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**Significance of the WHO
criteria in national achievement
of oral health objectives
(Experiences from Belarus and Uzbekistan)**

[Based on a study conducted by the
WHO Collaborating Centre on Oral Health,
Minsk, Belarus]

by

K.K. Shadiev & P.A. Leous
in consultation with G.N. Pakhomov



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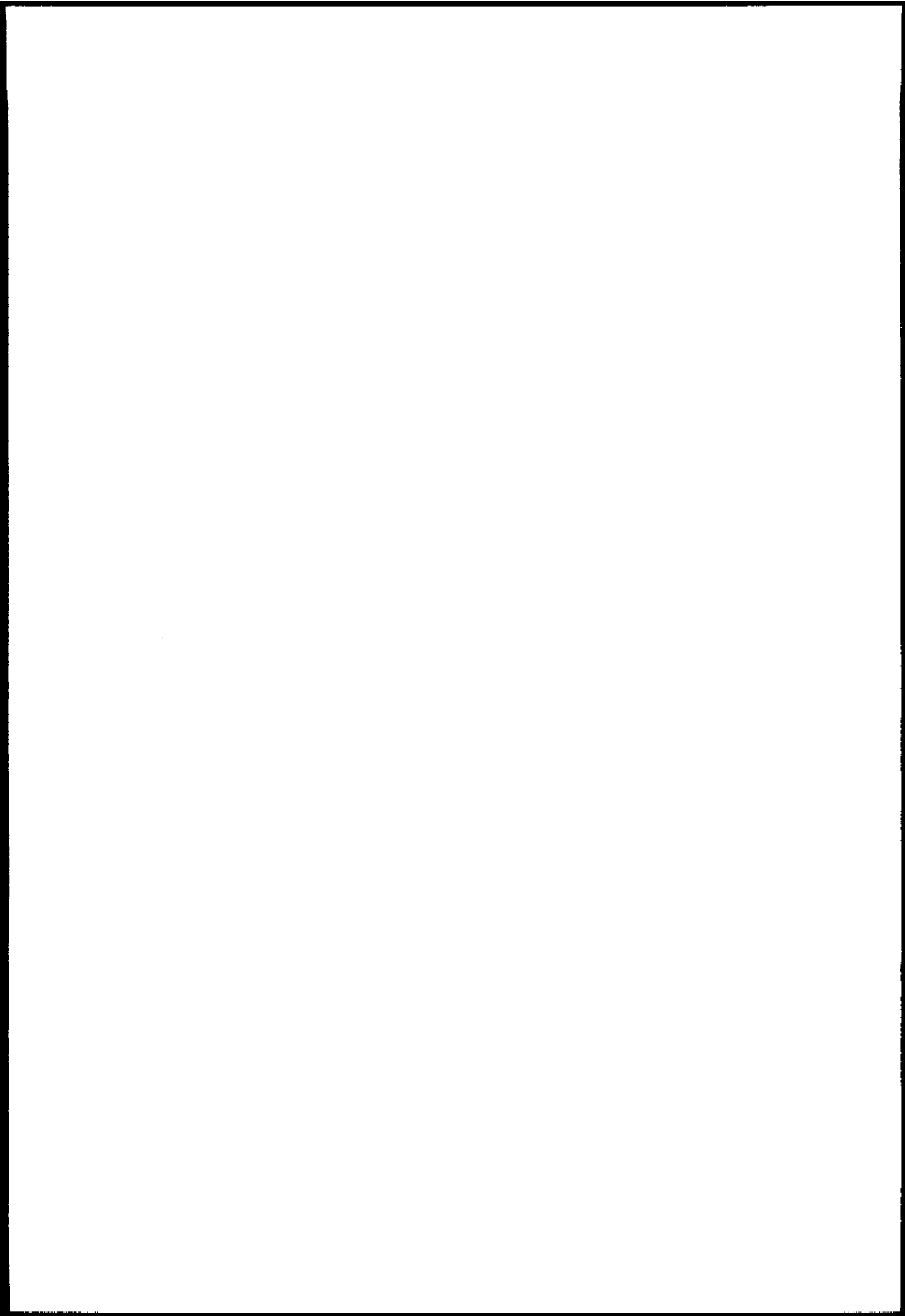
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1 Introduction

During the past three decades, a dramatic reduction in dental caries has been noted in children in several countries, particularly in western Europe. Oral diseases in general, however, remain an important health problem among adults everywhere. Indeed, according to a recent World Health Organization publication (1), the incidence of dental caries will increase in many of the developing countries until preventive measures are implemented effectively. Assessment of the worldwide periodontal health situation will require further study in the next few years.

While there has been some success in improving oral health status in many countries, a large proportion of the world's population remains well short of the global oral health goals set by WHO for the year 2000. This is particularly true for more than 350 million people living in eastern and central Europe, where the prevalence of dental caries varies from "moderate" to "very high" and where periodontal diseases affect even children.

In some countries of the former USSR, the prevalence of dental caries has remained low in populations who have maintained their traditional dietary patterns and eating habits. The changes in living conditions and lifestyle that have accompanied industrialization, however, have resulted in an increase in dental caries, reported in several of the central Asian countries of the former USSR. This situation has given rise to considerable concern: the overall rise in disease levels in countries with economies in transition and with limited resources may result in an increase in the amount of *untreated* disease and a deterioration in oral health.

One of WHO's policies for the prevention of oral disease is the promotion of simple, efficient, and effective oral hygiene measures through practical, community-based programmes. Dental caries is to a large extent preventable by such simple measures as the systemic and/or topical use of fluorides and the adoption of a prudent diet; future approaches to caries management are expected to be geared more towards prevention than towards treatment alone. Chronic periodontal diseases can also be prevented by appropriate oral hygiene measures if these are started early in childhood and continued throughout life. This approach is well documented and its effectiveness is supported by data showing that periodontal disease is declining among the younger age groups of the populations of certain industrialized countries.

The use of fluoridated toothpastes is a particularly important element of all preventive programmes: the fluoride delivered to the tissues during the process of brushing teeth and gums strengthens them and makes them more resistant to carious disease. Moreover, thorough brushing removed dental plaque, which is a major cause of periodontal disease.

The current poor oral health status in countries of the former USSR perhaps reflects the many years of neglect of oral hygiene measures in health education and oral care programmes. The first, and most important, step in public health programmes in this region must therefore be oral hygiene education among children, young people, and adults.

Practical implementation of WHO's policy on oral health promotion at community level demands the establishment of an internationally comparable information system. Although the recording and reporting systems of the dental services in the Republics of Belarus and Uzbekistan have been functional for decades, few of the parameters used matched those used by WHO. It was therefore difficult to evaluate the quality of dental services and the oral health status of the populations in a manner that permitted international comparisons to be made.

2 Rationale

In 1969, the WHO Global Oral Data Bank (GODB) was established to monitor the disease trends in the world, and WHO's Oral Health programme promoted the collection of epidemiological data by offering data analysis free of charge to those who used WHO standard methodology. This opportunity was particularly interesting for countries with minimal resources. A "pathfinder" methodology was proposed in the oral health survey with the aim of enabling administrators to obtain working estimates of oral health status very rapidly and to develop national oral health programmes.

In May 1981, the World Health Assembly adopted a global oral health status indicator – an average of no more than three decayed, missing, or filled permanent teeth (DMFT) at 12 years of age by the year 2000. This goal was developed jointly by the WHO Oral Health programme and the FDI (World Dental Federation). Since that time, data on caries levels have been regularly updated by WHO. Since 1996, the latest information has been available on WHO's home page on the Internet (www.who.ch, Division of Noncommunicable Diseases, Oral Health); a print-out can be made available to those without access to the Internet.

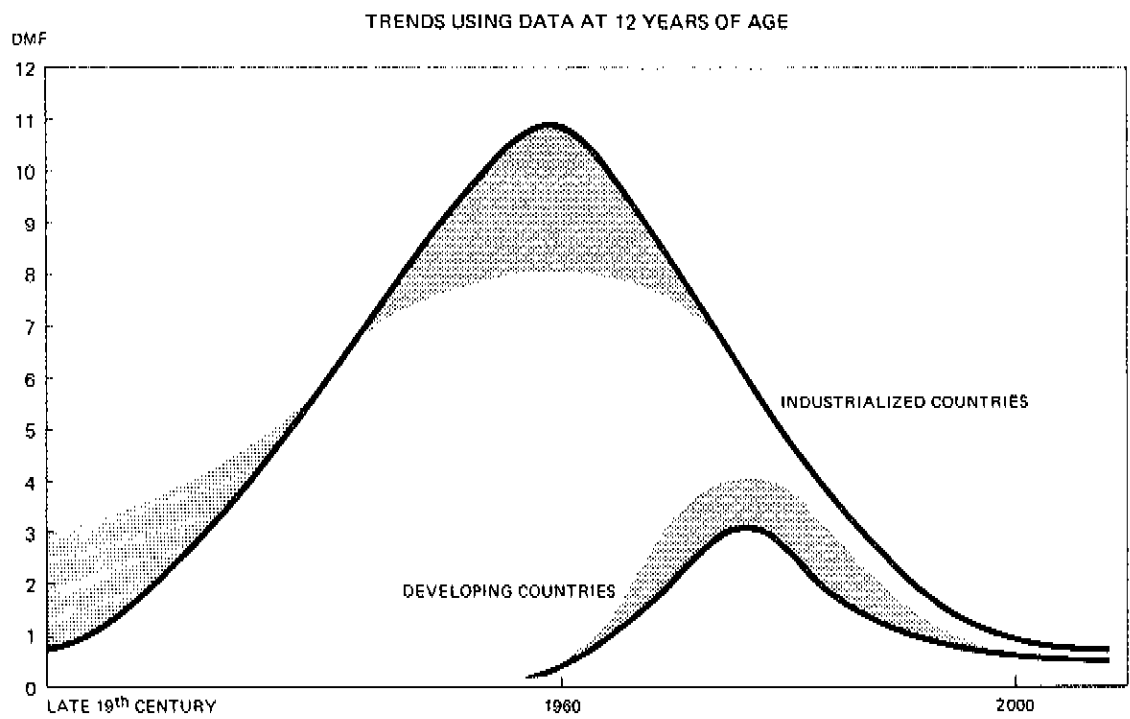
Comparison of the most recent data with records for the 1970s and 1980s reveals a dramatic reduction in the prevalence of dental caries in many industrialized countries. This may be explained by the development and implementation of preventive measures, especially exposure to appropriate levels of fluoride from a variety of sources. The data also reveal either a stable situation or a trend of slowly rising prevalence in a number of developing countries.

The global goal for the prevalence of dental caries by the year 2000 was both realistic and scientifically sound. In 1980 the global weighted average DMFT was 2.4 and had risen to 2.9 by 1984; by 1992, however, DMFT had fallen to 2.3 (2).

A projection of dental caries trends in developed and developing countries was made in 1988 (Figure 1). It is now apparent that, in general, dental caries has followed this trend. It is important to note that, although the world has already achieved the global goal of less than 3 DMFT in 12-year-old children, the prediction of further trends (i.e. for one or two decades after the year 2000) was not possible in 1988. Moreover, Figure 1 reflects the situation only in developed and developing countries; the large numbers of people living in the countries of the former USSR, now identified as countries with economies in transition, do not necessarily follow either of the illustrated trends.

The overall value of DMFT (3.5) in the former USSR was appreciably lower than in many other industrialized countries, but—perhaps unsurprisingly in view of the vastness of the territory—wide variations were apparent, both in the level of dental caries and in trends. The most recent data show that, among countries with transitional economies, the number in which DMFT values exceed 3 has increased (3).

Figure 1. Projected trends in dental caries using data for 12-year-olds



3 Objectives

The main objective of this report was to evaluate the significance of WHO oral health criteria to the national oral health information systems, on the basis of experience gained in Belarus and Uzbekistan. It was the authors' intention:

- to perform a national oral health survey among key age groups of the population in Belarus and Uzbekistan;
- to analyse the progress in achieving the WHO long-term oral health goals;
- to develop general recommendations based on the results of the study.

4 National oral health surveys in Belarus and Uzbekistan

4.1 Materials and methods

A stratified cluster sampling technique was used, in accordance with WHO's recommendations (4) and samples were drawn from the most important subgroups of the population – ages 6, 12, 15, 18, 35–44, and 65–74 years. The sampling sites chosen were the six provinces in Belarus (Brest, Gomel, Grodno, Minsk, Mogilev, and Vitebsk) and 11 of the 12 provinces in Uzbekistan (Andizhan, Bukhara, Dzhizak, Ferghana, Karakalpakstan, Khorezm, Namangan, Navoi, Samarkand, Syr-Darya, and Tashkent – rural and city areas). Each group at each site contained 50 or more subjects. A total of 1587 subjects were surveyed in Belarus and 5685 in Uzbekistan. Survey data were recorded using the WHO Oral Health Assessment Form,¹ and an international team of six dental epidemiologists from Belarus were calibrated to ensure appropriate assessment of the oral health status.

The following information was obtained during the course of the study:

- the overall prevalence of the various oral diseases affecting the population;
- important variations between the various population subgroups in disease level, disease severity, and need for treatment;
- the age profiles of oral diseases (to enable care needs for different age groups to be determined).

For intercountry and global comparison of the national oral health data obtained, the authors used previous studies (5). A suitable computer programme was used to calculate mean values and standard deviations (SD), and to determine statistical significance (t-test) when necessary.

¹ *Oral health survey: basic methods*, 4th ed. Geneva, World Health Organization, 1995.

4.2 Location

4.2.1 Republic of Belarus

The Republic of Belarus has a population of approximately 10.2 million (1996 figures) of whom 60% live in rural areas. Children under 14 years of age make up 20.6% of the population, and elderly people about 20%. Dental care is carried out in 1388 polyclinics and dental surgeries; in 1997 there were 5518 dentists. Oral health in Belarus has been monitored since 1960. During the 1990s, the Republic of Belarus started collaborating with WHO in the development of oral health programmes. This undertaking coincided with increasing international cooperation and assistance in all aspects of oral care, including prevention.

Analysis of local publications and of recent oral health surveys (Azarenko, Melnitchenko and Terechova) revealed several important features of oral health in Belarus:

- During the past 20–25 years, the prevalence of dental caries has been increasing in all age groups, reaching “moderate” to “high” levels.
- It was not possible to predict the trend of periodontal disease because of the different criteria used in past studies. The present level is “high”, with poor or unsatisfactory standards of oral hygiene in children and adults.
- In the 1960s and 1980s, several state programmes were developed in an effort to prevent oral diseases; however, none of these was implemented at country level.

4.2.2 Republic of Uzbekistan

The Republic of Uzbekistan has a population of about 22 million,¹ of whom 61.4% are concentrated in rural areas. Overall population density is 5.4 per square kilometre, and 41% of the population are children under 14 years of age. Population growth rate is 29.4 per 1000.

The medical service in Uzbekistan has 1344 hospitals, 3041 clinics and polyclinics, and 6670 primary health-care clinics. In 1992, the Health Ministry formulated a plan of public health reform, with new directions for the development of the health-care system. Attention focused principally on transition from extensive to intensive development of the health infrastructure, on changing the approach to financial problems, and on the development of multidisciplinary medical care with more rational use of staff and facilities. As a result, hospital bed occupancy has fallen by 24.6%.

¹ Figures from the Uzbekistan Health Ministry, 1995.

In 1994, Uzbekistan had 74 400 medical doctors and 6419 dentists. Numbers remained stable over the period 1996–1997, with approximately 1 doctor for every 300 people and 1 dentist for every 3500. Medical care is also provided by auxiliary personnel, who numbered 240 356—or slightly more than 1 per 100 population—in 1994; they include 197 990 primary health care personnel, who work mainly in clinics in rural areas and in first-aid stations, and of whom 179 269 are nurses working in both inpatient and outpatient departments.

The public health reforms taking place in the Republic of Uzbekistan have demanded a revision of the basic concepts of medical training. A new, multi-stage programme for the training of doctors and middle-level medical personnel is currently being introduced in the medical schools of Uzbekistan. Recent training of general practitioners or family doctors has been geared towards the development of a multi-faceted public health system. In addition, the number of medical graduates is set to decrease, with the intake of medical students being reduced by more than 50%. Uzbekistan has one of the most advanced oral health care systems of all the central Asian republics of the former USSR. In 1986, at the second Congress of Dentists of Uzbekistan, the following achievements were reported:

- 27 dental polyclinics provided oral health care to the Uzbekistan population;
- 5590 dental units were in daily operation;
- 29 mobile dental units were available in rural areas;
- 115 classes had been opened to teach children about oral hygiene;
- a comprehensive countrywide programme for prevention of oral diseases had been developed and implemented.

Oral health status in Uzbekistan has been monitored continuously since 1961. Several surveys have been conducted during the past 30 years, of which the most comprehensive and scientifically useful was carried out by Dr K. Shadiev in 1983 and Babadijanov et al. in 1991.

5 Oral health survey data in Belarus and WHO goals

Details of the prevalence of dental caries in the Republic of Belarus are summarized in Table 1, and data on the periodontal status of the population in Table 2. Collection of these data provided the opportunity to assess the trend of dental caries in Belarus (Figure 2) in terms of WHO's long-term goals or oral health criteria.

Figure 3 shows the mean number of healthy sextants by CPITN (community periodontal index of treatment needs) in 15-year-old children compared with the proposed WHO goal for the year 2010 of at least 5 healthy sextants. In the present study, an average of

only 0.9 sextants were healthy, with values ranging from 0.65 (in Grodno) to 1.0 (in Mogilev). Among 18-year-olds, the national average for healthy sextants was 0.5, ranging from 0.5 to 0.8 in different provinces; the proposed goal of the WHO Regional Office for Europe (EURO) for 2010 is at least 4 healthy sextants.

In the 35–44-year age group, the proposed WHO/EURO goal for the year 2010 is no more than 0.1 sextant with a CPI score of 4. Among this section of the Belarus population, an average of 0.2 sextants (range 0.1–0.3) had a CPI rating of 4, with an average 0.2 sextants excluded (and possibly reflecting an even worse condition). These results are illustrated in Figure 4.

Table 1. Prevalence of dental caries in Belarus: 1996 oral health survey

Age group (years)	Number of subjects	Percentage affected	Average no. of teeth				Edentulous (%)
			Decayed (D)	Missing (M)	Filled (F)	DMF	
6	450	95	—	—	—	6.6(dmf)	0
12	300	92	1.3	0.1	2.4	3.8	0
15	410	92	1.6	0.2	2.9	4.7	0
18	384	94	2.3	0.4	4.1	6.8	0
35–44	393	100	2.1	6.5	5.2	13.8	0
65–74	400	100	1.7	18.2	2.6	22.5	14.8

More significant periodontal conditions were recorded among 65–74-year-olds (see Table 2). For this group, however, comparison with WHO goals was difficult because of the large number of excluded sextants. It is believed that the CPITN "4" indicator lacks validity for individuals aged 65 and over.

For 15-year-olds, the WHO/EURO goal for the year 2010 is for 100% of individuals to retain complete dentition. The survey in Belarus showed that the average number of missing (extracted) teeth in this age group was 0.2, with a range of 0.1–0.3 in the different provinces. In the 35–44-year age group, the average number of extracted teeth was 6.5, ranging from 6.1 (in Grodno) to 7.3 (in Minsk).

An average 14.8% of the individuals aged 65 years and over were edentulous, with values for the different provinces ranging from 11.3 to 18.6. A lack of reliable information made it impossible to evaluate the trend of this criterion.

Table 2. Prevalence of periodontal disease (by CPITN) in Belarus: 1996 oral health survey

Age group (years)	Number of subjects	Percentage with CPITN score of 0-4				Mean number of sextants per subject					Excluded (x)	
		0	1	2	3	4	Healthy (0)	Bleeding (1+2+3+4)	Calculus (2+3+4)	Projects Shallow (3+4) Deep (4)		
15	410	0.2	6.7	78.5	14.6	0	0.9	5.1	3.7	0.2	0	0
18	384	0.2	1.6	70.0	28.0	0.2	0.6	5.4	4.3	0.5	0.003	0
35-44	393	0	0	24.2	62.5	13.3	0.1	5.7	5.2	2.2	0.2	0.2
65-74	400	0	0.3	19.9	62.8	17.0	0	3.1	3.0	1.7	0.2	2.9

Figure 2. Dental caries trend in Belarus

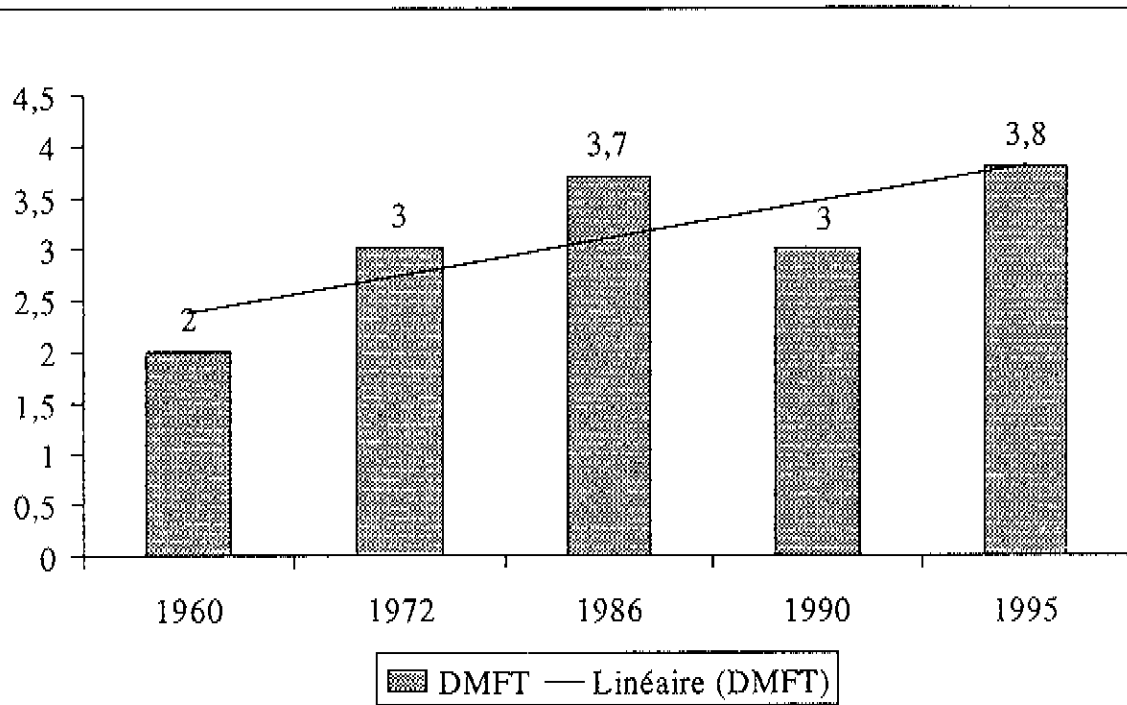


Figure 3. Mean number of healthy sextants by CPITN index in 15-year-old children in Belarus compared with WHO goals for the year 2010

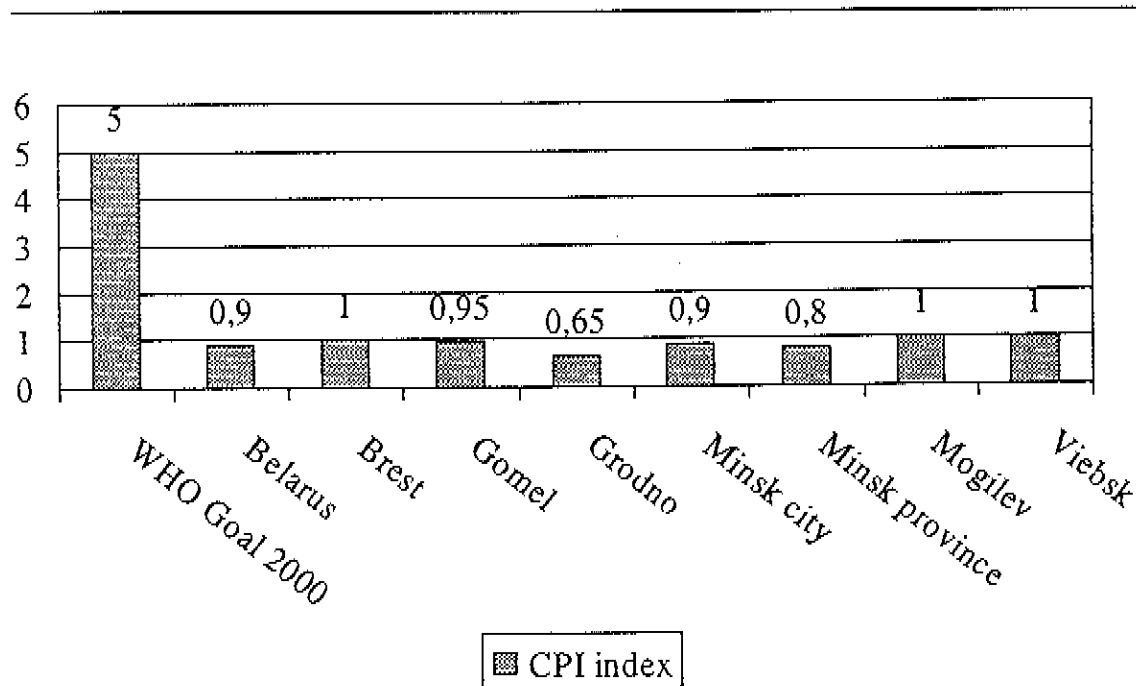
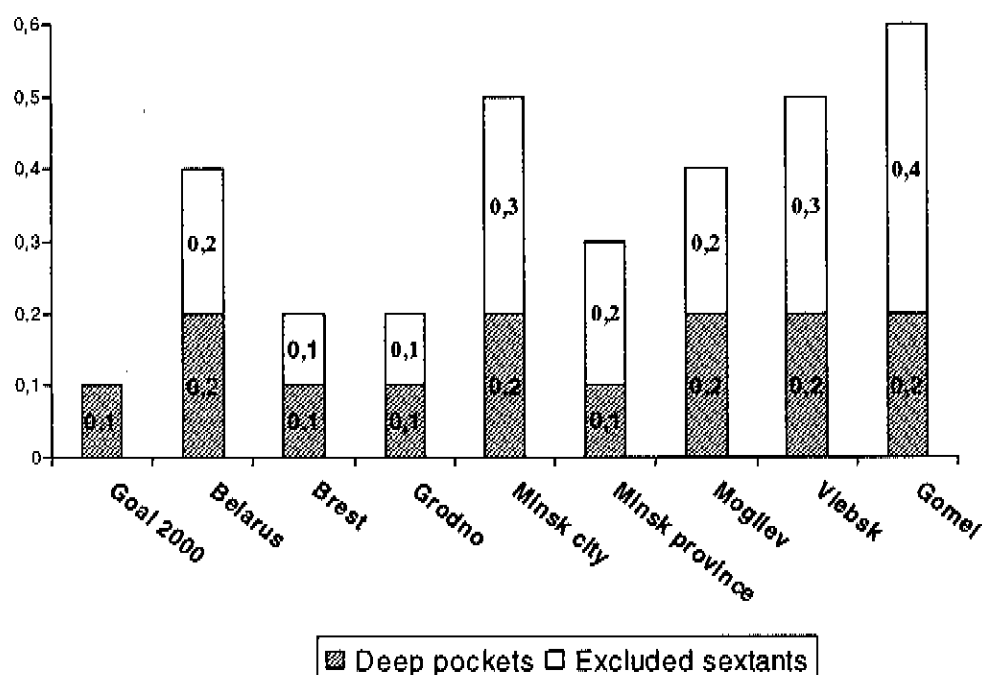


Figure 4. Mean number of sextants with deep pockets by CPI (code 4) in people aged 35–44 years in Belarus compared with WHO goals for the year 2010



6 Oral health survey data in Uzbekistan and WHO goals

6.1 Dental caries

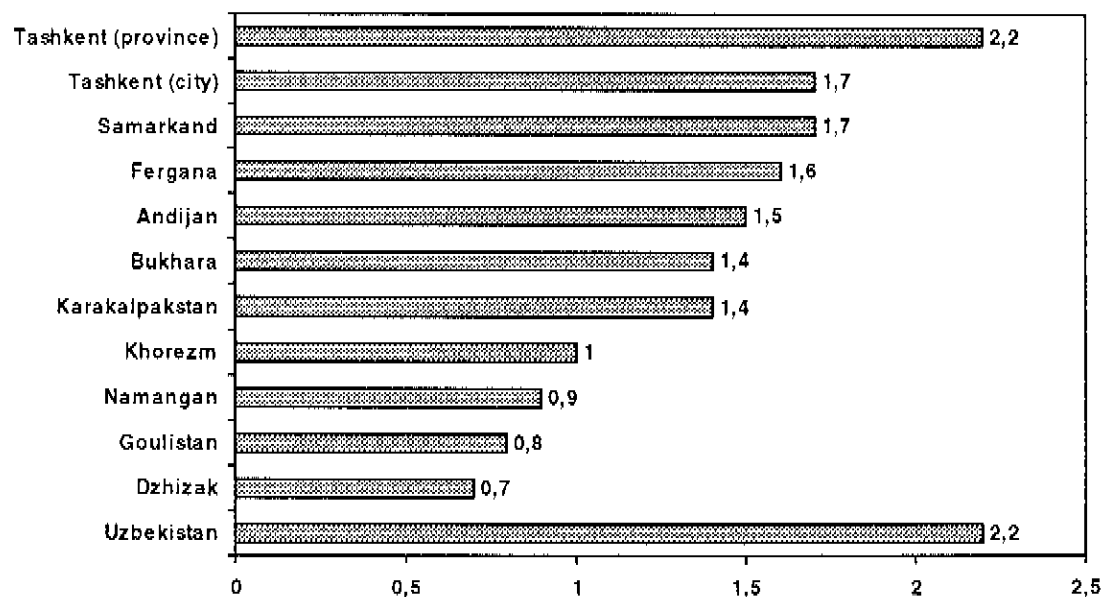
Prevalence of dental caries among children and young adults in the different regions of Uzbekistan varied from "very low" to "low". Details of the survey results are summarized in Table 3.

The mean DMFT value among 12-year-old children was 1.34. The lowest prevalence of dental caries was recorded in the rural area of Dzhizak (0.72 DMFT) and in Namangan (0.9 DMFT); prevalence was appreciably higher in Tashkent city (1.7 DMFT) and in rural parts of Tashkent (2.2 DMFT). In the 11 localities surveyed, between 34.3% and 80.3% of 12-year-old children were affected by disease, with a national average of 56%. In all regions, DMFT levels were below the WHO global goal of 3 DMFT for the year 2000 (see Figure 5).

**Table 3. Prevalence of dental caries in Uzbekistan:
1996 oral health survey**

Age group (years)	No. of subjects	Percentage affected	Average no. of teeth			DMF	Edentulous (%)
			Decayed (D)	Missing (M)	Filled (F)		
6	719	83	3.5	0.1	0.3	3.9 (dmf)	
12	1143	56	1.1	0.05	0.2	1.34	
15	1050	68	1.5	0.2	0.4	2.1	
18	436	80	2.2	0.6	0.5	3.3	
35-44	415	98	2.1	6.1	1.7	9.9	
65-74	380	100	1.3	18.7	2.3	22.3	24.0

Figure 5. DMFT levels in 12-year-old children in Uzbekistan



Among the 15-year-olds surveyed, an average of 68.3% – with a range of 40–85% – were affected by dental caries. Tashkent city had the highest DMFT level (2.91) and the rural area of Namangan the lowest (0.60); the average level was 2.1.

Only a small proportion of children in both these age groups were reported to have fillings – 15% of 12-year-olds and 18% of 15-year-old subjects. In some localities no fillings were recorded.

The number of extracted permanent teeth was low, averaging 0.05 for 12-year-olds and 0.2 for 15-year-olds; this reflects a low prevalence of dental caries. In the 35–44-year age group, however, recorded prevalence of dental caries averaged 98%, with an average DMFT level of 9.89. More than 50% of the DMFT were extracted teeth.

Dental health status among people aged 65 years and more was significantly worse, with an average DMFT level in nine localities (380 subjects) of 22.3. Most teeth were missing (MT = 18.7), and 24.2% of subjects in this group were edentulous.

Temporary dentition status at age 5–6 years was evaluated among children attending kindergartens in 13 localities. Prevalence of dental caries ranged from 81% to 94% (average 83.4%), and dmft values from 2.98 to 5.78 (average 3.97), indicating a disease level varying from “moderate” to “high” across the different parts of the country.

6.2 Periodontal disease

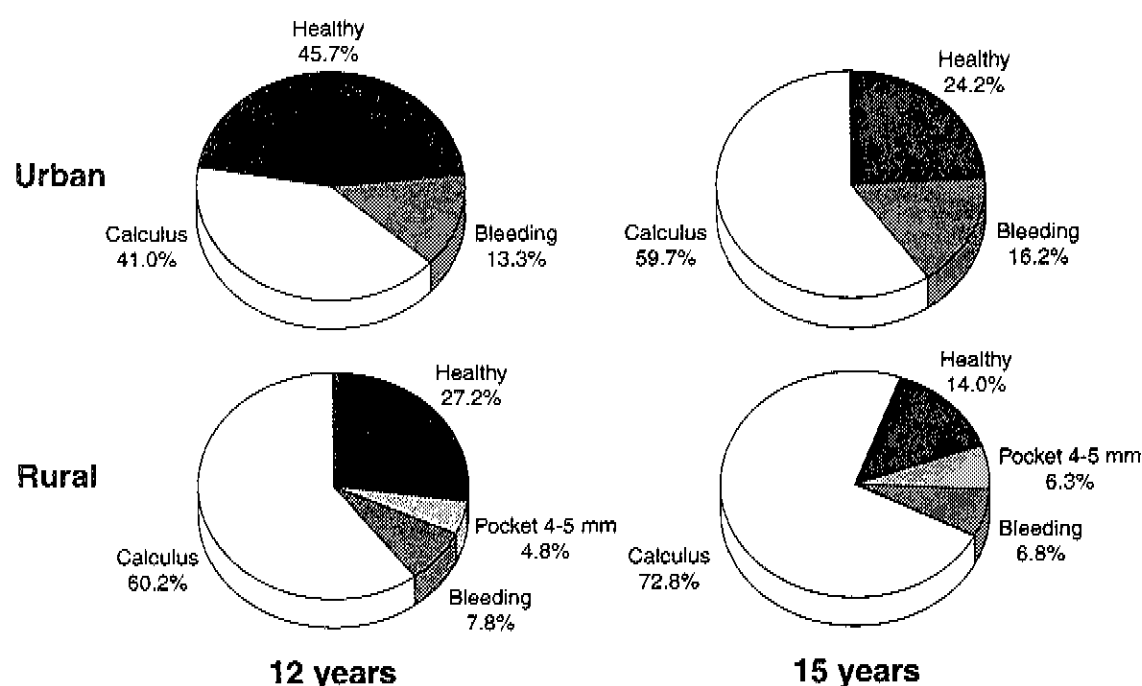
The national oral health survey showed that periodontal disease is the major dental problem in all regions of Uzbekistan (see Table 4): 96.4% of 15-year-old children were affected by the disease, with an average of 4.64 sextants bleeding or in a worse condition. For reasons that remain unclear, the number of affected sextants varied widely between the different regions of Uzbekistan – from 5.48 in Dzhizak to 2.4 in Bukhara and Navoi. Overall, periodontal conditions were unacceptable, falling short of the WHO goals. Standards of oral hygiene among schoolchildren in all the areas surveyed were unsatisfactory.

The poor periodontal status of schoolchildren in rural areas (Figure 6) caused much concern to the health authorities, prompting them to adopt a more active stance on effective preventive oral health care. Among the oldest members of the population, the situation is much worse, with the prevalence of disease reaching 100%, almost no healthy sextants, and an increasing proportion of periodontal pockets.

Table 4. Prevalence of periodontal disease (by CPIITN) in Uzbekistan: 1996 oral health survey

Age (Years)	Number of subjects	Percentage affected (\pm SD)	Percentage of subjects with			Average number of sextants \pm SD					p	
			Bleeding	Calculus	Pocket	Healthy	Bleeding	Calculus	Pocket	4-5 mm		\geq 6 mm
12	687	91.7 \pm 9.44	12.3 \pm 10.9	79.4 \pm 15.8	0	0	2.21 \pm 1.74	0.78 \pm 1.02	2.99 \pm 1.73	0	0	
15	817	96.4 \pm 3.40	1.6 \pm 2.50	77.5 \pm 4.58	17.3 \pm 7.77	0	1.36 \pm 1.47	0.51 \pm 0.68	3.75 \pm 1.58	0.33 \pm 0.75	0	<0.001
18	396	97.2 \pm 8.44	0	71.7 \pm 7.55	25.3 \pm 7.66	0.22 \pm 0.67	1.07 \pm 1.30	0.57 \pm 0.82	3.90 \pm 1.49	0.46 \pm 0.83	0.01 \pm 0.3	[0.01 excluded] <0.01
33-44	375	97.3 \pm 8.20	0	36.9 \pm 8.20	42.4 \pm 10.5	18.0 \pm 10.1	0.22 \pm 0.56	0.31 \pm 0.55	3.75 \pm 1.77	1.23 \pm 1.52	0.13 \pm 0.34	[0.38 \pm 0.88 excluded] <0.001

Figure 6. CPITN components in children in urban and rural areas of Uzbekistan, 1996



6.3 Treatment needs of the population

In general, the need for treatment of dental caries among schoolchildren was low; however, almost all children affected by disease clearly required dental treatment—fillings, pulp care, or extraction. Very few fillings were recorded during this survey, which is an indication of unsatisfactory dental care for schoolchildren throughout Uzbekistan.

In 12-year-olds, treatment needs for one surface filling ranged from 0.28 tooth per child in the Namangan region to 0.83 tooth per child in Ferghana per child; treatment needs for two or more surface fillings averaged 0.29 tooth per child. Pulp care needs in this age group varied from 0.07 to 0.27 tooth per child and extraction needs were very low—0.07 tooth per child. Among 15-year-old schoolchildren treatment needs rose on average to 0.69 tooth for one surface filling, 0.47 tooth for two or more surface fillings, 0.21 tooth for pulp care, and 0.17 tooth for extractions per child.

The need for prosthetics in children was low and questionable (especially for those missing only one tooth). However, the proportion of 18-year-olds needing crown and bridge work was 82%, with an average 6.6 bridge elements needed per patient. In the 35–44-year age group, 20% of individuals needed upper partial dentures, 40% lower, and 15% both jaws. Full dentures for both jaws were needed by 21% of surveyed individuals aged 65 years and over; 53% needed upper full dentures and 65% lower.

7 Summary of the oral survey findings in Uzbekistan

The prevalence of dental caries among 12-15-year-old children varied from 40% to 80% in different regions of Uzbekistan; the average DMF level in 12-year-olds was 1.34 and in 15-year-olds it was 2.1. Thus, according to WHO criteria, the dental caries level in Uzbekistan is "low". The dental caries trend for permanent teeth among school-age children in Uzbekistan has been stable for at least the past two decades, probably as a result of the ingestion of optimal quantities of fluoride in food.

The public oral health service operates on the basis of "treatment-on-demand" rather than "treatment-when-needed". As a consequence, even with the low DMFT level, there is a significant need for fillings in teeth with untreated caries, for pulp care, and for extractions. Unmet treatment needs in children lead to a sharp increase in the numbers of adults with missing teeth. On average 6.1 teeth were missing in those aged 35-44 years; in the 65-74-year age group, 24% of individuals were complete edentulous, 42% had lost more than 24 teeth, and almost 100% were in need of prosthetic care. The development of a countrywide programme of systematic dental care for schoolchildren should therefore be the first priority of the public oral health care system in Uzbekistan.

Prevalence of periodontal disease was 96.4% among 15-year-olds, with an average of 4.6 sextants (cumulative CPI) affected. The unsatisfactory oral hygiene status of children generally is an obvious factor in this situation. Effective instruction in oral hygiene instruction for primary schoolchildren may be a rational alternative to current oral health education efforts.

A further consequence of the unmet dental treatment needs of schoolchildren and the resultant complicated diseases among young people and adults is the growing cost of dental care.

8 Conclusions and recommendations

Practical application in Belarus and Uzbekistan has proved the acceptability of the WHO oral health criteria in the national oral health information system. All criteria tested, with the exception of CPI "4" in the 65-74 year age group, are very effective for evaluating the oral health of a population and for monitoring the trend towards WHO's long-term oral health goals, particularly the goals for the year 2000. The criteria provided a unique possibility to compare the national oral health parameters with the situation in other WHO Member States.

The positive results of this evaluation provide a basis for implementing the WHO oral health criteria in Belarus, Uzbekistan, and other members of the Commonwealth of

Independent States (CIS) interested in monitoring their progress towards the achievement of long-term health objectives.

It would be very valuable for CIS countries to indicate their political will to strengthen the capacity for oral health promotion within their health systems and to increase substantially the resources allocated to health promotion and disease prevention. In spite of a lack of resources and of dental products, it is clear that these countries already have the needed infrastructure and public health experience. These could be strengthened and refocused, particularly in the area of prevention, to incorporate broader oral health promotion and disease prevention initiatives.

The most important contribution made by WHO and other national and international organization to the development of preventive oral health programmes in eastern Europe in recent years has been the competent building of relevant activities. Two areas that need special and urgent attention are the development of skills and exchange of experience, and information on infrastructure development and effective oral care models. Expertise could be provided by the WHO Intercountry Collaborating Centre for Oral Health for Demonstration, Training and Implementation of Oral Health in Europe (Minsk, Belarus), whose staff might assist other countries in the following:

- analysis of national oral health situations to evaluate priorities and to identify available and needed resources;
- planning of national oral health care programmes;
- arranging seminars and workshops for national staff and their counterparts from other countries to prepare programmes/project proposals, for submission to their respective governments, dealing with matters such as new profiles for oral health care personnel and appropriate modifications in staff education and training.

Oral health promotion and oral disease prevention based on systemic or topical uses of fluorides should be the first priority for national programmes. Primary health care and community oral health activities are also important elements. Learning/teaching modules for primary health workers and dental students are available from WHO.

A number of research projects on community oral health could be established on a bilateral or multilateral basis in collaboration with WHO and/or other international organizations. Undertaking a comprehensive comparative study of fluoride exposure, intake, and utilization at different levels of environmental fluoride would probably be extremely valuable.

Research and community trials have demonstrated the likely benefits of several preventive methods in Uzbekistan and Belarus. However, the methods are not necessarily appropriate in other CIS countries; for example, the implementation of salt fluoridation requires infrastructure and technology that may not be available.

Self-care and a healthy lifestyle are emphasized in our recommendations, including the use of fluoride toothpastes and strictly limiting consumption of caries-inducing snacks. In developing oral health programmes in countries of the CIS, priority should be given to these and other preventive approaches that can bring about decisive improvements in health and quality of life.

The availability of appropriate and validated oral health data provides a basis for a continuing improvement in oral health in all countries of the world. Such data enable researchers to identify practices that should be changed and administrators to formulate appropriate goals and design effective oral health programmes.

Use of WHO health objectives and epidemiological principles in this study made it possible to compare oral health care systems, and elements of those systems, and identify the approaches that are effective in improving oral health and that might guide other communities in developing systems suited to their own health and socioeconomic status.

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