. Given the potential problems with surveillance, caution must be exercised when using such information as a source of data for

evaluation. Surveillance must be planned so that it can satisfy the needs of evaluation. Surveillance could be considered a system – an information system and a learning system. She presented obesity data from the USA as an example, indicating the importance of trends over time. Such data can be used at a sub-national level to inform local health promotion programmes. While surveillance data can be used to evaluate interventions, there are limitations. For example, traditional research designs may fail to capture the complexities of today's problems. Complex health issues cover many inter-related disciplines (e.g., sociology, psychology, epidemiology, medicine, etc.). Demonstrating behavioural change takes time and success is often judged by positive results. Funding for evaluation is not always available, nonetheless, evaluation remains critical and should be undertaken with care and with high quality standards (such as utility, feasibility, propriety and accuracy).

The WHO study on the effectiveness of community based programmes for NCD prevention and control

Ruitai Shao

Dr R. Shao described the development of 'quasi study design'. He indicated five areas for consideration, with two main divisions – intervention evaluation and process evaluation. The former might be undertaken every five years but the latter is likely to be considered every year. The process evaluation should lead to a reassessment of the intervention, which might then be changed during the study.

Study design and statistical aspects in community oral health programmes

Kaj Stoltze

Professor K. Stoltze presented the differences in statistical analyses of randomised controlled trials (RCT) and community trials. The RCT is a very good design for control of confounders provided successful outcome of randomization and high participation rate in the study at baseline and at follow-up. Randomization and highly controlled conditions are most difficult to establish in communities. In addition, the RCT based evaluations have limitations as regards generalization of findings and activities implemented under such programmes are seldom applicable to communities at large. The RCT is relevant in clinical trials but is very often not appropriate for the evaluation of community preventive and health promotion programmes. Community trials could be externally controlled, self-controlled, or parallel controlled – the last is the best design. Understanding of cluster design and analysis is growing. Techniques are available for ensuring powerful sample sizes and follow-up of "natural" social groups, for example children attending a school class, workers employed in an industry, or people living in certain residential areas. Criteria are also developed that clusters may provide for parametric statistical analysis, based on sufficient minimum number of participants in relevant sub-population groups. Cohort design was discussed, but was not generally recommended for long-term evaluation. Long-term evaluation of national oral health programmes would mostly be based on time-series analysis (Petersen *et al.*, 2004).

Introduction to working groups

Dr P.E. Petersen presented information about the special features of oral health programme evaluation within the context of diet, nutrition and chronic disease prevention. Oral disease is considered one out of six components of major chronic diet-related diseases and the recently published WHO Technical Report 916 (WHO, 2003b) describes how preventive programmes may be effectively coordinated through application of the common risk factor approach. Countries are now challenged as regards policy development, setting of goals, implementation of activities towards control of disease through diet, and evaluation of accomplishment of goals and policies at national and subnational/community levels. This was followed by Dr S. Kwan who introduced a framework for evaluation, as used in the Health Promoting School Initiative (WHO, 2003c). The WHO Oral Health Programme has developed guidelines for organization of school-based oral health promotion and disease prevention and criteria for evaluation of such programmes are given. The levels of interest in school health evaluation relate to process and outcome evaluation but also to policy analysis. Three main questions were posed: How can we ensure that policies and programmes are implemented effectively? How do we evaluate the policies and monitor activities? What are the indicators for outcome evaluation?

Attendees were then allocated into two Working Groups. The following topics were considered by each group:

Working Group 1: Quality Improvement: Evaluation methods and measures

- Intervention planning: building evaluation into the planning process, consider range of strategies available
- Evaluation design and methods: options available, what is best? how decide? Timescale required?
- Evaluation measures: outcomes and processes – strengths and limitations of clinical measures? Other options available? What is most appropriate?
- Resources: what resources are required for evaluation? What is already available? What is needed?

Under 'intervention planning', there were a range of strategies and it was important to develop a standard. It was important to distinguish between interventions known to be effective compared with those not known to be effective. Under 'evaluation design and methods', it was important to be situation-specific. There was a need to distinguish between disease prevention and health promotion, although they do overlap. There has been a trend from recording overt disease to recording earlier stages. Post programme evaluation should be undertaken. Under 'evaluation measures', quality of life measures need to be developed. Disease measures are better developed but may not be the most important outcome. Under 'programme implementation analysis', this must be continuous, and it is necessary to monitor the process and judge efficiency.

Working Group 2: Developing evaluation capacity: Translating ideas into action

- Capacity building: need for training oral health

professionals in evaluation methods – how should this be done? What is already available?

- Community involvement: who should be involved in evaluation? What role do the community have in this?
- Partnership working: how can academics and health providers work together to share expertise? What can we learn from other disciplines? What role do national decision makers have to play?
- Collaboration: is there a role for better international joint working? What are the options available? How can models of good practice be disseminated and communicated better?

There was a need for different levels of evaluation, involving different types of people, and building capacity at different levels. Appropriate levels of training should be included within the process of evaluation to increase capacity; academic staff may be involved in training. It is important, also, to involve the community in evaluation; a clearly defined steering group will be required.

A general discussion followed and the key points and recommendations from the Workshop are summarized in the following sections.

Summary of key issues

- While the design and conduct of RCTs are well documented, the design and evaluation of community oral disease preventive programmes and oral health promotion programmes are much less clearly defined. Subsequently, there is a danger that the conduct of such programmes will be inappropriately evaluated in systematic reviews.
- Community oral disease preventive programmes and health promotion programmes are different in many aspects of design, conduct and evaluation. How they differ needs clarification.
- There are no clear models in general health promotion to follow.
- Statistical analysis in one form may be appropriate in the evaluation of community oral disease prevention programmes, but another form may be required in the evaluation of health promotion programmes.
- Unlike the situation in RCTs, interventions may be changed during the course of community preventive or health promotion programmes, in the light of on-going process evaluation.
- Evaluation of interventions could use routinely collected surveillance data. Surveillance methods should be developed and used with this in mind.
- Evaluation of disease outcomes is common, and useful, but consideration should be given to intermediate outcomes (which may be risk factors and often show change earlier than disease) and to measurement of health.
- There is a need for more research into appropriate outcomes for the evaluation of the effectiveness of community preventive programmes and oral health promotion programmes.
- The importance of evaluation is often underestimated. At least ten per cent of the programme budget should be allocated for evaluation.
- Process evaluation is poorly understood and prac-

tised less often than intervention evaluation. Its role needs to be defined clearly and methods used should be developed and recorded. Process evaluation is likely to be required throughout the programme, although assessment of the programme as a whole is required at completion of the programme. In contrast, intervention evaluation takes place principally at the end of the programme, or even later.

- Because of the variety of methods involved in intervention evaluation and process evaluation, a variety of skills will be required. A team with appropriate skilled staff will be required and they should have clearly defined roles.
- Training is required to develop the above skills. Centres of expertise should consider increasing this skills capacity as one of their functions.
- WHO Collaborating Centres could have a role in promoting good practice, training and encouraging collaboration between teams throughout the world.

Recommendations

- WHO should publish a document which will provide guidance on the design, conduct, and especially the evaluation, of community oral disease prevention programmes and oral health promotion programmes.
- Evaluation of community oral disease prevention and oral health promotion programmes should integrate with general evaluation of health programmes.
- Recognising that there is much uncertainty concerning appropriate designs and evaluation of community preventive programmes and oral health promotion programmes, research should be funded and undertaken to examine these issues in order to improve evaluation.
- Appropriate WHO Collaborating Centres should assist the WHO Oral Health Programme in promoting good practice in design and evaluation, within their spheres of influence.
- Established centres of expertise in this field should seek to increase capacity of staff able to undertake community oral disease prevention studies and oral health promotion programmes. Such centres should seek to train staff not only from that country but also from countries in need of such expertise.
- WHO should, after a suitable period, during which progress is being made in developing evaluation methods, hold another workshop with the aim of improving the guidelines given in the first WHO document mentioned above.
- Centres undertaking systematic reviews should consider the guidelines given in the proposed WHO document when defining their evaluation criteria.

Conclusion

Dr P.E. Petersen provided a summary of the situation so far. He said that the WHO intends to provide guidelines for programme evaluation. There is a logical progression from realisation of the problem, to a decision on the intervention, formulation of objectives and goals, to the application of an appropriate evaluation design. Process

evaluation and implementation analysis should be carried out. He questioned the RCT was a suitable gold standard in community health programme evaluation. In addition, we should be concerned with quality of life rather than just disease outcomes. Outcome measures might include behavioural variables, self-care and indicators of empowerment. Capacity building is important in order to sustain programmes, and to encourage and enable expansion of successful programmes. The infrastructure needed in a project is often forgotten but should be measured and reported. The value of surveillance programmes, which have been encouraged by WHO for many decades, should be considered. Guidelines need to be applied. It is the role of WHO to produce guidance to enable national and local workers to choose the most appropriate method.

References

- Brown, L. (1994): Research in dental health education and health promotion: a review of the literature. *Health Education Quarterly* **21**, 83–102.
- Nutbeam, D. (1998): Evaluating health promotion – progress, problems and solutions. *Health Promotion International* **13** (1), 27–44.
- Petersen, P.E. (1989): Evaluation of a dental preventive program for Danish chocolate workers. *Community Dentistry and Oral Epidemiology* **17**, 53–59.
- Petersen, P.E. and Peng, B. (2004): Effect of a school-based oral health education programme in Wuhan City, People's Republic of China. *International Dental Journal* **54**, 33–41.
- Petersen, P.E. (2003): The World Oral Health Report 2003: continuous improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology* **31** (Suppl. 1), 3–24.
- Petersen, P.E., Kjöllér, M., Christensen, L.B. and Krstrup, U. (2004): Changing dentate status of adults, use of dental health services, and achievement of national dental health goals in Denmark by the year 2000. *Journal of Public Health Dentistry* **64**, 127–135.
- Protheroe, L., Dyson, L., Renfrew, M.J., Bull, J. and Mulvihill, C. (2003): *The effectiveness of public health interventions to promote the initiation of breastfeeding*. London: Health Development Agency.
- Puska, P. (2000): Do we learn our lessons from the population-based interventions? *Journal of Epidemiology and Community Health* **54**, 562–563.
- Schou, L. and Locker, D. (1994): *Oral health: A review of the effectiveness of health education and health promotion*. Amsterdam: Dutch Centre for Health promotion and Health Education.
- Sprod A, Anderson R, and Treasure E. (1996): *Effective oral health promotion. Literature Review*. Cardiff: Health Promotion Wales.
- Watt R, Fuller S., Harnett R, Treasure E, and Stillman-Lowe C. (2001): Oral health promotion evaluation – time for development. *Community Dentistry and Oral Epidemiology* **29**: 161–166.
- World Health Organization (1986): *Ottawa Charter for Health Promotion*. Geneva: World Health Organization.
- World Health Organization (1998): *Health promotion evaluation: Recommendations to policy makers*. Copenhagen: World Health Organization Regional Office for Europe.
- World Health Organization (2001): *Evaluation in health promotion. Principles and perspectives*. Copenhagen: World Health Organization Regional Office for Europe.
- World Health Organization (2003a): *The World Oral Health Report 2003*. Geneva: WHO, 2003.
- World Health Organization (2003b): *Diet, Nutrition and the Prevention of Chronic Diseases. Report of a Joint WHO/FAO Expert Consultation*. WHO Technical Report Series 916. Geneva: WHO.
- World Health Organization (2003c): *Oral health promotion: an essential element of a health-promoting school*. WHO Information Series on School Health, Document Eleven. Geneva: WHO.

Oral health should become a model in health promotion and disease prevention.

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