

Oral health information systems — towards measuring progress in oral health promotion and disease prevention

Poul Erik Petersen,¹ Denis Bourgeois,¹ Douglas Bratthall,² & Hiroshi Ogawa¹

Abstract This article describes the essential components of oral health information systems for the analysis of trends in oral disease and the evaluation of oral health programmes at the country, regional and global levels. Standard methodology for the collection of epidemiological data on oral health has been designed by WHO and used by countries worldwide for the surveillance of oral disease and health. Global, regional and national oral health databanks have highlighted the changing patterns of oral disease which primarily reflect changing risk profiles and the implementation of oral health programmes oriented towards disease prevention and health promotion. The WHO Oral Health Country/Area Profile Programme (CAPP) provides data on oral health from countries, as well as programme experiences and ideas targeted to oral health professionals, policy-makers, health planners, researchers and the general public. WHO has developed global and regional oral health databanks for surveillance, and international projects have designed oral health indicators for use in oral health information systems for assessing the quality of oral health care and surveillance systems. Modern oral health information systems are being developed within the framework of the WHO STEPwise approach to surveillance of noncommunicable, chronic disease, and data stored in the WHO Global InfoBase may allow advanced health systems research. Sound knowledge about progress made in prevention of oral and chronic disease and in health promotion may assist countries to implement effective public health programmes to the benefit of the poor and disadvantaged population groups worldwide.

Keywords Oral health; Information systems/organization and administration; Dental health surveys; Health status indicators; Risk factors; Databases, Factual; Epidemiologic surveillance/methods; National health programs (*source: MeSH, NLM*).

Mots clés Hygiène buccale; Système information/organisation et administration; Épidémiologie dentaire; Indicateur état sanitaire; Facteur risque; Base données factuelles; Surveillance épidémiologique/méthodes; Programme national santé (*source: MeSH, INSERM*).

Palabras clave Salud bucal; Sistemas de información/organización y administración; Encuestas de salud bucal; Indicadores de salud; Factores de riesgo; Bases de datos factuales; Vigilancia epidemiológica/métodos; Programas nacionales de salud (*fuentes: DeCS, BIREME*).

Arabic

Bulletin of the World Health Organization 2005;83:686-693.

Voir page 691 le résumé en français. En la página 692 figura un resumen en español.

Introduction

WHO has a long tradition of epidemiological survey methodology and surveillance in oral health. The so-called WHO Global Oral Health Data Bank was established in 1967; the bank emerged from the gathering of information from surveys on the growing burden of dental caries among children, particularly notable in industrialized countries. Most of the surveys carried out in these countries were initially motivated by the need for planning of oral health services or organization of public health intervention programmes. Over the past decades, WHO has encouraged Member States to report information on disease level for making international comparisons, by use of a standardized methodology (1–4). For comparison between countries, certain indicator age groups are suggested: 5–6 years, 12 years, 15 years, 35–44 years and 65 years or more (or 65–74 years), and a simplified pathfinder sampling methodology (convenience sampling) has been developed for

urgent data collection in countries or settings where probability sampling is not possible. To ensure data of high validity and reliability, WHO has designed basic instruments and record forms for use in the collection of clinical data. Standard criteria for recording clinical conditions are recommended, focusing on dentition status, prosthetic status and needs, dental caries and dental treatment needs, developmental anomalies of teeth, periodontal disease and treatment needs, oral mucosal lesions and oral precancer/cancer. Special attempts have been made to obtain high quality data through specification of clearly defined examination procedures, training, and calibration trials for assessment of intra- or inter-examiner variability (5).

Tools for oral epidemiology have been instrumental in the establishment of oral health information systems worldwide. The objectives of the present report are to outline experiences of use of such systems at the global, regional and national levels, and to describe the efforts made in developing

¹ Global Oral Health Programme, Department of Chronic Disease and Health Promotion, World Health Organization, 1211 Geneva 27, Switzerland. Correspondence should be sent to Dr Petersen at this address (email: petersenpe@who.int).

² WHO Collaborating Centre for Education, Training and Research, Malmö, Sweden.

Ref. No. 04-020321

(Submitted: 8 June 2005 – Final revised version received: 28 June 2005 – Accepted: 28 June 2005)

expanded systems for the surveillance of oral disease and risk factors within the new WHO STEPwise approach for measuring progress in prevention of chronic disease and promotion of health.

Oral health information systems at the global and regional levels

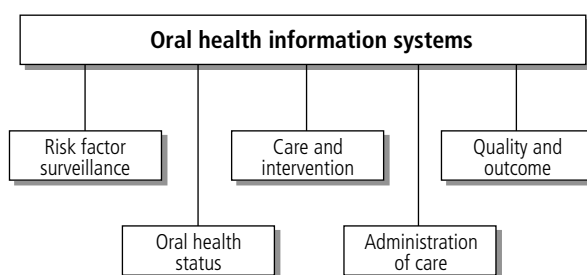
Data on oral health status for monitoring disease patterns and trends over time represent an essential component of oral health information systems (Fig. 1). In addition to epidemiological information, decision-makers and health planners need information about risk factors to oral health, oral health-related quality of life, service coverage and utilization of oral health services, intervention and care, administrative procedures, and quality of care and services.

An important public health rationale of the WHO Global Oral Health Data Bank has been to provide for epidemiological analysis of changing oral health status, to highlight how such changes might be related to new risk profiles in countries or regions, and to assess the impact of development or adjustment of oral health systems. In parallel to the continuous update of the Global Data Bank, similar databanks have been developed for the WHO Regional Offices (6, 7) based on common procedures for data collection. Time-series analyses conducted on the basis of the global and regional data available show improved oral health status in children in several industrialized countries, as measured by a decline in the average number of teeth affected by dental caries at the age of 12 years (8). This trend is partly a reflection of the introduction of preventive oral care programmes in these countries. In contrast, information is available on the increasing prevalence of dental caries in developing countries over recent years, due to the increasing consumption of sugars and lack of preventive programmes.

In 1996, WHO established an Internet online oral health database, supported by the WHO Collaborating Centre in oral health at Malmö University, Sweden, and the University of Niigata, Japan. The so-called WHO Oral Health Country/Area Profile Programme (CAPP) (9) aims at presenting information on oral diseases in individual countries, including data on oral health services, programmes, dental education and human resources. Data are obtained from the scientific literature, WHO, and ministry of health reports. The database is designed for easy use and information is targeted to oral health professionals, policy-makers, health planners, universities and the general public. The user can select a country and in addition to country data on oral health, the CAPP provides a databank of ideas and experiences in relation to oral health programmes as well as facilitating access to other important databases (e.g. PubMed and WHO technical programmes).

The WHO European Health for All Target 31 aimed at the improvement of quality of health care by use of appropriate health care technology and the provision of health information systems (10). In the 1990s the WHO Regional Office for Europe developed initiatives to encourage Member States to harmonize their information systems in oral health. Many east-European countries traditionally recorded the number and type of services provided (e.g. the number of teeth extracted and number of dental fillings) but not the outcomes, i.e. whether interventions contributed to health or not. Some western European countries have established outcome-oriented information systems, but neglected the processes. The so-called

Fig. 1. Components of oral health information systems



WHO 05.102

WHO European ORATEL project (Use of Telematics in Oral Health) (11) sought to stimulate the development of more comprehensive data systems for improving the quality of oral health care and systems. Software tools were designed that incorporated numerous quality indicators including oral health status, treatment procedures/intervention, follow-up/recall visits, patient satisfaction and patient administration (12).

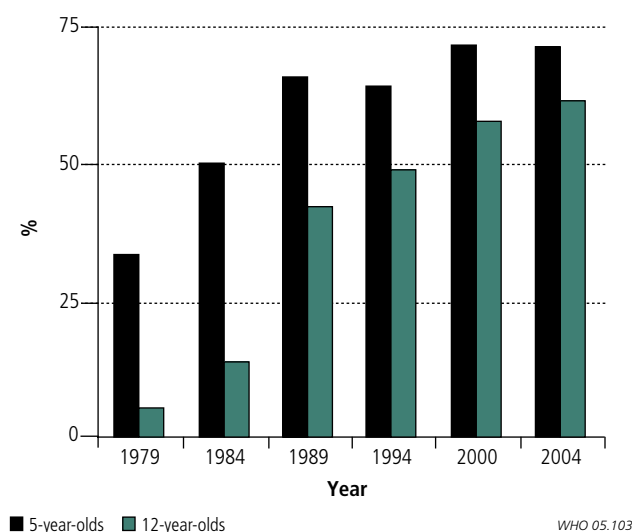
In recent years, the European Commission has supported the development of a set of European Global Oral Health Indicators (13). The objectives of this international project are to help to identify basic oral health indicators for a European surveillance system and thereby provide a basis for comparisons between countries of achievements by oral health systems in the region. A core group of oral health indicators is being designed for integration into national health information systems. In particular the indicators will focus on health status, morbidity and oral function, behavioural determinants, oral health delivery models and outcomes, and oral health-related quality of life.

Country-based systems

For effective surveillance, WHO has suggested that regular clinical oral health surveys be conducted every 5–6 years in the same community or setting. In the developing countries of Africa, there has been little systematic survey activity over the past years. However, some countries, such as Niger (14) and Senegal (15) have conducted regular surveys to ascertain the negative impact on oral health of changing lifestyles and living conditions, although no systematic oral health programmes have yet been introduced. In Madagascar, an oral health information system has been established (16) based on a scheme of regular national oral health surveys conducted with the purpose of evaluating the organization of oral health care programmes in schools and of community-oriented preventive oral care programmes for the adult population.

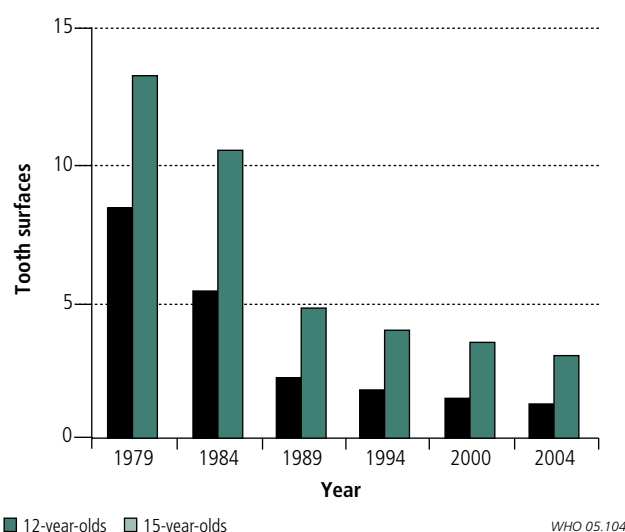
In a few countries in Asia, regular surveys for the evaluation of public health initiatives have been undertaken. In Thailand, the Ministry of Health has conducted regular surveys every 5 years since 1984 (17). Despite the many public health efforts aimed at the prevention of oral disease, the increasing consumption of sugars continues to have a negative impact on oral health, and the amount of dental caries tends to increase, particularly in young children. In China, the regular surveys carried out by the National Committee for Oral Health of the Ministry of Health have highlighted the positive public health benefits from implementation of national mass health promotion programmes (18–20).

Fig. 2. Percentages of 5- and 12-year-olds free of dental caries in Denmark in selected years (28)



WHO 05.103

Fig. 3. Mean number of tooth surfaces affected by dental caries among 12- and 15-year-olds in Denmark in selected years (28)



WHO 05.104

Certain Latin-American countries have introduced national programmes of salt fluoridation for the prevention of dental caries, and regular oral health surveys have demonstrated a decline in dental caries experience of the child population (21, 22).

Several industrialized countries have established regular oral health surveys for surveillance. In the United Kingdom, systematic surveys of dental caries in young children and adolescents are conducted by the British Association for the Study of Community Dentistry (23, 24) and the improvement in the oral health of the child population is documented. A series of surveys on dental health status of the adult population undertaken in the United Kingdom has revealed that dentate status of adults has changed markedly as more individuals preserve their natural teeth at functional level (25). In Scandinavia, oral health information systems are an integral part of health service systems. Systems for reporting on the oral health status of the child population provide information on an annual basis about the continuous improvement of oral health (26–28); databases are true epidemiologically (i.e., population based) as participation in public dental care programmes is nearly 100%. In Denmark, an advanced computer-based record system has been established for children (Fig. 2 and Fig. 3) (28) whereas surveillance of the oral health of the adult population is based on integrated, chronic disease questionnaire schemes (Fig. 4) (29). In Germany, a series of standardized surveys of oral health have been conducted on random samples of children, adolescents, adult age groups and elderly people (30). The surveillance data comprise clinical data and information on use of oral health services and self-care. The tradition of surveillance is less developed in southern and eastern Europe but such schemes have been established recently in Hungary (31), Poland (32) and Portugal (33).

From health surveys to surveillance of risk factors

Surveillance underpins public health action by linking data with health policies and programmes. Surveillance provides ongoing (i.e. continuous or periodic) collection, analysis and

interpretation of population health data, and the timely dissemination of such data to users (34). Properly conducted, surveillance ensures that countries have the information they need to control disease immediately or to plan strategies to prevent disease and adverse health events in the future. The goal is to assist governments, health authorities and health professionals in formulating policies and programmes to prevent disease and to measure the progress, impact and efficacy of efforts to control diseases that are already affecting their populations.

The distribution of the major common risk factors for chronic diseases within the population is the key item of information required by countries for planning health promotion and primary prevention programmes. Because of the relatively long time that elapses between exposure to a causal agent and manifestation of disease, monitoring and surveillance of chronic diseases can be a costly exercise involving disease registers and legislation to ensure disease reporting. For this reason most of the focus for surveillance of chronic disease, including oral diseases, involves surveillance of modifiable risk factors. As emphasized by the *World oral health report, 2003* (8), the common risk factors approach is a rational basis both for the prevention of oral diseases and for promoting oral health, and the risk factors need to be considered for future oral health information systems. Furthermore, the relevance of less costly, but practical questionnaire-based tools for oral health surveillance has been suggested recently by the US Centers for Disease Control and Prevention (35).

WHO surveillance tools

Based on standardized survey instruments and agreed-upon indicators, definitions, methods and sampling principles, WHO has developed major new tools for chronic disease surveillance: the STEPwise approach to surveillance (STEPS) and the WHO Global InfoBase (36–38). Both have relevance to the oral health data already collected and stored in the Global Oral Health Data Bank as well as the potential for obtaining new data on core oral health indicators by additions to ongoing country-level surveys or by inclusion of appropriate questions in surveys on general health and chronic disease risks.

The WHO global strategy for chronic disease surveillance has several components (36–38). These include:

- identification and description of common risk factors using recommended WHO definitions;
- a coordinated approach to surveillance of risk factors that relies on scientific principles and that is sufficiently flexible to meet local, national and international needs;
- technical materials and tools, including training, to support the implementation of surveillance; and
- effective communication strategies for providing data to those involved in the design of policies and intervention programmes, potential funders and the general public.

The STEPwise approach allows for the development of an increasingly comprehensive surveillance system, adapted to local needs and resources. By using the standardized protocols for data collection, all countries can use the information not only for monitoring disease trends within a country, but also for comparisons between countries. The framework underlying STEPS is shown in Fig 5. There are three distinct levels of risk factor assessment:

- Step 1: information obtained using questionnaires;
- Step 2: physical measurements; and
- Step 3: biochemical measurements.

In addition, there are three modules involved in describing each risk factor, namely, core, expanded core, and an optional set of indicators.

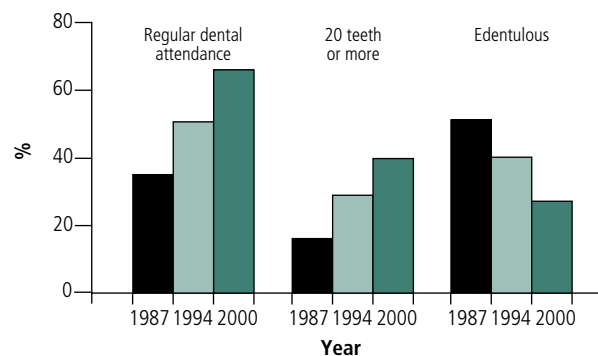
Surveillance of risk factors

Step 1 surveillance is based on self-reported information. The core module of Step 1 comprises markers of socioeconomic status, data on tobacco and alcohol use, measurements of nutritional status and physical activity, all based on standard WHO definitions (37). Step 2 adds simple physical measurements (e.g. blood pressure, height, weight and waist girth) to the Step 1 data. Steps 1 and 2 are desirable and appropriate for most countries. Step 3 incorporates data collection at levels 1 and 2, but adds measurements obtained from biochemical analysis. WHO does not recommend such advanced measurements for countries with limited resources.

Oral health indicators within the frame of STEPS

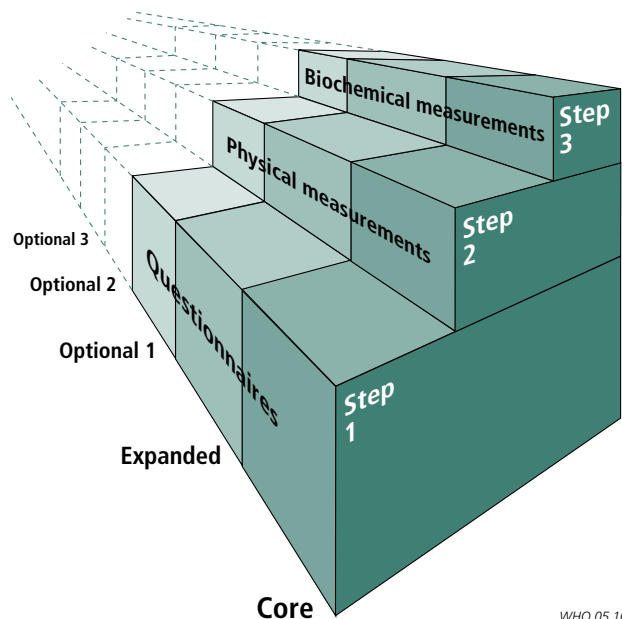
Recently, the WHO Oral Health Programme designed a risk factor model (8) which provided the conceptual framework for inclusion of oral health modules within STEPS (Fig. 6). The indicators comprise both determinants of health and common modifiable risk factors such as diet/nutrition, tobacco use and excessive alcohol consumption. In addition, oral hygiene practices and use of available oral health services are considered. Most of the risk indicators are Step 1 variables (i.e. ascertained by questionnaire), but oral health also lends itself to Step 2 (physical measurements made during clinical examination). Step 3 measurements in oral health may imply laboratory tests such as microbial assessment (e.g. *Streptococcus mutans*) or buffer capacity of saliva. The WHO Oral Health Programme has now developed standardized questions for obtaining Step 1 data (Fig. 7) and the WHO Oral Health Surveys Basic Methods manual for oral epidemiological surveys (4) is being updated and modified to allow for collection of data at the Step 2 level.

Fig. 4. Percentages of 65–74-year-olds in Denmark who have regular (annual) dental attendance habits, functional dentition (20 teeth or more), and without natural teeth (edentulous), by year of observation (29)



WHO 05.105

Fig. 5. Framework for the WHO STEPwise approach to chronic disease surveillance (36)



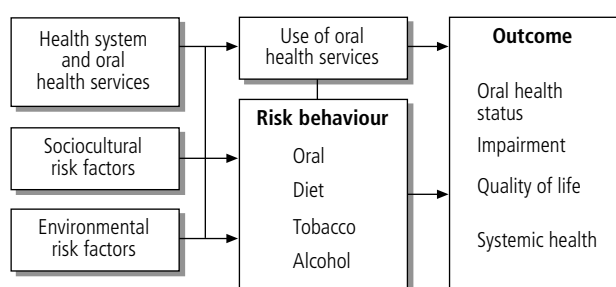
WHO 05.106

These oral health modules are currently being field-tested in several developing and developed countries. The results may help to identify variables to form part of the core, expanded core and optional modules for countries. An additional simplified questionnaire for assessment of the oral health system has been prepared to examine systems orientation (i.e. emergency or curative care only, prevention and health promotion).

The WHO Global InfoBase

To predict the future burden of chronic disease, including oral disease, in populations, as well as to identify potential interventions to reduce the burden these diseases will impose in the future, data collection and reporting standards are needed to ensure that the data can be used effectively to inform policy, prevention and control activities for health. The WHO Global InfoBase stores the country data being collected as part of the

Fig. 6. Risk factor model for the promotion of oral health (8)



Petersen, WHO 2002.

WHO 05.107

STEPS approach. The data entered may also derive from a range of sources such as reports published in the literature or ministry of health reports. The database brings together existing country-level data stratified by age and sex, with complete source and survey information. The InfoBase makes use of the compiled data to produce comparable country estimates for risk factors and selected diseases.

The WHO Global Oral Health Data Bank was recently updated on the basis of the available national reports (ministry of health and other), dental scientific literature (obtained through PubMed), information available in the Country/Area Profile Programme (CAPP) (9) and data provided by WHO Collaborating Centres and the International Agency of Cancer Research (39). The updated information on dentate status, dental caries, periodontal disease and incidence of oral cancer has now been entered into the WHO Global InfoBase and the databank will allow for cross-analysis of oral health status with general health (chronic disease) and common risk factors (Table 1). Such analysis will provide valuable information for integrated prevention of chronic disease and for the integration

of oral health promotion into national and community health programmes. Systematic surveillance data also allow for time-series analysis of oral disease, chronic disease and common risk factors, and the health information system may also provide a means for systematic evaluation of the effect of public health intervention programmes.

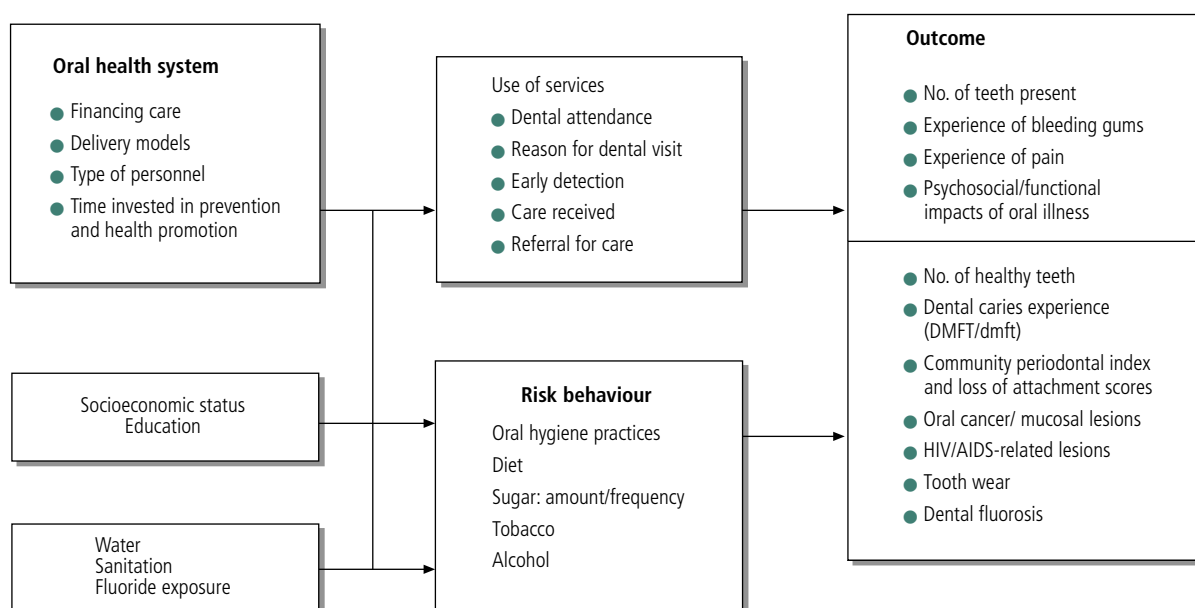
Measuring progress and achievement of goals for oral health

Oral health information systems are important in the evaluation of public health initiatives and programmes and for the assessment of achievements of goals for health. The relevance of oral health goals was first emphasized in 1979 by WHO as part of the global strategy for Health for All by the year 2000 (40). Jointly with the World Dental Federation (FDI), WHO advocated that the following goals be achieved by the year 2000 (41):

- At least 50% of children aged 5–6 years should be free of dental caries.
- On average, no more than three DMFT (Decayed, Missing due to caries, and Filled Teeth) should be found in children aged 12 years.
- Eighty-five per cent of the population should have all their teeth at the age of 18 years.
- There should be a 50% reduction in edentulousness among 35–44-year-olds, compared with the 1982 level.
- There should be a 25% reduction in edentulousness at age 65 years and over, compared with the 1982 level.
- A database system for monitoring changes in oral health should be established.

Over the past two decades, there have been significant achievements in oral health (8), but, it still remains a challenge to most countries to achieve goal 6, i.e. the establishment of a database for monitoring and surveillance.

Fig. 7. Operational model of factors for an integrated oral health-chronic disease surveillance system



DMFT, Decayed, Missing due to caries, and Filled teeth; HIV/AIDS, human immunodeficiency virus/acquired immunodeficiency syndrome.

WHO 05.108

Table 1. Matrix of risk factors and chronic diseases in WHO Global InfoBase (37)

Risk factor	Condition				
	Cardiovascular disease	Diabetes	Cancer	Chronic obstructive pulmonary disease	Oral/dental disease
Tobacco use	✓		✓	✓	✓
Alcohol use	✓	✓	✓		✓
Physical inactivity	✓	✓	✓		
Nutrition	✓	✓	✓		✓
Obesity	✓	✓	✓	✓	
Raised blood pressure	✓	✓			
Dietary fat/blood lipids	✓	✓	✓		
Blood glucose	✓	✓	✓		

Recently WHO, jointly with the FDI and the International Association for Dental Research (IADR), formulated goals for oral health to be achieved by the year 2020 (42). The new goals have been formulated not only to further strengthen activities to control and prevent dental caries, but also to address other significant components of the oral disease burden such as periodontal health conditions, oral mucosal lesions, oral precancer and cancer, craniofacial trauma, pain and oral health-related quality of life. Goals, targets and standards for oral health have to be established on the basis of regional, national and local circumstances such as the adequacy of health information, oral health systems and priorities, as well as socioenvironmental conditions. The WHO Regional Office for Europe consequently formulated regional goals for the year 2020 as part of the Health21 policy (43). Several other new targets for the year 2020 may be evaluated by use of the risk factor indicators designed for the WHO STEPS approach and the WHO Global InfoBase.

The global goals for oral health will encourage regions, countries and local health care planners to develop preventive programmes and health promotion schemes that are targeted at populations and high-risk groups and at further improving the quality of oral health systems. The need for strengthening prevention and health promotion was emphasized by the Declaration of Alma-Ata on Primary Health Care (44) and in 1986 by the Ottawa Charter on Health Promotion (45). More than 20 years after its widespread adoption, the strategy of Health for All through primary health care has still not been fully implemented, particularly as regards oral health care in developing countries. In addition, in several other countries such as those of central and eastern Europe, reorientation of oral health services towards community-oriented prevention

and health promotion is urgently needed. Operational goals for oral health, risk factor interventions and assessment of achievement of goals and targets based on effective surveillance and information systems may assist this process globally.

Conclusion

The existing global, regional and national oral health databanks have been used for epidemiological analysis of oral disease trends and assessment of the outcome of oral health systems and preventive programmes. Research on oral health systems has been based on both cross-sectional and time-series data available for indicator countries; the data were mainly available for research in developed countries, whereas time-series analysis is only possible for a few developing countries. Surveillance systems have been in operation for several years in certain developing countries such as Madagascar and Thailand, where data from the evaluation of child populations are used for targeting school-based oral health activities towards those most in need. Improved quality of oral health information systems worldwide may help to strengthen health systems and operational research may assist in translating sound knowledge about prevention programmes and health promotion for the benefit of the poor and disadvantaged population groups. ■

Acknowledgements

The WHO Oral Health Programme is grateful for the continuous support of the Association Dentaire Française (France), the University of Niigata (Japan) and the Sunstar Foundation for Oral Health Promotion (Japan).

Competing interests: none declared.

Résumé

Mesure des progrès réalisés dans la promotion de la santé et la prévention des affections dans le domaine bucco-dentaire grâce aux systèmes d'information sur la santé bucco-dentaire

Le présent article décrit les composantes essentielles des systèmes d'information sur la santé bucco-dentaire destinés à analyser les tendances suivies par les affections bucco-dentaires et à évaluer les programmes de santé bucco-dentaire aux niveaux national, régional et mondial. La méthodologie standard pour la collecte des données épidémiologiques sur la santé bucco-dentaire a été conçue par l'OMS. Elle est utilisée par divers pays à travers le monde pour la surveillance des affections et de la santé bucco-

dentaires. Des banques de données mondiales, régionales et nationales sur la santé bucco-dentaire ont mis en lumière la diversité d'expression des affections de la bouche et de la denture, qui reflète principalement la variabilité des profils de risque et la mise en œuvre de programmes de santé bucco-dentaire orientés vers la prévention des affections et la promotion de la santé dans le domaine bucco-dentaire. Le programme OMS sur le profil de la santé bucco-dentaire par pays/région fournit des données sur

la santé bucco-dentaire en provenance de ces pays, ainsi que des retours d'expérience du programme et des idées à l'intention des professionnels du domaine bucco-dentaire, des décideurs politiques, des planificateurs en matière de santé, des chercheurs et de la population générale. L'OMS a mis sur pied des banques de données à l'échelle mondiale et régionale, destinées à la surveillance de la santé bucco-dentaire, et des projets internationaux ont donné lieu à la définition d'indicateurs de ce paramètre sanitaire, utilisables par les systèmes d'information sur la santé bucco-dentaire pour évaluer la qualité des soins et des systèmes de surveillance dans ce domaine. Des systèmes modernes d'information sur la santé

bucco-dentaire sont en cours de mise au point dans le cadre de l'approche par étapes (STEPS) de l'OMS de la surveillance des maladies chroniques non transmissibles et les informations stockées dans l'Infobase mondiale OMS pourraient permettre d'étudier des systèmes sanitaires avancés. Des connaissances solides sur les progrès réalisés dans la prévention des affections bucco-dentaires et chroniques et dans la promotion de la santé pourraient aider les pays à mettre en œuvre des programmes efficaces de santé publique, bénéficiant aux groupes de population pauvre et défavorisés du monde entier.

Resumen

Sistemas de información sobre salud bucodental: hacia la medición de los progresos de la promoción de la salud y la prevención de enfermedades bucodentales

En este artículo se describen los componentes esenciales de los sistemas de información sobre salud bucodental orientados al análisis de las tendencias de las enfermedades de esa naturaleza y la evaluación de los programas de salud bucodental a nivel de país, regional y mundial. La OMS ha ideado una metodología estándar de recopilación de datos epidemiológicos sobre la salud bucodental que ha sido utilizada por países de todo el mundo para vigilar las enfermedades bucodentales. Los bancos de datos mundiales, regionales y nacionales sobre ese componente de la salud han puesto de relieve un cambio de tendencia de la morbilidad bucodental, que refleja principalmente los nuevos perfiles de riesgo y la implementación de programas de salud bucodental orientados a la prevención de enfermedades y la promoción de la salud. El Programa OMS sobre los Perfiles de la Salud Bucodental por países/regiones (CAPP) proporciona datos de salud bucodental de los países, así como experiencias de los programas e ideas destinadas a los profesionales de la salud

bucodental, las instancias normativas, los planificadores sanitarios, los investigadores y el público en general. La OMS ha desarrollado bancos de datos mundiales y regionales sobre el tema con fines de vigilancia, y como parte de diversos proyectos internacionales se han diseñado indicadores de salud bucodental que permiten a los sistemas de información al respecto evaluar la calidad de la atención bucodental y los sistemas de vigilancia correspondientes. Se están desarrollando sistemas modernos de información sobre salud bucodental dentro del marco del método progresivo de la OMS para la vigilancia de las enfermedades crónicas no transmisibles, y los datos almacenados en la InfoBase Mundial de la OMS permitirían llevar a cabo investigaciones avanzadas sobre los sistemas de salud. Unos sólidos conocimientos sobre los progresos de la prevención de las enfermedades bucodentales y crónicas y la promoción de la salud podrían ayudar a los países a aplicar programas eficaces de salud pública en beneficio de los pobres y los grupos de población desfavorecidos en todo el mundo.

Arabic

References

1. *Oral health surveys — basic methods. 1st Edition.* Geneva: World Health Organization; 1973.
2. *Oral health surveys — basic methods. 2nd Edition.* Geneva: World Health Organization; 1979.
3. *Oral health surveys — basic methods. 3rd Edition.* Geneva: World Health Organization; 1987.
4. *Oral health surveys — basic methods. 4th Edition.* Geneva: World Health Organization; 1997.
5. *Calibration of examiners for oral health epidemiological surveys.* Geneva: World Health Organization; 1995.
6. *European health for all database.* Copenhagen: World Health Organization Regional Office for Europe; 2002.
7. Beltran-Aguilar ED, Estupinan-Day S, Baez R. Analysis of prevalence and trends of dental caries in the Americas between the 1970s and 1990s. *International Dental Journal* 1999;49:322-9.
8. Petersen PE. The World Oral Health Report: continuous improvement of oral health in the 21st century – the approach of the WHO Global Oral Health Programme. *Community Dentistry and Oral Epidemiology* 2003;31 Suppl 1: 3-24.
9. *WHO oral health country/area profile.* Geneva: World Health Organization; 27 May 2005 (available at: URL: <http://www.whocollab.od.mah.se/index.html>).
10. *Targets for Health for All. The health policy for Europe — Summary of the updated edition. September 1991.* Copenhagen: World Health Organization Regional Office for Europe; 1992.
11. Petersen PE, Staehr Johansen K. ORATEL: Telematic system for quality assurance in oral health care (AIM Project 2029). *Computer Methods and Programs in Biomedicine* 1994; 45:141-3.
12. *Manual on indicators for quality of oral health care.* Copenhagen: World Health Organization Regional Office for Europe; 1992.
13. Bourgeois DM, Llodra JC (editors). *Health surveillance in Europe — European global oral health indicators development project.* Paris: Quintessence International; 2004.
14. Petersen PE, Kaka M. Oral health status of children and adults in the Republic of Niger, Africa. *International Dental Journal* 1999;49:159-64.
15. Sembene M, Kane AW, Bourgeois D. Caries prevalence in 12-year-old schoolchildren in Senegal in 1989 and 1994. *International Dental Journal* 1999;49:73-5.
16. Petersen PE, Razanamihaja N, Poulsen VJ. Oral health surveillance in Madagascar. Results after 10 years of community-based health promotion and oral disease prevention. Geneva: World Health Organization; 2005.
17. Dental Health Division. *Report of the fifth National Oral Health Survey in Thailand 2001.* Bangkok: Department of Health, Ministry of Public Health; 2003.
18. Wang HY, Petersen PE, Bian JY, Zhang B-X. The second national survey of oral health status of children and adults in China. *International Dental Journal* 2002;52:283-90.
19. Peng B, Petersen PE, Tai BJ, Yuan BY, Fan MW. Changes in oral health knowledge and behaviour 1987-95 among inhabitants of Wuhan City, PR China. *International Dental Journal* 1997;47:142-7.
20. Zhu L, Petersen PE, Wang H-Y, Bian J-Y, Zhang B-X. Oral health knowledge, attitudes and behaviour of children and adolescents in China. *International Dental Journal* 2003;53:289-98.
21. Estupinan-Day SR, Baez R, Horowitz H, Warpeha R, Sutherland B, Thaner M. Salt fluoridation and dental caries in Jamaica. *Community Dentistry and Oral Epidemiology* 2001;29:247-52.
22. Irigoyen ME, Sanchez-Hinojosa G. Changes in dental caries prevalence in 12-year-old students in the State of Mexico after 9 years of salt fluoridation. *Caries Research* 2000;34:303-7.
23. Pitts N, Boyles J, Nugent ZI, Thomas N, Pine CM. The dental caries experience of 5-year-old children in England and Wales. Surveys co-ordinated by the British Association for the Study of Community Dentistry in 2001/2002. *Community Dental Health* 2003;20:45-54.
24. Pitts NB, Boyles J, Nugent ZI, Thomas N, Pine CM. The caries experience of 14-year-old children in English and Wales. Surveys co-ordinated by the British Association for the Study of Community Dentistry in 2002/2003. *Community Dental Health* 2004;21:45-57.
25. Walker A, Cooper A (editors). *Adult dental health survey. Oral health in the United Kingdom 1998.* London: The Stationery Office. Office of National Statistics; 2000.
26. Birkeland JM, Haugejorden O, von der Fehr FR. Analysis of the caries decline and incidence among Norwegian adolescents 1985-2000. *Acta Odontologica Scandinavica* 2002;60:281-9.
27. Swedish National Board of Health and Welfare. Stockholm: Socialstyrelsen; 2002.
28. Danish National Board of Health. *Dental caries in Danish children: 1973-2004.* Copenhagen: National Board of Health; 2005.
29. Petersen PE, Kjoller M, Christensen LB, Krustup U. Changing dentate status of adults, use of dental services, and achievement of national dental health goals in Denmark by the year 2000. *Journal of Public Health Dentistry* 2004;64:127-35.
30. Micheelis W, Reich E, editors. *Third German oral health study (DMS III).* Cologne: Deutscher Ärzte-Verlag; 1999.
31. Szöke J, Petersen PE. Evidence for dental caries decline among children in an East European country (Hungary). *Community Dentistry and Oral Epidemiology* 2000;28:155-60.
32. Wierzbicka M, Petersen PE, Szatko F, Dybizbanska E, Kalo I. Changing oral health status and oral health behaviour of schoolchildren in Poland. *Community Dental Health* 2002;19:243-50.
33. de Almeida CM, Petersen PE, Andre SJ, Toscano A. Changing oral health status of 6- and 12-year-old schoolchildren in Portugal. *Community Dental Health* 2003;20:211-6.
34. Berkelman RL, Stroup DF, Buehler J. Public health surveillance. In: Detels R, McEwen J, Beaglehole R, Tanaka H (editors). *Oxford textbook of public health.* 4th Edition. Oxford: Oxford University Press; 2002.
35. Beltran-Aguilar ED, Malwitz DM, Lockwood SA, Rozier RG, Tomas SL. Oral health surveillance: past, present, and future challenges. *Journal of Public Health Dentistry* 2003; 63:141-9.
36. Bonita R, de Courten M, Dwyer T, Jamrozik K, Winkelmann R. *Surveillance of risk factors for non-communicable diseases. The WHO STEPwise approach. Summary.* Geneva: World Health Organization; 2001.
37. *The SURF Report 1 — Surveillance of risk factors related to non-communicable diseases: current status of global data.* Geneva: World Health Organization; 2003.
38. Lippe J, Strong K. *WHO Global NCD InfoBase user manual version 1.* Geneva: World Health Organization; 2003.
39. Stewart BW, Kleihues P. *World cancer report.* Lyon: International Agency for Research on Cancer; 2003.
40. *Prevention methods and programmes for oral diseases. Report of a WHO Expert Committee.* Geneva: World Health Organization; 1984. WHO Technical Report Series, No. 713.
41. World Health Organization/Fédération Dentaire Internationale. Global goals for oral health by the year 2000. *International Dental Journal* 1982;32:74-7.
42. Hobbell M, Petersen PE, Clarkson J, Johnson N. Global goals for oral health 2020. *International Dental Journal* 2003;53:285-8.
43. *Health 21 — Health for all in the 21st century.* Copenhagen: World Health Organization Regional Office for Europe; 1999.
44. *Formulating strategies for health for all by the year 2000. Guiding principles and essential issues.* Geneva: World Health Organization; 1979.
45. *Ottawa Charter for Health Promotion.* Geneva: World Health Organization; 1986.